

Are Lengthy Power Outages Acceptable?



**Tomorrow's Distribution
Automation Solutions Today**



ELECTRICITY POWERS CRITICAL INFRASTRUCTURE

Imagine flipping a light switch, and the light doesn't come on.

Maybe a minor inconvenience unless it is a light switch in a hospital's trauma center emergency operating room. Today we have more technology than ever before, in virtually every aspect of our life. And they all depend on us having access to safe, reliable, and cost-effective electricity.

The lifestyle and lifesaving services we have come to enjoy and expect are not possible without electricity. Just try and imagine our society without access to reliable electricity. Tait offers operational Distribution Automation solutions to improve how utilities manage power grid outages.

Outages have multiple causes: weather, equipment failures and man-made. Over the past decades security, communication systems, transmission, distribution, and generation have improved, but our demand for electricity has increased too. Everyone is impacted when electricity services are interrupted.



A COMMON CHALLENGE ALL UTILITIES FACE

As Utilities re-evaluate their wireless communications options, decision-makers often ask: “How can I improve grid operations?”

In response, it’s important to first acknowledge that while communications technologies may have advanced, the challenges that Utilities face remain constant.

Utilities communications must support a reliable, cost-effective and safe worker environment 24 hours a day, 7 days a week, 365 days a year.

However, during day-to-day routine operations, transmission and distribution outages, emergencies and disasters and rapid restoration have become increasingly important. Why? Because our energy dependence has increased exponentially. Of course, essential public services and businesses need power to function safely, efficiently and securely. Even at home, losing power goes well beyond the inconvenience of having to reset clocks or go without Netflix; life-sustaining medical equipment is now common in homes everywhere.

Regardless of where they operate, every Utility faces three challenges:

- Grid operations and outage restoration must be done safely
 - Utilities cannot endanger the men and women on their teams,
- Power must be restored quickly to keep public services and businesses operating smoothly,
- Regulators and customers demand cost-effective operations that pass savings to customers and investors.



TAIT GRIDLINK BUSINESS BENEFITS

Tait GridLink provides utility managers with a layer of network intelligence that delivers both visibility and control over their grid, ensuring operational cost reductions, optimized energy usage, and improved grid reliability and resilience.

Operational Cost Reductions

With better grid visibility, utilities are able to more quickly isolate and resolve faults, as well as limit the number and scale of any outage in less time and with fewer people, resulting in operational cost reductions.

Optimized Energy Usage

Electricity grid control enables utilities to optimize Volt/VAR, which in turn improves power delivery effectiveness and management. With better usage management, it is easier to ensure that your budgeted asset life cycles are realized and avoid premature equipment failure or replacement.

Improved Grid Reliability and Resilience

Tait GridLink gives managers enhanced visibility and control of their electricity distribution networks helping them to predict potential weaknesses and improve their grid reliability and resilience. Greater grid reliability and resilience will ensure better System Average Interruption Duration Index (SAIDI) and Customer Average Interruption Duration Index (CAIDI) metrics, which in turn means improved levels of customer service and increased utility profits.



GRID VISIBILITY AND CONTROL

Improving distribution grid operations with real time remote monitoring and control of grid assets has become simple and affordable with wide area Digital Wireless Fixed Multipoint Data System. Our Mission Critical Communications Infrastructure provides full feature services and wide area data transport services.

Delivering power reliably and safely is a constant challenge for electrical distribution utility companies. The diverse environments that many utilities operate across pose reliability and resilience challenges for their distribution network. Improving their grid visibility and control over their distribution network is a key priority.

Grid managers around the world have leveraged various types of communications to connect distribution line infrastructure and substations to their Supervisory Control and Data Acquisition (SCADA) systems. However, large parts of distribution grids remain off limits and are not visible or manageable due to the cost of connecting them.

Providing data communication for Distribution Automation (DA) in remote areas with a low density of pole top and pad mount transformers, reclosers, and capacitor banks is commercially challenging, and in rural areas cellular coverage can be too inconsistent, unreliable and a security risk for mission critical communications.

Enhancing distribution grid operations with real time remote monitoring and control of grid assets has become simple and affordable with wide area digital radio communications. Tait Communications provides full feature digital data services and wide area data transport services through our Tait GridLink solution.

Tait GridLink employs wide area, trunked digital radio coverage to deliver a DA solution that is highly economic, reliable and secure, providing visibility and control of your entire grid.

TAIT GRIDLINK SOLUTION HIGHLIGHTS

Tait GridLink builds on our Utility Critical Communications experience to provide extremely reliable and robust SCADA and Distribution Automation data communications.

Improved coverage

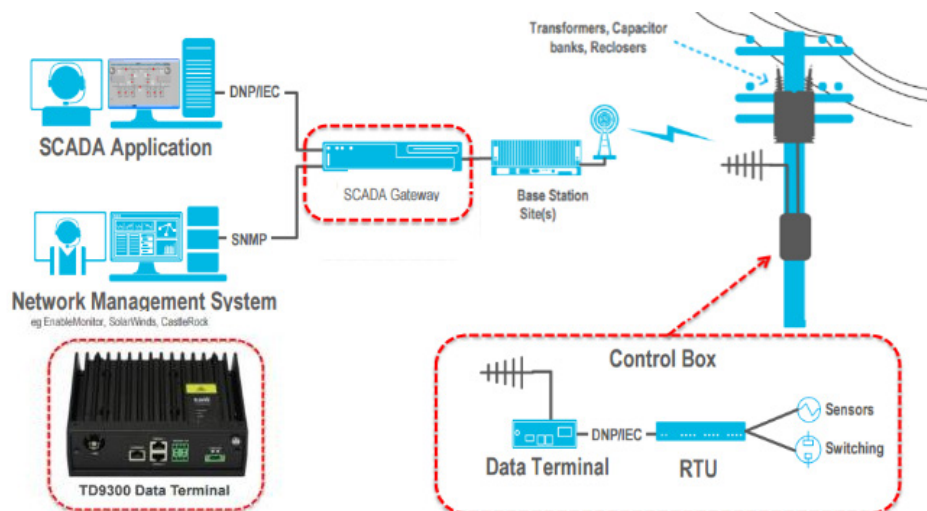
Tait GridLink delivers affordable wide area coverage for suburban and rural networks - equivalent to analog radio systems. Tait GridLink provides significantly wider area coverage for data than other digital radio technologies, such as Tetra. Depending on terrain, Tait GridLink coverage allows outstations to be located up to 43 miles (70km) from the base station sites. This minimizes the requirement for multiple base station sites and therefore reduces the capital costs of creating a wide area SCADA and Distribution Automation network.

Reliability and resilience

Tait GridLink radio networks are designed to deliver highly reliable network services. All infrastructure equipment is offered in redundant configurations to ensure business critical SCADA and DA communications can continue to operate in the rare event of an equipment failure. Tait GridLink employs digital trunking capability to dynamically reassign traffic to radio channels, so even if channels are lost, data will continue to pass through the network to its destination.

Scalability

Tait GridLink is a highly scalable solution, making it easy for a utility to deploy a small number of Tait GridLink data terminals and then gradually scale-up the solution, pole by pole, to a grid-wide system when required.



Ease of Integration

The integration of Tait GridLink with SCADA control systems and outstation equipment is seamless. Tait GridLink supports global SCADA communication standards and Tait has extensive experience integrating equipment from multiple vendors.

Tait provides comprehensive support during system integration and roll out including tailored acceptance testing, deployment planning and project management to guarantee the successful operation of your SCADA system once deployed.

Securing Tait GridLink

All SCADA communications are encrypted to prevent unauthorized access to your electricity network. In addition, access to the Tait GridLink wireless network is restricted to authorized terminals using standard security authentication protocols.

Remote Management and Control

GridLink provides remote management and diagnostics facilities allowing console access to RTU / IED equipment, which removes the need to physically visit outstations for routine maintenance activities. The status of all the Tait GridLink equipment is made accessible via SNMP / MIB interfaces for display through industry standard Network Management Systems.

Detailed Communication System Reporting

Tait GridLink systems monitor and provide detailed reports of system performance for both individual outstation and base station sites, including:

- Transaction latency and volumes to identify overloaded communication paths
- Transaction failure and retry metrics to identify failing equipment
- Received signal-strength and bit-error counters to identify interference or faulty antennas
- Supply voltage readings to confirm performance of outstation power supplies

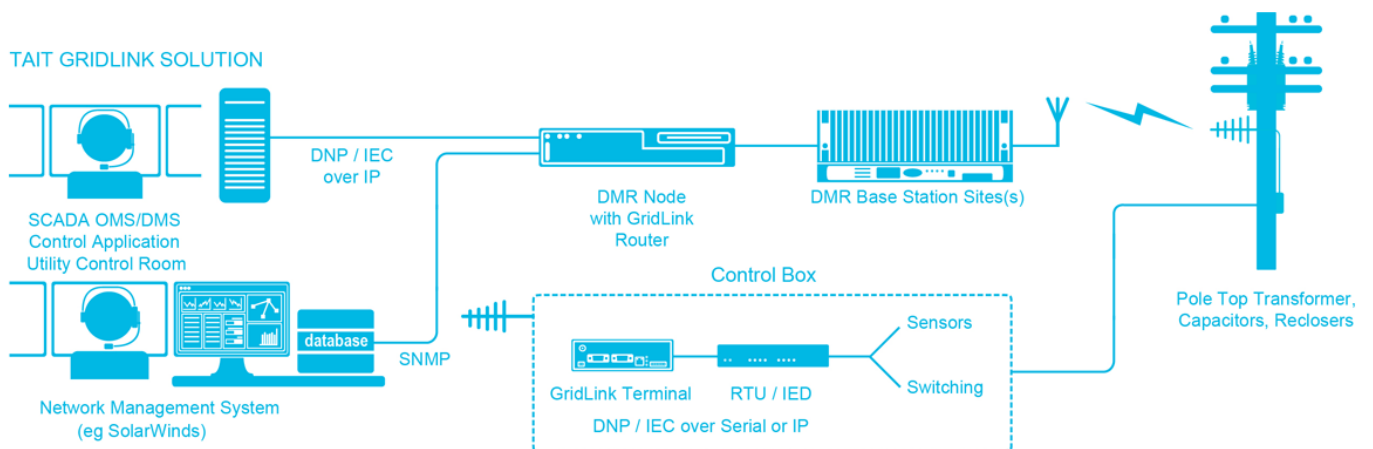
Industry standards

Tait GridLink supports major SCADA communications standards, including:

- DNP3 over both TCP/IP and serial
- IEC60870-5-101 and 104

Other communications protocols can be made available on request.





HOW DOES TAIT GRIDLINK WORK?

Tait GridLink builds on Tait Communication's proven experience in providing mission critical communications solutions for electrical utilities companies with the addition of data-enabled grid device monitoring and control.

SCADA communications are passed from the control application to the Tait GridLink communications server, which is located on the Tait GridLink Node, and transmitted via the Tait GridLink Base Station sites to Tait GridLink terminals at outstation sites.

- SCADA communications are passed from the control application to the Tait GridLink communications server, which is located on the Tait GridLink Node, and transmitted via the Tait GridLink Base Station sites to GridLink terminals at outstation sites.
- The Tait GridLink solution passes SCADA and DA messages using the packet data service on Tait GridLink traffic channels.
- In the event of RF interference, the Tait GridLink terminal and communications server automatically resends communications to ensure messages are reliably passed between the SCADA and DA equipment.
- The number of Tait GridLink terminals that may be provisioned on a single network will vary based on customer requirements. Tait GridLink provides a number of options to scale from small to very large networks. The number of outstation RTUs and associated Tait GridLink SCADA and DA terminals supported by a logical* Tait GridLink channel is dependent on a number of factors including the number of outstations and the frequency of status checks being conducted.

* A single physical Digital Tait GridLink RF channel provides 2 logical channels or timeslots.

WIDE AREA, UNIFIED MISSION CRITICAL DATA

Designed for telemetry and data communications, the Tait GridLink solution offers a secure and reliable M2M data terminal. The Tait GridLink TD9300 terminal has multiple data interfaces and the intelligence to simplify wide area mission critical utility data connectivity, to transparently support data communications.

FEATURES AND BENEFITS

Improve efficiency

- Monitor and control devices via long range licensed Digital Radio, reduce travel & site visits
- Centralized, standards-based network management
- Design, manage and maintain a data network which can support multiple fixed data applications

Designed to perform in demanding environments

- Tough die-cast metal chassis protects in demanding environmental conditions
- Protection and fold back mechanisms limit hardware failures, automatically restore service after fault cleared
- Flexible mounting systems, DIN rail in both vertical and horizontal, on a 19 inch rack tray or wall mounted

Security

- AES-256 bit data encryption
- Key management via web page configuration
- Terminals must both register and be authenticated to access the network
- Stun and revive to disable device

Remote site monitoring

- Extensive outstation diagnostics
 - Temperature
 - Telemetry equipment status
 - Signal (RSSI & BER and MER)
 - Antenna Fault
 - Input voltage
 - Digital I/O
- Over-The-Air (OTA) configuration of SCADA and DA interface

Standards based interface protocols

- Industry based interface protocols
 - DNP3 over IP/serial
 - IEC60870-5-101 and -104
 - MODBUS
- Network Time Protocol (NTP)
- Internet Control Message Protocol (ICMP)
- Eliminates costly proprietary protocol integration and support

SCADA and DA Applications

- Distribution utilities
- Oil and gas utilities
- Monitoring & control for renewables

Data services

- Packet data over traffic channels for telemetry, SCADA, DA and customer specific applications
- Native and Transparent IP data interface operation
- Control channel short data messages, location, status and text

Flexible interfaces

- Two RS232 / RS485 serial interfaces for legacy equipment connection
- 10/100 Mbps Ethernet connection
- 2 digital input and 2 digital outputs to monitor and control surrounding environment, fully isolated.

TAIT GRIDLINK FOR UTILITIES: A GAME CHANGER

REDUCE TRUCK ROLLS USING EXISTING UTILITY FCC LICENSED FREQUENCIES

Technologies like Tait GridLink Distribution Automation and SCADA systems improve utilities total cost of ownership while cost-effectively reaching power grid locations that are cost prohibitive for private fiber and require a higher degree of reliability than commercially leased lines or wireless cellular systems.

Every year all utilities face the common challenge of managing capital projects and operating expenses. Aging infrastructure, proprietary legacy systems, combined with weather events, and unplanned maintenance, these require excessive truck rolls day after day to supplement grid maintenance, the gathering of performance data, and addressing fault conditions.

Consider aging infrastructure and the amount of grid modernization taking place to address increased demand for cost-effective energy. Smart Grid, grid automation, smart metering, integrating renewables, charging stations for electric vehicles are utility business drivers to support the modernization of the power grid.

Obsolete, outdated single purpose analog wireline and wireless systems are aggressively being replaced with multipurpose digital critical communications solutions. Solutions like Tait GridLink provide utilities the opportunity to support multiple applications from a common network. Using the existing FCC licenses provides utilities cost-effective access to multiple data applications.

Consider: A typical US electric distribution utility might have 2,000 capacitor banks, distributed across its operation, to compensate for voltage loss associated with warm weather and/or planned state changes. Four times a year, each bank must be manually switched over, using utility truck rolls. On average, a truck roll costs a utility \$500.

LET'S TAKE A LOOK AT THOSE NUMBERS:

2000

CAPACITOR BANKS

x 4

VISITS ANNUALLY

x \$500

PER VISIT

US\$4MILLION

OPEX EACH YEAR.



2,000 capacitor banks x four visits annually x \$500 per visit = \$4 million OPEX each year

CRUNCHING THE NUMBERS

Imagine converting that \$4 million OPEX per annum into CAPEX for infrastructure upgrades, or business efficiency assets. By simply using the data capacity that already exists in a Tait digital LMR network, these manual switchovers can be managed remotely, from your control center.

This is not entirely without cost – each capacitor bank would need a data terminal installed to control the switchover. But at around \$1,000 each, the company in the example will have paid that cost in just two truck rolls. So after just six months, the CAPEX is repaid, and they begin to recoup OPEX. Better still, you do not need to invest

\$1,000 on each of those capacitor banks all at once. In fact, the business case to tackle the less-accessible banks first is compelling, as the savings on those truck rolls are greater. By investing first in those banks with the highest savings, you can use those OPEX savings to fund rollout of terminals on other capacitor banks.

This is premised on \$500 per truck roll being the average. Depending on your geography, distance travelled and weather, some of those banks may be costing twice that (or more) for every visit. Conservatively, you might have 10% of your capacitor banks in this category.

Here is a review of those numbers:

200 hard-to-reach banks
x four visits annually
x \$1000 per visit

= \$800,000 OPEX saving

200 hard-to-reach banks
x \$1,000 data terminal each

= \$200,000 CAPEX investment

\$800,000 OPEX saving

- \$200,000 CAPEX investment

= \$600,000 CAPEX available to invest in 600 further data terminals.

200

HARD-TO-REACH BANKS

x 4

VISITS ANNUALLY

x \$1,000

PER VISIT

US\$800,000

OPEX SAVING

200

HARD-TO-REACH BANKS

x \$1,000

DATA TERMINAL EACH

US\$200,000

CAPEX INVESTMENT

US\$800,000

OPEX SAVING

- US\$200,000

CAPEX INVESTMENT

US\$600,000

CAPEX AVAILABLE TO INVEST IN 600 FURTHER DATA TERMINALS.



At the end of the second year, truck rolls to those first 200 banks have netted you \$600,000 net OPEX to spend, and those 600 new banks add at least an extra \$1,200,000. Converting those OPEX savings to CAPEX, you now have enough funding to complete the data terminal rollout to the remaining capacitor banks.

That is not the end of the efficiency gains and cost saving those data terminals provide. Other operational uses include SCADA applications, such as polling switches and reclosers, capturing voltage and current readings, providing remote diagnostics, and making configuration updates. In addition, this frees up the crews by eliminating truck rolls by leveraging services performed by the Tait GridLink system.

Please note, we are not advocating a massive change in the way you do business. But it makes great business sense to use your manpower and vehicles in a smarter way and to take advantage of the data capability that you already have. By substantially reducing your OPEX, you can free up that hard-to-get CAPEX for maintenance, repairs, and upgrades to the infrastructure your community depends on. The decisions made in selecting your next Digital Wireless Fixed Multipoint Data System may be one of the best decisions you will ever make.



Tait has taken every care in compiling this brochure, but we're always innovating and therefore changes to our models, designs, technical specification, visuals and other information included in this brochure could occur. For the most up-to-date information and for a copy of our terms and conditions please visit our website www.taitradio.com.

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