

Reclosers: Safeguarding Electrical Grid Reliability

Reducing system outages and increasing reliability by providing quality overcurrent protection on overhead lines.

Global Grid Reliability Issues

"Poor (grid) reliability doesn't just impact households, but also hospitals, factories, telecom systems, government buildings, etc., all of which are important to economic development," according to the 2017 blog post *The Developing World Is Connecting to the Power Grid, but Reliability Lags*.¹

The blog post, published by the Energy Institute at Haas, delves further into the economic impacts of grid reliability, but summarizes that there is a:

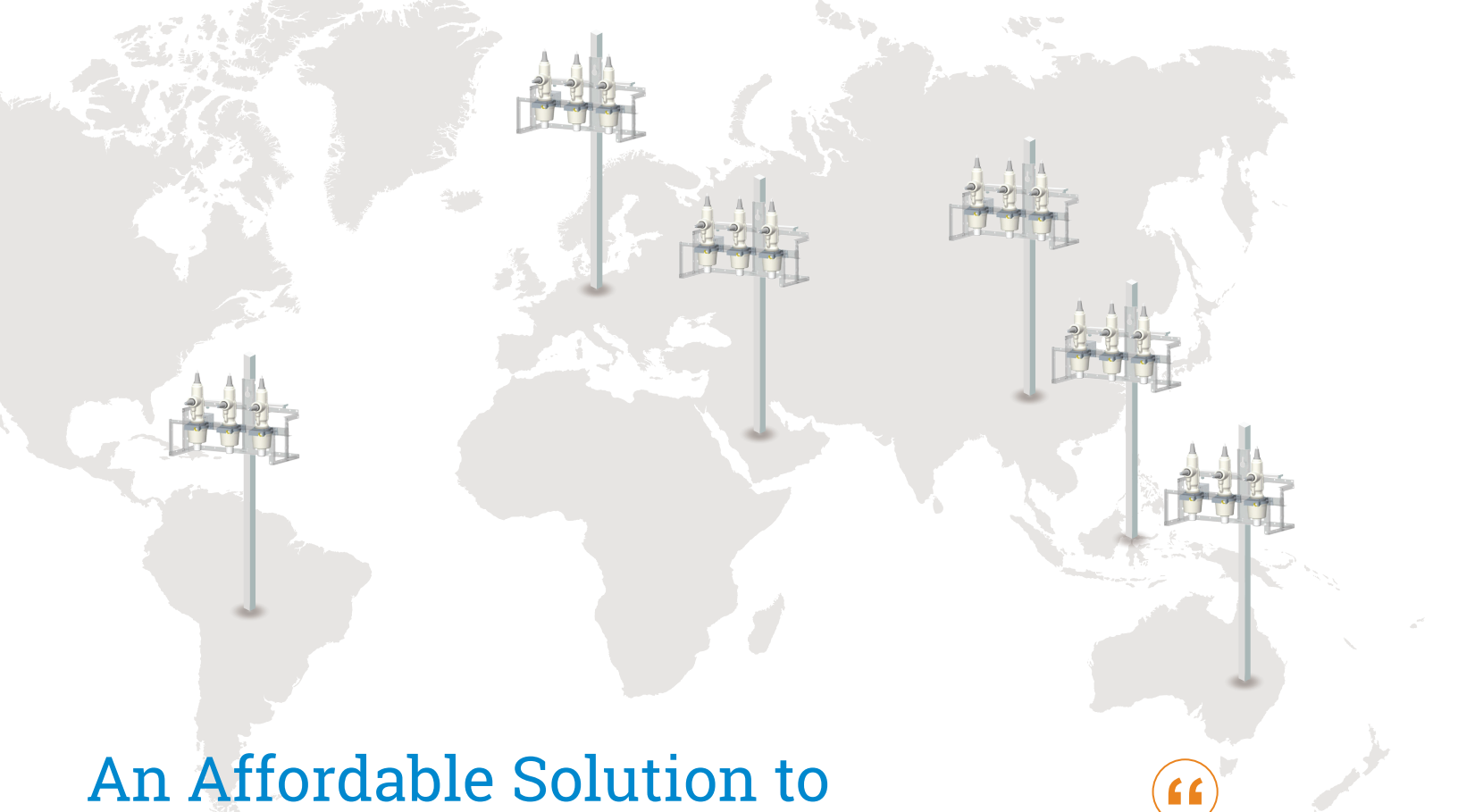
"Need to figure out cost-effective ways to improve measurement technologies, identify the many varied causes of poor reliability, work with utilities to improve their systems for both preventative maintenance and triaging when they face reliability incidents...and identify ways to provide utilities with better incentives and more capital to invest in reliability. There are big payoffs to getting these answers right."

Of course, grid reliability does not just impact developing countries; the economic impacts of poor grid reliability are felt worldwide. However, in the Asia Pacific (APAC), Latin America (LATAM), Middle East and Europe, the culmination of population growth, new construction, more reliance on technology and impacts of climate change has made grid reliability a major concern. The result is a failure in the system and massive outages. The reasons for these system failures and outages aren't new; in fact, some are obvious. For high-voltage electric lines, a majority of power outages are temporary and occur because of lightning strikes, downed tree branches or tampering from wildlife. However, as climate change continues to exacerbate more extreme weather conditions, such as hurricanes, wildfires and heatwaves, power outage frequencies and durations will likely increase. Additionally, as the global population continues to increase, the demand will place higher pressure on utilities to continue to provide more reliable power.



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¹Energy Institute Blog, Energy Institute at Haas, The Haas School of Business at the University of California, Berkeley, 2017, [The Developing World is Connecting to the Power Grid, but Reliability Lags](#).



An Affordable Solution to a Complex Problem

One of the solutions that has seen tremendous improvements, including smart technology, is the recloser. The majority of improvements made in recloser manufacturing are to help utilities better manage and mitigate disruption of electrical service. From simplifying the mechanism, to incorporating smart technology while eliminating the need for routine maintenance, reclosers have evolved into a critical must-have component for a utility's grid reliability.

Across the globe, grid reliability issues are related to all sorts of external factors but for purposes of this paper, the scope of this problem will address challenges in APAC, LATAM, Middle East, and European regions and how the right reclosers and partner can reduce widespread power outages.



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Deeper Look by Region

ASIA PACIFIC

The energy sector has become more vulnerable to interruptions and outages because of various forms of natural and human-induced disasters. Many island nations' electrical infrastructure are prone to typhoons, earthquakes, soil erosion, and drought, which are some of the top causes of power interruptions and outages. In many areas, especially in more remote or rural regions, overhead lines are aging and of course susceptible

to weather events. In addition, inadequate access to electrical power still impacts a significant percentage of populations in the APAC region. Other challenges facing countries are the role governments and regulations play. For example, in Thailand, state bodies play a major role in managing energy generation and distribution, as well as in setting prices and planning for investment to increase supply to the national grid.

LATIN AMERICA

With the recent growth of the middle class in Latin America, the demand for electricity has increased and is expected to continue. According to *The New York Times*, electricity consumption in Latin America is projected to rise more than 70 percent by 2030.² Along with a growing middle class, many of these nations have aging infrastructure and are dealing with the challenges of growing populations and therefore will need to invest in components to ensure their grids keep pace with growing demand.

In addition, regulatory bodies can vary from country to country and make it challenging for uniformity in terms of system upgrades. Like many regions across the world, Latin America faces similar challenges in terms of weather-related interruptions due to climate change. Across the region, more than 80 percent of its renewable energy comes from large hydroelectric dams. In recent years, heatwaves in the region have lowered water levels in many areas, reducing the amount of renewable energy produced by the dams. As a result, the drop of energy generated and increased demand from air conditioners has led to blackouts.

To meet the increased demands, countries in this region will need to modernize their electrical grids. To do so, many countries are building more reliable renewable energy sources such as solar and wind. However, to fully integrate the energy into the electrical grid, additional upgrades throughout the grid will be necessary to ensure the renewables deliver reliable electricity to customers across the region.



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MIDDLE EAST

Despite being one of the more energy-rich regions in the world, the Middle East still experiences grid reliability issues. As noted in an article in *The New Yorker*, “The Middle East, though energy-rich, no longer has enough electricity. From Beirut to Baghdad, tens of millions of people now suffer daily outages, with a crippling impact on businesses, schools, health care, and other basic services, including running water and sewerage. Little works without electricity.”³

Furthermore, a report titled *Review of Middle East Energy Interconnection Development* describes the need for more reliable energy. “In recent years, the Middle East has experienced rapid population and economy growth, which has resulted in large increase of energy and power demand. With the new generating capacity, the power grid infrastructure also needs to be improved for stable transmission and distribution.”⁴

While natural disasters can cause physical damage to electrical grids, extreme temperatures in the Middle East can put excessive stress on utilities and impact their reliability. The robustness of reclosers in extreme temperatures is important for utilities to avoid blackouts due to the increase in power demand. In July 2020, with record-setting temperatures across Iraq, Iran, Saudi Arabia, Lebanon, and Syria, electrical systems failed as utilities couldn’t keep up with the electrical demand as residents stayed inside to avoid the heat.

EUROPE

According to Eurelectric, “The electricity distribution business across Europe is very diverse. It varies in the number and size of operational areas, the number of customers, network characteristics as well as ownership structure.” Furthermore, the organization indicates that “Despite this diversity, European distribution system operators (DSOs) generally provide a very high level of reliability and quality of supply to their customers. However, DSOs are facing an increasing challenge of integrating rising shares of decentralized and variable generation and new loads such as electric vehicles into their networks. Considerable investments in distribution networks, including smart grids and smart meters, will be needed to accommodate these challenges.”⁵

Despite demand fluctuations in these regions, it’s imperative that utilities stay focused on ensuring their grid is improved and well-maintained. This does not mean major investment, but rather focusing on modernizing their electrical grids by upgrading interchangeable parts with “smarter” yet affordable parts.

²Lisa Viscidi and Ariel Yépez, *The New York Times*, 2018, [The Energy Solution Latin America Needs](#)

³Robin Wright, *The New Yorker*, 2017, [The Lights Are Going Out in the Middle East](#)

⁴Zhang, Ou, Song, & Li, 2017, [Review of Middle East Energy Interconnection Development](#)

⁵Union of the Electricity Industry – Eurelectric, 2013 (last updated in 2018) [Power Distribution in Europe Facts & Figures](#)

Installing Reclosers into Existing Grids to Improve Reliability

In countries throughout APAC, LATAM, Middle East, and Europe, distribution power lines and substations are facing increasing reliability issues due to aging infrastructure, overgrowing vegetation, deterioration and inadequate ratings. As smart-grid technology becomes more affordable, replacing or upgrading those lines is not only a necessary improvement, but a short-term investment for utilities to reduce future costs.

Automation has provided a means not only to control, but intelligently manage the operation to avoid interruptions in the power supply. As a result, equipment such as reclosers are installed to reduce the complexity of fault diagnosis, detection and isolation with SCADA, which becomes an integral part of the digital components.

When an outage occurs, reclosers can save utilities time and money by restoring power automatically. In the event an outage requires a repair, reclosers help crews to quickly locate the problem and restore power by minimizing the outage area. As utilities work to save customers the expense and inconvenience of frequent power outages, the global recloser market is expected to surge as populations and demand for more reliable power continues to grow. Increasing investments in distribution automation for power reliability, expansion of distribution networks, and growth in renewable power generation are driving the global recloser market.

For utilities looking to improve their grid reliability, they should consider the following capabilities when specifying reclosers:



SIMPLIFIED MECHANISM

Reducing the need for maintenance is one of the biggest ways for utilities to cut costs. In regions where outages are frequent, the costs and penalties associated with outages can pile up quickly. To help eliminate these costs, newly available reclosers now feature an improved mechanism containing a minimum of operating components and no operating electronics in the mechanism. A simple mechanism ultimately translates into a lightweight, highly reliable and maintenance-free device.



POSITION INDICATOR VISIBILITY

Newer reclosers on the market feature designs that include a unique transparent bottom cover over the mechanism housing to allow full visibility of the magnetic actuator and all mechanism components from ground level. This allows direct on-site visibility of proper functionality from a safe distance for field crews.



SMART

As utilities look for more intelligent monitoring, some manufacturers are integrating six-voltage sensors as a standard offering to allow reclosers to be site-ready for distribution automation applications. With a focus on connectivity and security, "smart" reclosers support the latest in communications technologies and protocols. Additionally, the intelligence provides standard security tools helping to ensure that device's integration into new or existing SCADA, OMS or DMS is as simple and secure as possible.



MODULAR CONTROLS

A simple, modular layout of control components on newer reclosers allows for quick disconnecting and re-connecting of components without removal of other/unrelated devices. A compact design and small relay panel footprint enables a plug-n-play design platform that makes maintenance requirements throughout the life of the control easier and faster.



ENVIRONMENTAL

As countries in the APAC, LATAM, Middle East, European regions install more electrical lines in rural areas, external conditions can negatively impact the reliability and longevity of a recloser system. Standardization on higher-creepage modules and sealing the mechanism significantly reduces the potential of adverse conditions damaging the recloser throughout its service life.

Selecting a Recloser Supplier

Well-designed, reliable, and affordable products are mandatory. But it is also crucial to partner with a well-established supplier that is committed to customer service. In addition, it's important to review and understand the company's commitment to innovation, safety, quality, and sustainability, and has sought out and continues to seek third-party certifications such as ISO.

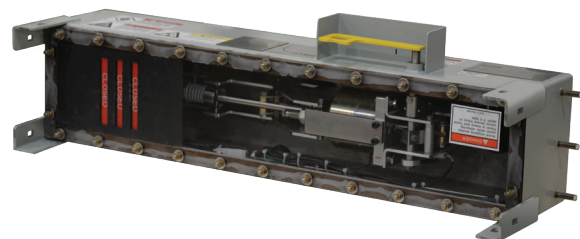
It is critical for utilities to work with a partner that is continually innovating and researching ways to make this simple, yet critical, technology even better. Reclosers are extensively used equipment in a utility's distribution network and a capital-intensive equipment. When specifying these devices, utilities should look for manufacturers that offer easy, flexible, and affordable solutions. with almost any configuration in any setting.

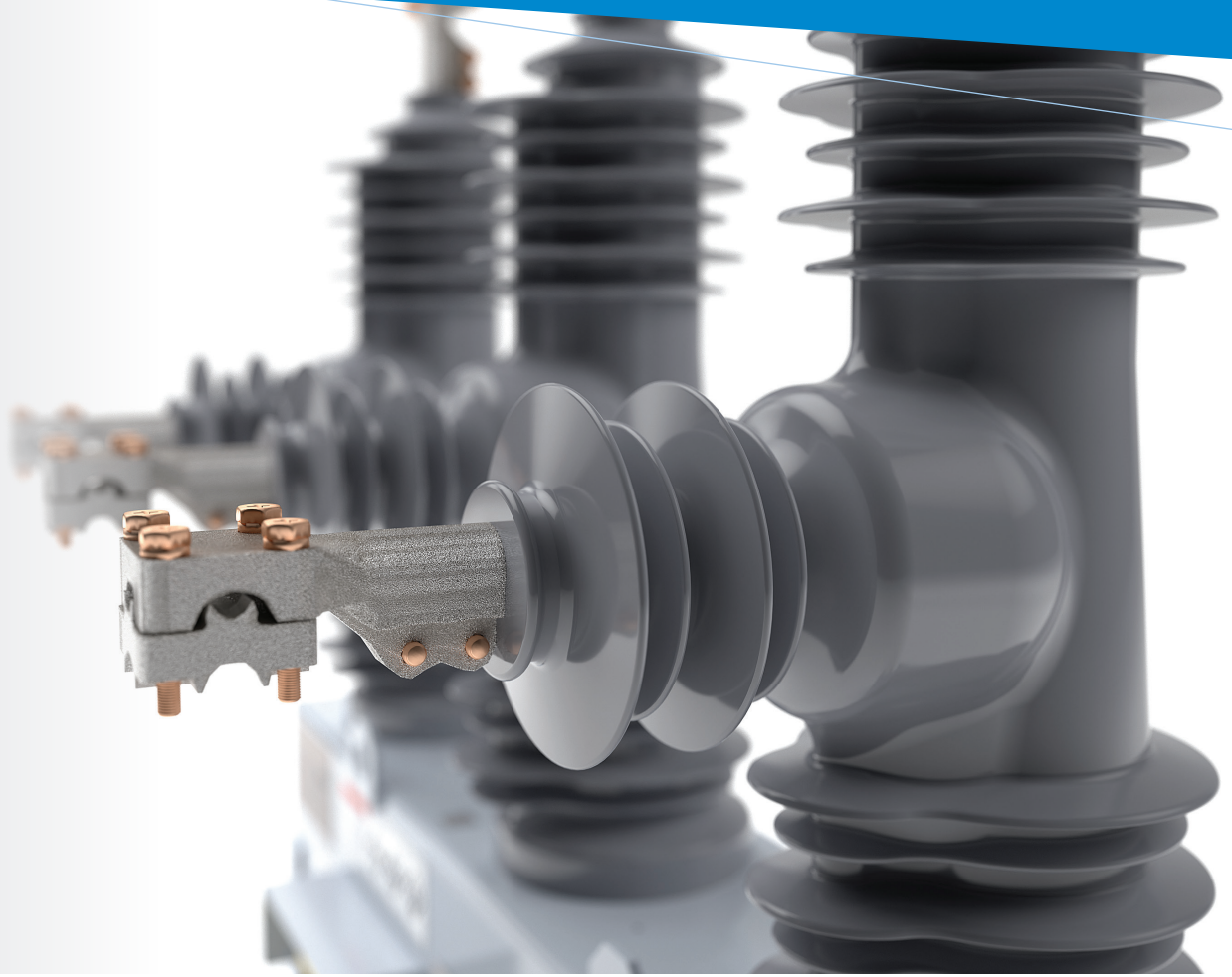
G&W ELECTRIC'S TEROS™ RECLOSER SYSTEM

Designed to improve system reliability and grid resiliency, G&W Electric's Teros Recloser system provides overcurrent protection for temporary faults on overhead distribution lines and provides utilities enhanced functionality that is automation ready. The Teros Recloser requires no oil or SF6, which eliminates the need for routine maintenance and improves personnel safety. The modular platform integrated with a state-of-art control offers ultimate user flexibility by permitting a variety of operating modes.

The Teros Recloser has all electronic components inside the control panel instead of in the recloser mechanism. This design approach allows electric utility resources to have quick access and the ability to easily change any damaged components (such as a power supply, driving electronics, capacitors, relay, etc.) within the control panel.

As most countries have their own specific requirements for utilizing and deploying devices on their power distribution lines, it becomes difficult to have a universal one-size-fits-all approach for reclosers. But based on a wide range of benefits, the Teros Recloser can work with almost any configuration in any setting.





Whether utilities are looking to improve system reliability or expand their network capabilities in growing urban areas, the new Teros Recloser from G&W Electric combines quality and durability to provide a highly reliable, smart solution for high-speed fault isolation. G&W Electric's Teros Recloser offers additional features and benefits for site-ready designs in new or existing electrical systems. These include:



Confidence in Grid Reliability

The solid dielectric three-phase gang operated 15 and 27kV Teros Recloser provides system reliability and grid resiliency by offering durability, maintenance-free construction and modular turnkey solutions.



Reducing Frequency and Length of Outages

Designed to reduce the amount, frequency and duration of outages on overhead distribution systems including main distribution lines, distribution branch circuits and substations.



Field-Tested Reliability

G&W Electric's reclosers are solid dielectric, electronically controlled, vacuum interrupter switches, making them more reliable for load switching and overcurrent protection.



Ease of Installation

The Teros Recloser is lightweight and compact. Site-ready designs provide all accessories including brackets, arresters and voltage transformers.



Power Grid Automation Ready

The Teros Recloser is automation ready, simplifying conversion for any future automation requirements.



Overall System Serviceability

The Teros Recloser system is based on a maintenance-free concept and is specifically designed to have all the electronic components inside the control instead of in the recloser mechanism. This design platform allows for quick access of all electronic components for a wide range of utility resources and, therefore, provides the best level of serviceability throughout the entire life of this recloser solution.

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This white paper is published by the experts at G&W Electric. Since 1905, G&W Electric has been a global supplier of electric power grid equipment. The company's product offerings include padmount and underground distribution switchgear, automation solutions, reclosers, current and voltage sensors, distribution and transmission cable accessories, and current-limiting system protection devices. The products are designed to the latest industry standards and backed by more than a century of engineering expertise. The result is time-proven, reliable performance.