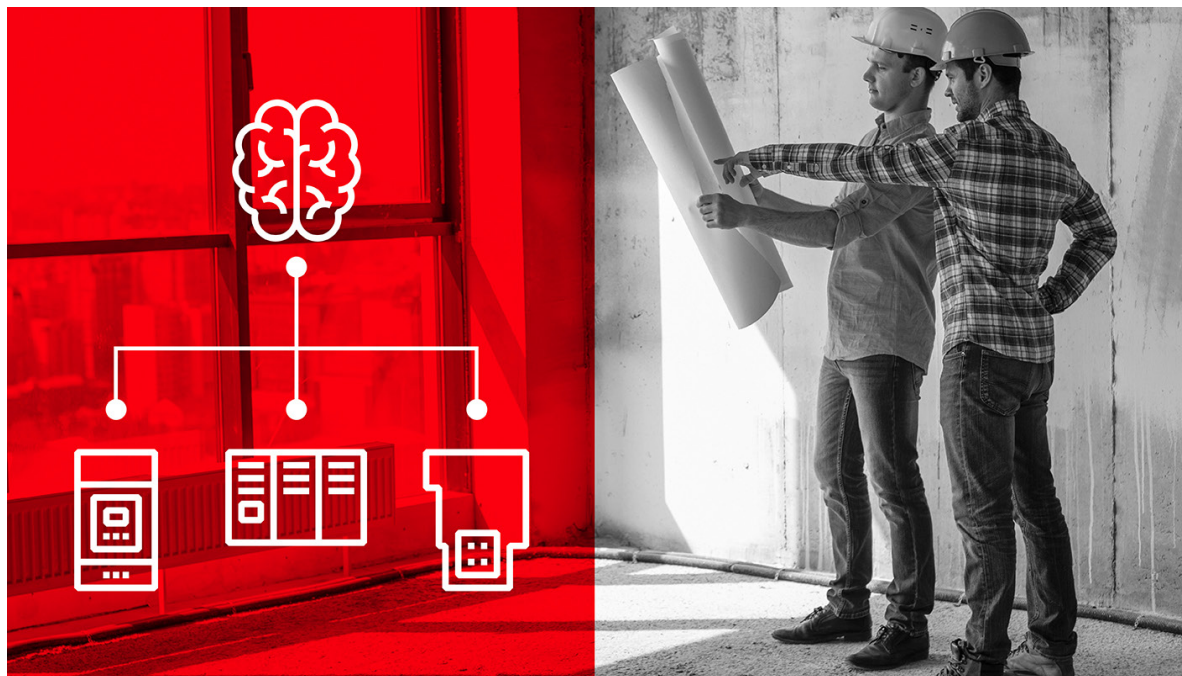


Smart Advancements in Electrical Distribution Systems

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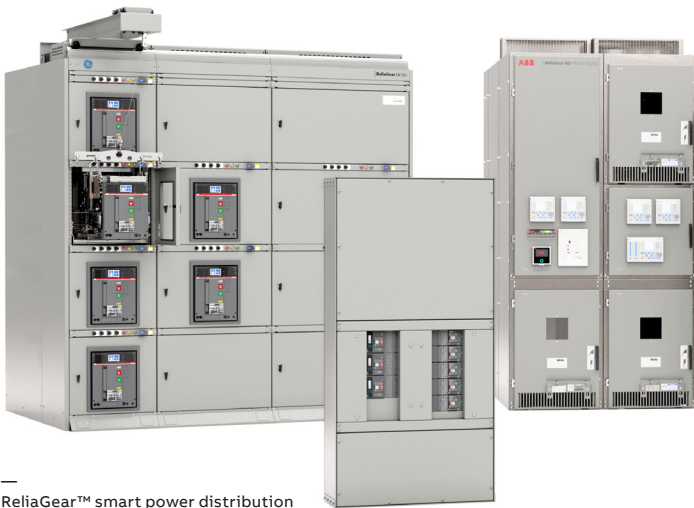
Electrical power distribution systems have gone through some significant evolutions in capability over the last few decades. The traditional distribution system is the interconnection of various power system components such as transformers, conductors, synchronous machines, motor control centers, switchgear, and panels all functioning to deliver reliable power to various types of loads. The system is monitored and protected by electromechanical relays, which have earned a well-deserved reputation for accuracy, dependability, and reliability. However, these systems are sometimes considered “dumb” due to limited means of communication between devices and little internal regulation. These systems are typically put in place to allow the availability of power whenever it is needed with minimal dynamic changes, particularly at the facility end-user level. While this approach certainly can produce incredibly reliable systems, there are new options available today that can provide many advantages on the reliability and sustainability front, and most importantly in the area of safety.

From improved physical designs to the addition of smart technologies, there are many improved options for electrical distribution systems. Ranging from large pieces of high voltage arc-resistant switchgear to small arc-fault and ground-fault sensing circuit breakers, manufacturers continue to find innovative ways to help keep personnel clear of safety hazards. Traditional switchgear that experiences an arc flash event has the



potential to blow open the enclosure and engulf several feet around the gear in a fireball. Arc-resistant gear is designed to contain or divert away the arc flash energy so that personnel are protected from hazardous temperatures and debris. To take it a step further, there are advancements in protective devices that use fiber-optic light sensors in parallel with smart relay technology, like the ABB REA arc fault protection system, that can detect a developing arcing fault and send trip signals to appropriate breakers to prevent the arc from developing into a high energy arc flash. The need to protect our workers is driving new innovative solutions at an exciting rate.

In today's connected and fast-paced world, there is continued emphasis on facility uptime. Today's engineers must consider every aspect of the lifecycle



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ReliaGear™ smart power distribution



of equipment to optimize the reliability and availability of a distribution system. Equipment designs are modular, compact, and lightweight for ease of installation, with additional focus on minimizing downtime during maintenance or future modifications. More designs now include finger-safe characteristics to minimize shock hazards, as well as replacing bolted connections with simple spring-loaded components to reduce the potential for loose connections and eliminate the need to check and retorque bolted connections. These are just a few examples of what the major electrical equipment providers are including to help streamline installation and sustainment activities while working to safeguard electrical workers.

But do these new features make your system “smarter”? These advancements in technology certainly continue to drive smart innovations in electrical equipment. But the innovative features that make the distribution systems smarter relate to the integration of power systems and facility automation systems that not only protect and monitor the power distribution but also can make decisions in real-time based on changing variables. These smart systems have a bidirectional flow of data. Applying smart IoT technology to distribution equipment means that a wide variety of data can be precisely collected, displayed, and analyzed allowing facility managers to make proactive decisions or even program automated decisions based on system variables. In a fault scenario,

sensors can be used to pinpoint the precise location of the fault and the smart system can very quickly determine which breakers to open or close to isolate the fault while minimizing the outage impact. The sky is the limit when one begins to consider the possibilities when adding smart technology to a facility’s power distribution system.

Smart equipment like ABB’s [ReliaGear™ smart power distribution](#) offers the opportunity for an innovative cloud-computing platform designed to monitor, optimize, and control the electrical distribution system. This system collects data related to the equipment performance which can be used to optimize the operation and maintenance of the system. This capability puts data at key personnel’s fingertips to assist in making data-driven maintenance decisions as well as determining how to make the system more efficient based on real-time conditions.





The ability to add logic functions to switchgear can also play an important role in energy savings and sustainability. The equipment can be programmed to sense when renewable energy is available and switch appropriate loads to renewable energy sources, thus minimizing the use of traditional utility power. These smart systems can also detect when loads or areas of a facility are not being used and automatically de-energize those loads to reduce energy losses and reduce the overall environmental impact. Conversely, these systems can sense when the load is needed again and automatically provide power back to it immediately. This capability can be applied in countless applications to reduce utility bills and minimize a facility's overall carbon footprint.

Another aspect of increased connectivity plays directly into the realm of personnel safety. This new generation of breakers and switchgear offers a Bluetooth feature, which allows electrical workers to stay outside of the arc flash boundary of electrical equipment while connecting to it with a smartphone. Through this wireless connection, workers can safely monitor real-time status, set parameters, and check measurements without being exposed to the potential arc flash hazard. Removing personnel from exposure to electrical

hazards through technological advancement is something all employers should be very interested in and consider for all future capital investments.

It is very exciting to see companies like [ABB](#) rapidly deploying smart innovative capabilities into their lines of electrical equipment. The challenge to the rest of us electrical professionals is finding creative ways to use these capabilities in our designs to create a much safer and more sustainable world through smart electrical distribution systems. The demand for electrons seems to be growing; how we make them available when needed is becoming more of a work of art as system capabilities continue to become more intelligent and autonomous.

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