Emerson Network Power Hybrid Energy Solutions

Multiple Energy Source Solutions for Your Access Site Operational Challenges

The Challenge
off-grid and on-grid

For telecom operators and tower companies, fuel, generator and maintenance costs are often the major operational expenses for access sites. Minimizing these costs while improving network reliability will help you balance falling ARPU, attracting additional tenants (if applicable), and ensuring sufficient capital is available to keep your network one step ahead of your competition.

The Path to a Reliable Network, Rapidly Deployed
with minimized fuel and power conditioning costs

Rapidly deployed and operationally efficient is achievable in off- and on-grid environments. But first we ask — what is your desired balance between capital cost and operational efficiency?

It is easy to think of a hybrid energy solution as one-size-fits-all. But if you do, you may end up with a solution designed for someone else. Emerson Network Power's team of solutions experts listens to our operator partner's unique needs and engineers the solution that achieves the capital/operational balance desired.

What matters most to you? Up-front capital cost? We focus on providing the most essential hybrid solution at a very competitive price. Minimizing fuel consumption? We tune your solution to ensure fuel savings is first. Protecting from surges or dirty mains/grid power? We include technologies to protect your equipment and maximize mains/grid energy use. Achieving the best ROI? We leverage smart hybrid technologies to ensure that even after installed, a site continues to improve, watching for trends and managing energy and maintenance as operating conditions change.

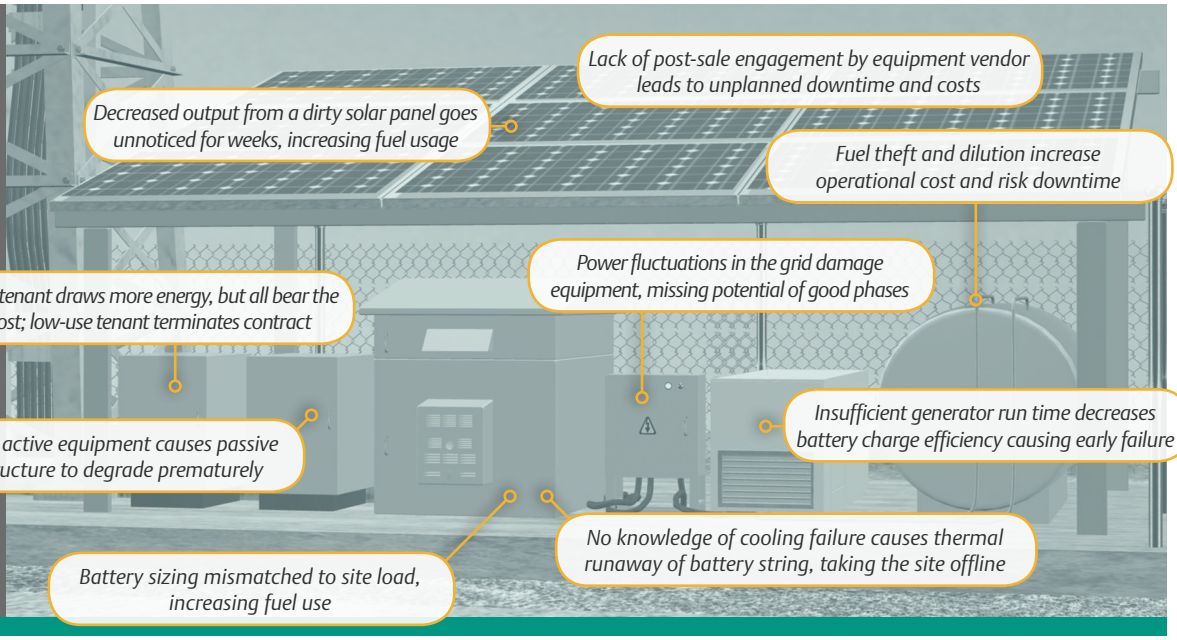
Whether these, power conditioning, multi-tenant support, or other factors lead your list of concerns, Emerson Network Power Hybrid Energy Solutions can help you rapidly deploy sites and achieve your operational goals.

Challenges	Consequences	Opportunities
Fuel expense is high due to: ■ Frequent generator operation ■ Theft and quality/dilution ■ Site accessibility	High operating cost	■ Strategically blend power from batteries, solar, grid/mains and other sources to achieve lowest possible energy cost ■ Actively manage sites to ensure proper battery health, optimal generator maintenance, clean solar panels, and tracked fuel quality and level
Deployment speed slowed by: ■ Passive infrastructure not in place ■ Complex supply chains ■ Availability of installation experts	Consumers choose competing carriers Carriers choose competing tower company	■ Ensure site readiness by selecting a single coordinator for all site passive infrastructure and installation ■ Tension supply chain through joint schedule and customs management
Operation and maintenance costs impacted by: ■ Improper hybrid dimensioning ■ Lack of site visibility post-installation ■ Calendar-based maintenance dispatch	Reduced profitability	■ Engineer the hybrid site solution for the desired balance between capital and operational cost ■ Leverage smart hybrid technologies to minimize maintenance dispatch and achieve maximum ROI, even as operating conditions change
Site reliability impacted by: ■ Improper hybrid dimensioning ■ Strong focus on active infrastructure leaves passive infrastructure unchecked	Lost revenue Duplicate capital or operating expense to bring site back up	■ Validate vendor focus on the technologies and skills associated with deploying and operating energy and passive infrastructure ■ Keep vendor engaged in site performance post-deployment

EMERSON
Network Power

We understand your operating challenges

Emerson Network Power has the technology and expertise to meet and overcome operating challenges like these.



Hybrid Solutions for Telecommunication Sites

Emerson Network Power's team of experts leverages a portfolio of infrastructure technologies and services to overcome your unique challenges and ensure network reliability, operational efficiency, and deployment speed.

NetSure™ H Series Hybrid DC Power Systems

Speed Deployment

The NetSure™ H series of integrated hybrid DC power systems is designed to increase network reliability and reduce operational costs for wireless network access sites, backbone sites and hub sites with no or poor quality AC utility infrastructure. The systems enable hybrid operation of mains, generator, battery, renewable energy and standby DC power equipment with large battery backup requirements.

NetSure™ DC Power Systems

Increase Reliability, Minimize Operating Cost

NetSure™ DC power systems are optimized for use at telecom sites in off-grid or on-grid locations through a modular framework that is easy to configure. These systems provide proven reliability and low operational cost by working with a variety of energy sources, such as grid, diesel generator, solar panels and wind turbines. Cost-effectively optimized and prepared for future expansion, configurations are constructed for the unique solution needs of each customer.

Solar Sub Racks

Cut Fuel and Grid/Mains Cost

Innovative Solar Sub Racks can cut energy cost significantly by bringing solar energy to any customer site. Using a modular framework that offers efficiency levels of >98%, whether you want a small or a large amount of solar power, these sub-racks ensure you maximize your investment and minimize your energy costs.

High-efficiency eSure™ Rectifiers

Reduce OpEx and CO_2 Emissions

eSure™ high-efficiency rectifiers offer superior performance and uncompromised reliability. An industry-leading 97% efficiency with a wide temperature operating range ensures that your solution will offer the best energy and fuel efficiency available in diverse operating environments. Paired together, DSP-enabled active load sharing, redundancy and hot-swappable capabilities ensure safe power is available and the network reliable.

Solar Converters (S48-3000)

Maximize Solar Efficiency

With >98% conversion efficiency, the S48-3000 is the leading solar converter in the industry. Operating in maximum power point tracking (MPPT) mode, this converter leverages DSP technology in a modular, hot-pluggable form factor to ensure high site reliability and energy use from solar sources.

With Emerson Network Power, you can achieve greater operational efficiency and rapid deployment while increasing your network's reliability.

NetXtend™ Duo Enclosures
Optimize Site Capacity

NetXtend™ Duo Series of integrated enclosures are designed with dual compartment climate zones for use at wireless network access sites, backbone sites, and hub sites. These enclosures are designed with a compact footprint especially for hybrid energy solutions with mains, diesel generator, battery, renewable energy such as solar, DC power equipment, and customer equipment.

Battery Backup Solutions
Maximize Site Reliability

Providing cost-efficient energy storage where high and deep cycle performance is required, Emerson Network Power has a full suite of available products to fit your site applications. VRLA and other technologies can be selected depending upon site conditions, to minimize operational costs and maximize site reliability.

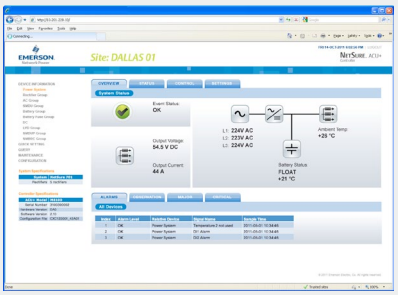
Additional Portfolio Offerings

- ATS for DG/Mains and other interconnections
- Junction boxes for solar interconnections

Emerson Network Power Smart Hybrid Ecosystem

Joined together, Emerson Network Power offers customers unmatched visibility and control of their infrastructure from afar and at the site – increasing reliability and decreasing operational costs, even after the installers have left.

ENEC™ Monitoring Systems
Reduce Operating Cost



ENEC™ Monitoring Systems offer customers a totally computerized supervision and control system managed and monitored 24x7 by a team of remote services infrastructure experts. By gathering and analyzing customer site performance and alarm data, we help customers increase network reliability and benefit from a continuous cycle of improvement in operational costs across the network.

NetPerform™ Services
Simplify Installation

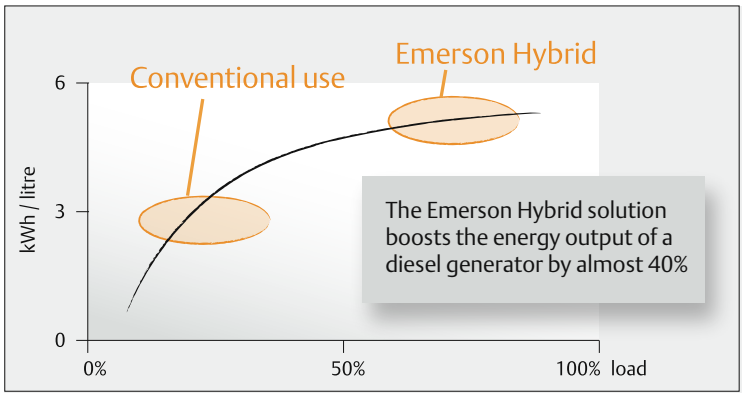
Speed your network deployment through single point of contact coordination of installation. Emerson Network Power's NetPerform™ Services team takes a holistic approach to the health of your network to ensure that every facet of your infrastructure is rapidly deployed and operating at maximum efficiency. By leveraging in-depth knowledge of DC power plants, batteries, generators, HVAC, UPS systems, alternative and other energy sources, we pay attention to the entire system and help keep your network reliable in even the most remote or challenging environments.

ACU+ Controllers
Improve Reliability, Minimize Operating Cost

The ACU+ for NetSure™ DC power systems enables enhanced site operation and advanced hybrid operating algorithms that balance AC mains, DC power plant, battery operation, diesel generator, site environment, and numerous other inputs. In addition, it stores a wealth of operational metrics including fuel monitoring, battery diagnostics, and more. Remote monitoring capabilities and alarms enhance network reliability well beyond solution installation by allowing for continuous improvement in energy efficiency and optimization of maintenance cycles.

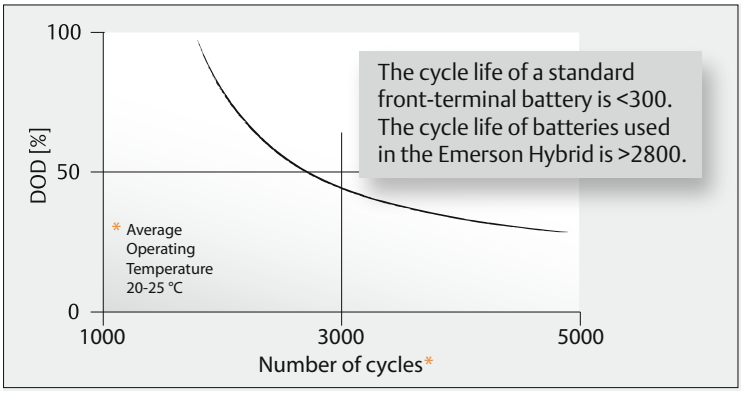
Hybrid Diesel Solution

Emerson Network Power manages your diesel generator operation to ensure it runs with the best fuel efficiency.



High Cyclic Battery Solution

High cyclic, valve regulated lead-acid batteries achieve thousands of cycles.



Emerson Network Power's rapidly deployed Hybrid Energy Solutions unite the industry's best multiple energy source management technology with innovative active remote infrastructure management technology. We rapidly deploy your solution and ensure that your network runs at the best operational cost — less fuel, fewer visits, faster response — and remains as reliable as your customers demand.

Globally, no location is too dense or too remote. With Emerson, *Consider it Solved.*™

EmersonNetworkPower.com/EnergySystems (North America)
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