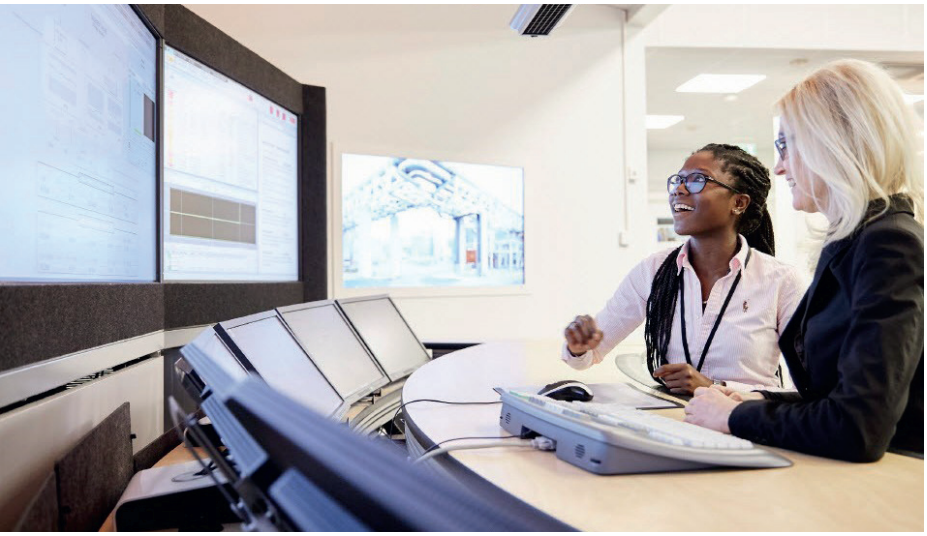
WHITE PAPER

Make your data center more competitive with digitalization



Greater efficiency, safety and reliability now plus a future-proof platform for growth.

Power is the lifeblood of data centers, and with 100MW facilities the new normal for top-tier facilities, managing it has become even more essential. Digital technologies offer the means to reduce energy costs and increase flexibility, making the given facility more competitive in an increasingly competitive market.

Several trends have emerged that appear likely to be with us for the foreseeable future:

- **Automation across multiple facilities.** Modern data centers already rely on a variety of automated processes (e.g., monitoring and control over cooling units), but as the drive toward lights-out operation continues, we can expect even more automation across the industry. The ability to manage multiple facilities from a single control center, for example, will put a premium on presenting relevant data to operators and on configuring or changing a local network remotely.
- **Simplification.** The scale of today's data centers demands that the systems and processes that support them be as straightforward as possible. Reducing the number of control layers, doing more at the local level (autonomously, if possible), and reducing latency are all part of the solution.
- **Cost and energy.** Both of these are already front-of-mind for operations managers, who will be looking ever deeper and farther afield in search of savings. One example: Google is using its Deep Mind AI to distribute processing load among servers such that the overall cooling load is minimized—by 40% according to the company. Facebook reportedly is even using temperature sensors to ensure the bolts of busway systems remain within tightness specifications.

What may not be apparent in this short list is how much these trends will depend on digitalization, which ABB distinguishes from simple "digitization" (the replacement of analog equipment with digital). Digitalization refers to the use of data to operate, maintain and optimize equipment and processes. It relies on digitization but goes much further.

A good example of how this plays out in the context of a data center can be found in the power distribution system, specifically digital switchgear.

Flexibility at scale

One of the most important aspects of digitalization is the flexibility and scalability it affords. In the case of switchgear, it means that the equipment can be adapted to changes in power system design even at

the final stage of the manufacturing process. Once installed, future changes can be applied via software instead of altering or replacing hardware.

The peer-to-peer architecture of digital systems also allows more decisions to be made at the device/local level, reducing network traffic and demand on supervisory level controls. This is useful in power systems as it allows potential disturbances to be addressed before they can cause significant damage and/or downtime.

One enabling force for such flexibility is the adoption of "open" standards like IEC 61850, which governs communications between power system equipment. This protocol establishes a future-proof platform that can be updated easily via programmable logic in protection relays instead making physical changes to hardwired connections.

Digital signals don't degrade over distance like analog ones do, so the Ethernet cables that replace miles of copper wire provide a more reliable, consistent signal. The IEC 61850 standard also calls for the wiring and signal transfer to be actively supervised, automatically, to enable fast and precise actions in event of a failure.

Safety

Safety is of particular concern with power systems, and digitalization delivers benefits here, too. Compared to conventional equipment, there is less material in digital switchgear that is exposed to high-voltage electrical stress. That means that data center personnel are not exposed to high voltages during inspections or maintenance activities.

Sensors such as those used to monitor digital switchgear are also more flexible and easy to work with than conventional metering transformers. They are easy to re-configure, even remotely, which cuts down on the risk of human error, further enhancing safety.

Smaller, faster, cheaper

Sensors are smaller (~30%) and lighter than the instrument transformers they replace. They're also one-size-fits-all, eliminating the need to engineer specific current or voltage transformers for a single installation. Sensors can also meet multiple needs, and are commonly stocked by power equipment distributors. In general, data center users can expect 30% faster delivery (i.e., lead time) and up to 25% faster installation and commissioning time when working with sensors as compared to traditional alternatives.

This pays dividends for digital switchgear that use such devices. A typical 30-panel lineup, for example, uses 80% less relay and protection control wires, incurs lower energy losses, uses fewer panels with fewer components in the control compartment, and can be installed in two days.

Sensors also collect data that can be gathered for use in predictive maintenance programs and other analytic applications.

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What's next?

We've focused here on switchgear, but the digitalization trend extends to other power system equipment as well. Transformers, for example, are now available with built-in sensors with Wi-Fi and Ethernet connections. With no additional wiring or hardware required, they feed operational data via any number of communication protocols into enterprise applications such as predictive maintenance. All of this additional functionality is rolled into the capital expense of the equipment.

Sensor technology continues to advance while costs continue to fall, so it's likely that this kind of baked-in digitalization will make its way into more asset classes going forward. The challenge for data center operators may well be an "embarrassment of riches" when it comes to the opportunities for fine-tuning operations that digitalization makes possible.

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