

The essential guide to intelligent power management for data centers

How the digitalization of power management systems improves safety, efficiency, uptime, and sustainability

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Why digitalize your power management system?

Future-proof critical data center power management systems

Data centers and colocation facilities face increasing regulations while needing to respond to unprecedented consumer demand. They are mandated to optimize efficiency while keeping power distribution systems running safely, reliably, sustainably, and in compliance with regulations.

Hidden risks can make it challenging for data center operators to reach these goals. A digitally-enabled power management system provides real-time visibility into power and equipment conditions to reveal risks, clearing the way for operational improvements. Digitalization paired with domain expertise offers deep insights to help teams respond to issues and optimize data center operations.

Modern facilities are already on the path to digitalization

Today, there are several cost-effective ways to digitalize power systems in data centers and colocation facilities. Most electrical systems already have digital protection relays, power meters, circuit breakers, and other smart devices that digitize data collection. The next step towards digitalization is connecting these devices to energy and power management software to get customized, actionable information to facility teams.

Uncover hidden risks and opportunities

Digitalizing a data center's power management system can deliver a large return with a short payback period. Consider just some of the dimensions of ROI that owners and operators can achieve:

- Uncover opportunities to **optimize energy use** and cut costs
- **Get earlier warning** of risks to avoid unplanned downtime
- **Recover faster** from power outages and incidents
- **Streamline** maintenance and reporting
- **Boost equipment** performance and lifespan
- Implement **cybersecurity best practices**
- Make **data-driven decisions**
- Add **layers of protection** through predictive insights

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Power digitalization for a competitive edge

Digitalizing power distribution infrastructure and connecting it to energy and power management software is a **differentiator that helps facility management and maintenance personnel make better decisions, resolve issues more quickly, minimize downtime, and use less energy.**

How this technology addresses data center challenges

Digitally-connected power distribution systems use smart devices and energy and power management software to provide real-time situational awareness. Actionable intelligence, predictive condition-based information, and digital tools enable data centers to **proactively manage and maintain critical equipment** as needed, without exposing it to potential risks of performing unnecessary maintenance.



The latest technology makes it cost-effective to digitalize electrical systems, whether new or existing.

Digital architectures: Innovation at every level

Connected Devices

- Protection relays
- Circuit breaker trip units
- Power monitoring devices
- Uninterruptible power supplies
- Automatic transfer switches
- Programmable logic controllers

Software

- Microgrid control system
- Energy and power management system (EPMS)
- Energy management
- Data center infrastructure management software

Advisory Services

- Power management
- Electrical distribution asset management
- Sustainability consulting
- Microgrid optimization services

Defining power digitalization for data centers

Power digitalization plays a fundamental role in facility energy management, power availability and quality, and electrical equipment maintenance. To achieve these insights, smart sensors and communication infrastructure must be connected to EPMS software.

Power digitalization consists of three basic steps: **Connect – Automate – Extend.**

Learn more in the white paper: [Power Digitalization: Understand and Achieve Active Energy Management in Buildings](#)



A woman with glasses and a light-colored polo shirt is standing in a server room, looking at a tablet. The room is dimly lit with green ambient lighting from the server racks.

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Digitally-connected data center systems are flexible, smart, and resilient

Digitalization makes many aspects of our daily lives safer, more reliable, and more efficient. For example, modern automobiles stay safely on the road thanks to integrated systems with digital monitors and displays that oversee every aspect of their operations. When they break down, digital scanners help diagnose and address problems.

The same is true for data center electrical distribution systems.

Getting connected

Power distribution infrastructure needs the right digital sensors, advanced controls, and analytic capabilities to detect, diagnose, and correct issues before they cause mission-critical systems to fail.

Modern electrical switchboards and panelboards likely have smart, connectable protection relays, breaker trip units, and power meters. Legacy systems can be retrofitted with communicating devices and sensors.

Electrical products can also be enabled with connectivity and intelligence. These devices provide rich diagnostic information about the electrical




system’s status. With open, non-proprietary communications protocols and various available communication standards, it’s easier than ever to connect devices and share information.

Digitally connected power management systems offer large data center operators and colocation providers real-time visibility into how the electrical system is performing across the network. Smart devices protect, correct, and monitor power systems and make it easier to collect and analyze data to provide actionable insights to maximize uptime and achieve efficiency goals. Operations and maintenance teams can also leverage these insights to collaborate across teams and optimize facility performance.




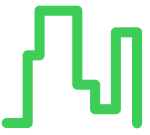


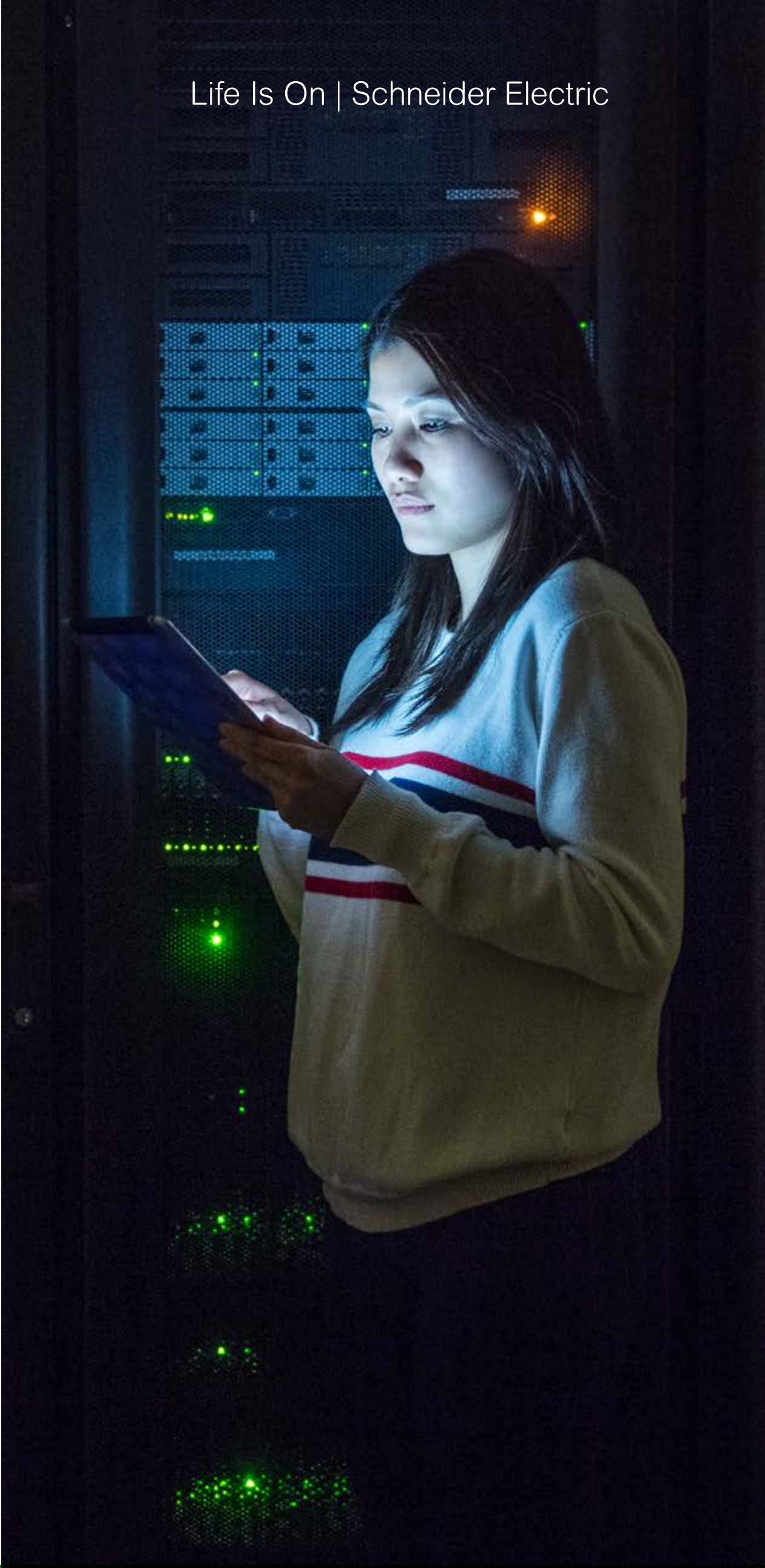
Energy and power management software unlocks the full potential of digitalization

Powerful cloud and facility-based software applications aggregate and analyze data, providing a view into every corner of the electrical system. This view enables operators to:

-  Supervise electrical processes
-  Receive early risk warnings
-  Identify opportunities to improve power, energy, and equipment performance

A digitally-connected power distribution system helps:

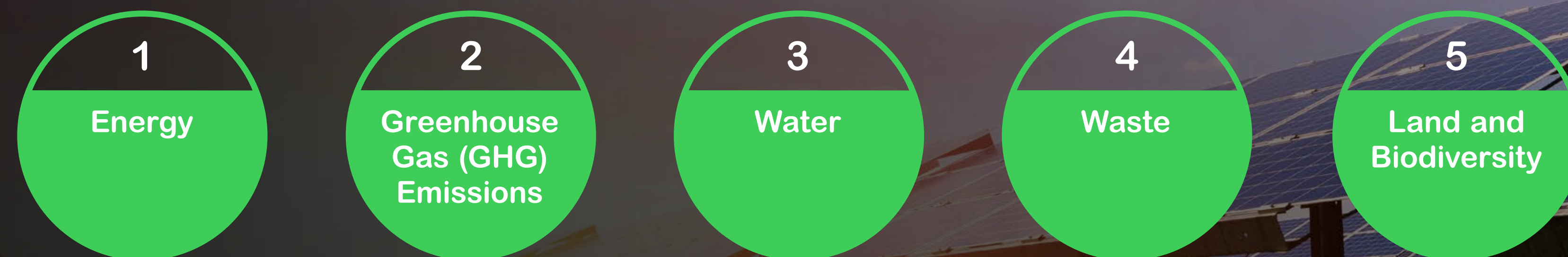
-  Optimize safety for people and assets while improving reliability and business continuity
-  Maximize energy and lifecycle efficiency while enabling condition-based maintenance
-  Track energy usage and emissions to simplify sustainability efforts
-  Enable remote support services for facilities with limited resources



Sustainability metrics for data centers

Standardized metrics take the guesswork out of data center sustainability

Data center owners and operators need a holistic sustainability framework with standardized metrics to guide their planning. Schneider Electric's Energy Management Research Center's [first-of-its-kind framework](#) includes 23 standardized metrics focused **on five significant areas of environmental impact** to help assess data center performance and make improvements:



The framework also helps data center operators identify where they are in their sustainability journey based on metrics they are already tracking. From there, data centers can choose additional metrics to start tracking as they advance in their journey.

Metrics are described in the white paper, [“Guide to Environmental Sustainability Metrics for Data Centers.”](#)

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Growing data center market needs to improve energy efficiency

Globally, data creation and reproduction are projected to grow at a compound annual growth rate of 23% by 2025. Although data centers have achieved incredible efficiency improvements over the past decade, it's unclear if those efficiency gains can continue to offset exploding data center energy demands in the years to come.

The U.S. Office of Energy Efficiency & Renewable Energy provides a wide range of efficiency advice for data centers through its National Data Center Energy Efficiency Information Program. The program:

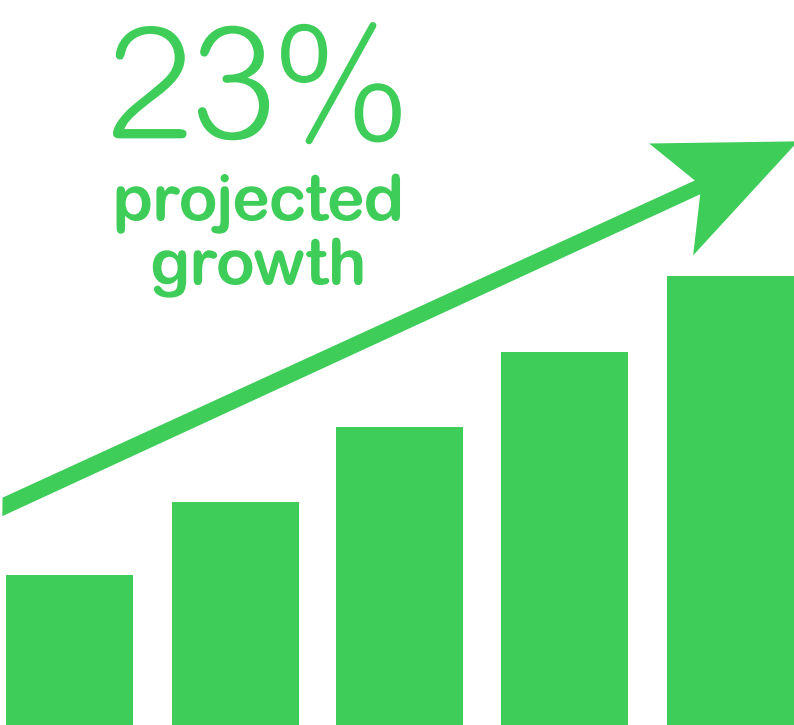


Encourages best energy management practices, including efficiency metrics and benchmarking.



Offers a certification process that recognizes best-in-class performance for new or existing data centers.

The following use cases provide examples of Schneider Electric solutions that delivered successful outcomes for customers.



of data creation and reproduction by 2025.

Source: IDC

Case Study | U.S. Department of Energy Laboratory achieves greater data center sustainability



Background: A U.S. Department of Energy laboratory was forecast to triple energy consumption at its supercomputing facility over the next few years. The facility wanted to automate data collection and analysis to get greater visibility into overall energy use and improve efficiency.



Solution: Schneider Electric EcoStruxure™ Power Monitoring Expert software which monitors and manages energy consumption.

- Continuously captures energy consumption values from an expanded collection of smart energy meters, power quality meters, and circuit breaker trip units.
- Automatically calculates Power Usage Effectiveness (PUE).
- Provides extensive insights into the facility's critical power networks that help minimize downtime, confirm backup generators are running reliably, and optimize maintenance.
- Features advanced alarm management that gives operations personnel early warning of risks, while power quality event analytics help quickly isolate problems.



Result:

- Identified energy inefficiency and waste
- Able to make data-driven decisions to prioritize energy efficiency projects
- Can easily calculate the PUE improvement that will result from gradually replacing computing equipment with alternatives that use warm-water cooling



Case Study | Data center reduces costs through energy efficiency



Background: A global data center operator needed a system to monitor power usage and improve energy efficiency in its Australian colocation data center. The company wanted to meet global efficiency mandates and earn LEED Gold certification for the facility. They also wanted a user-friendly power management system to improve power quality and availability.



Solution: EcoStruxure power management software combined with PowerLogic power monitoring devices to monitor and analyze power usage quality throughout the data center.

Software: EcoStruxure Power Operation tracks real-time energy usage, including PUE, down to the rack level with energy dashboards and reporting. It also monitors power quality and conducts power events analysis.

Hardware: PowerLogic power quality meters monitor the power supply at the main incomers and UPS input supplies. Additionally, PowerLogic branch circuit power meters (BCPM) monitor power consumption of each rack.



Result:

- Reduced energy cost by \$200K/month AUD for a rapid payback of 3.5 months
- Can generate PUE reports for compliance and identify racks overdrawing power
- Able to monitor power quality to quickly diagnose power related issues
- Acquired LEED Gold certification for facility

Case Study | Data center optimizes power usage and improves tenant billing



Background: A new, large colocation data center needed a sustainable design that would meet energy efficiency standards and drive down energy costs. In addition, owners wanted a power management system that could efficiently and accurately bill colocation clients for their energy usage.



Solution: EcoStruxure power management software with PowerLogic metering devices.

Software: EcoStruxure Power Operation provides real-time equipment status, energy usage information from mains down to the racks, and automated PUE reporting. The software also generates tenant energy usage reports and provides that data to third-party tenant billing applications.

Hardware: PowerLogic PM5000 series meters for energy monitoring throughout the facility, including the MID approved PowerLogic PM5111 meters which were used for tenant billing in accordance with local regulations.



Result:

- Can access critical status updates
- Improved visibility for metering and billing
- Able to generate monthly billing reports for more than 30 different tenants
- Positioned to leverage energy savings projects in the future

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Benefits of a digitally-enabled power management system

The improved operational efficiency, uptime, safety, and sustainability of digitalizing a data center's power system enables increased cost efficiency and savings. Owners and operators can expect to realize a significant and fast return on investment, typically **paid for in less than 2 years**, for a nominal incremental investment.

These are the benefits of power digitalization:

1. Optimize safety
2. Improve reliability
3. Enhance sustainability
4. Boost efficiency
5. Simplify compliance
6. Enhance cybersecurity



- Strategically placed thermal sensors continuously monitor abnormal temperature rises and **alert personnel to any thermal problems** before an arc flash or electrical fire destroys equipment or injures people.
- **Power forensics** help operational teams isolate problem sources using accurately time-stamped events from connected devices to visualize event timelines. Advanced capabilities can help quickly determine how disturbances have propagated through the electrical system and whether they originated inside or outside the facility.



2. Improve reliability

- **Digitalization keeps personnel connected to the power distribution system 24/7 and sends immediate alerts** when any conditions deviate from normal, so they can take action before an outage occurs. Continuous load trend monitoring enables active load management to prevent overloads and disruptions and reveal unused capacity. If there is an outage, a power event analysis can quickly isolate the root cause and restore power faster to prevent further disruption or potential equipment damage.
- **A fully digitalized power distribution system detects conditions before they exceed levels that harm sensitive equipment** and prevents issues such as harmonics, voltage sags and swells, flicker, transient voltages, or brief interruptions. Smart, active correction equipment mitigates various power quality disturbances to keep power stable, balanced, and free from harmonic pollution.
- Wireless thermal and environmental sensors continuously monitor conditions in extreme or outdoor environments to avoid premature switchgear aging. If conditions exceed defined thresholds and durations, maintenance teams can perform required maintenance to **help prevent corrosion, equipment failure, and downtime**.
- These environmental conditions can be monitored and analyzed by in-house teams or outsourced advisory services using cloud-based analytic platforms. **On-premise data from smart power devices** on power equipment such as transformers and circuit breakers can be leveraged to reveal hidden problems and perform predictive maintenance.



3. Enhance sustainability

- Energy analytics give real-time visibility into operational performance across connected data centers and colocation facilities. Owners and operators can normalize the data to accurately benchmark and compare energy performance across the enterprise. This **data can be leveraged to uncover and proactively address inefficiencies and waste** and accurately validate savings after the initiation of retrofits or other projects.
- Advanced analytics and microgrid control systems can help manage on-site energy generation and storage and provide predictive asset management. It can take into consideration the weather, energy pricing, and other drivers to optimize energy use as well as the best times to consume, store, or sell energy back to the grid. The **end result is increased cost savings and uptime.**



4. Boost efficiency

- **Digitalization enables conditioned-based and predictive maintenance** to help identify when equipment needs servicing. This leads to cost and time-savings while identifying risks that might otherwise be overlooked. For example, a circuit breaker aging analysis that integrates condition reporting from smart breakers and environmental data from temperature, humidity, and corrosive gas sensors can provide a more accurate picture of the circuit breaker's health and maintenance needs.
- Digitalization and data sharing are powerful enablers for third-party analytic and advisory services. Facilities challenged with limited or shrinking resources can outsource some facility management tasks as part of their smart, efficient strategy.



5. Simplify compliance

- **Analytic platforms can simplify energy efficiency certification processes and carbon reporting** for regulatory compliance. They also make it easy to showcase energy performance to stakeholders or the public.
- Advanced power meters provide **power quality compliance monitoring, while analytic software aggregates compliance data from across the facility**. Teams can track trends and identify the source of risks, inside or outside the facility, and validate that power quality meets the reliability standards of your most sensitive equipment. They can also validate that your power provider is meeting contract obligations.



6. Enhance cybersecurity

- Many digital power distribution solution providers have adopted the IEC 62443 cybersecurity standard and follow extensive **cybersecurity best practices** throughout product and solution development, engineering, and service delivery. This should be a top requirement in your choice of solution. To learn more, [explore Schneider Electric cybersecurity services](#). In addition, access the white paper, [Cybersecurity Guidance for Data Center Power and Cooling Infrastructure Systems](#), which offers guidance on best practices for cybersecurity for the design, installation, operation, and maintenance of data centers. It serves as a checklist to help data center operators develop a more detailed cybersecurity strategy.

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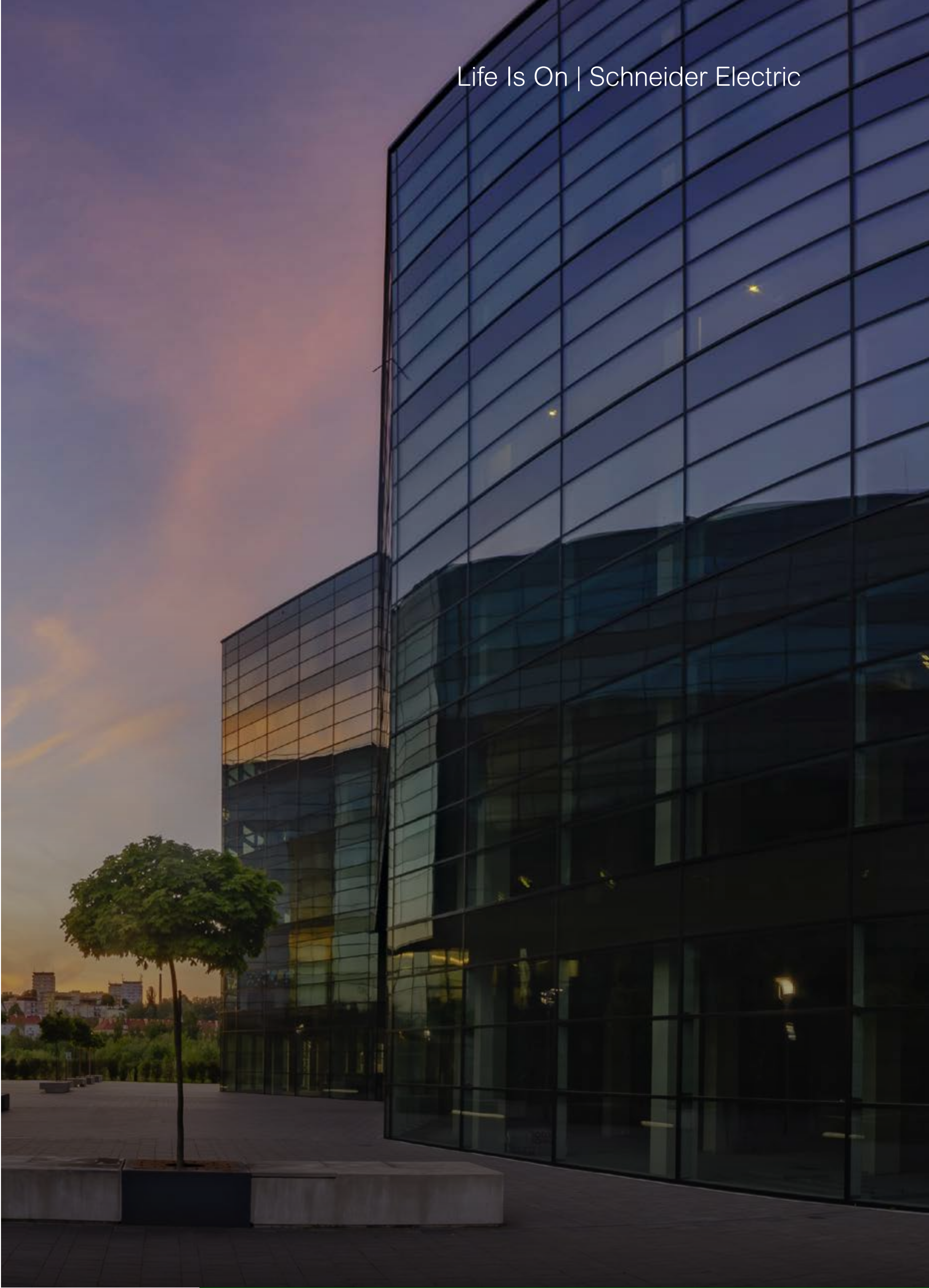
Intelligent power management systems can give data centers a competitive edge. When a data center’s power distribution infrastructure is connected to power management software, facility management and maintenance teams can access real-time, actionable information to make better decisions, resolve issues more quickly, minimize downtime, and use less energy, all while minimizing the risks associated with making operational improvements.

Today, there are many cost-effective ways for owners and operators to digitalize their data center power systems and realize a fast and significant return on investment, typically in less than two years. For a nominal incremental investment, data centers can reap the benefits of improved safety, reliability, efficiency, sustainability, security, and compliance.

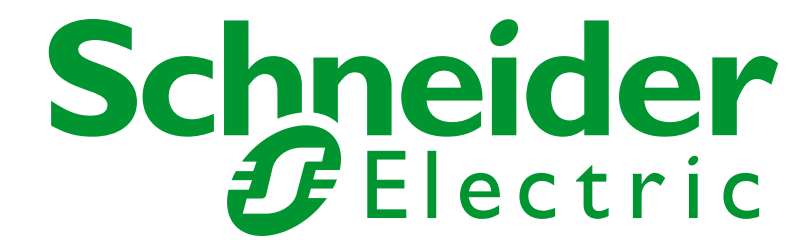
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