# Siemens Sm@rtGear® IE: A Digital Solution for NFPA 70B Compliance and Electrical Reliability

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## Introduction

In recent years, the maintenance of electrical infrastructure has undergone a rapid transformation. Driven by the convergence of aging equipment, increasingly stringent regulations, and the rise of digital technologies, facilities are under pressure to improve their management of electrical systems. The 2023 update to the National Fire Protection Association's NFPA 70B standard instituted this shift. Previously a recommended practice, NFPA 70B is now a prescriptive standard, requiring organizations to implement structured electrical maintenance programs that prioritize condition-based monitoring, predictive diagnostics, and real-time data analysis. This change has elevated electrical maintenance from a facility operations task to a strategic imperative.

In this landscape, Siemens Sm@rtGear® IE emerges as a vital solution. Designed to meet and exceed the requirements of NFPA 70B, Sm@rtGear® IE is a digitally connected low- and medium-voltage switchgear platform that integrates intelligent sensors, edge analytics, cloud connectivity, and industrial cybersecurity. Its purpose is twofold: to help facilities achieve compliance with NFPA 70B and to unlock significant operational value by reducing downtime, improving reliability, and streamlining maintenance efforts. As an Industry 4.0 and 5.0-ready platform, it aligns with enterprise-wide initiatives that prioritize digital transformation, cross-system integration, and human-machine collaboration.

The shift from time-based to condition-based maintenance is more than a technical adjustment; it's a fundamental change in how facilities approach risk, safety, and cost. Time-based inspections often result in over-servicing or missed failures due to fixed intervals that don't reflect the actual condition of the equipment. This introduces unnecessary labor, higher costs, and elevated risk of failure between scheduled checks. NFPA 70B now mandates the use of diagnostic tools, data-driven decision-making, and structured documentation. Sm@rtGear® IE enables all of these through a modular, scalable platform that brings visibility, intelligence, and control to the electrical system in ways that traditional switchgear cannot.

This white paper outlines how Sm@rtGear® IE directly supports NFPA 70B compliance while delivering measurable business outcomes. It explores the technical capabilities of the platform, the regulatory context it addresses, and the broader operational benefits of real-time monitoring, predictive analytics, and remote diagnostics. By leveraging the principles of Industry 4.0 and aligning with safety protocols outlined in NFPA 70E, Sm@rtGear® IE provides a comprehensive solution for organizations ready to modernize their approach to electrical maintenance and reliability.

# Condition-Based Maintenance and Safety Integration

Condition-Based Maintenance (CBM) lies at the heart of the 2023 revision to NFPA 70B. As an alternative to routine calendar-based inspections, CBM relies on data from equipment under actual operating conditions to determine when service is necessary. The goal is simple: to intervene only when performance begins to degrade, rather than too late or too early. This strategy minimizes unnecessary maintenance, improves labor allocation, and reduces the chance of costly equipment failure. Sm@rtGear® IE is purpose-built to deliver CBM across electrical systems by embedding a dense network of sensors, analytics software, and communication protocols directly into the switchgear environment.

The sensors embedded in Sm@rtGear® IE continuously monitor voltage, current, thermal profiles, harmonic distortion, insulation integrity, and arc flash risk indicators. Data is collected locally via Industrial Edge computing to enable real-time decision-making, even when connectivity to the cloud is limited. This enables the platform to detect issues such as overheating cables, abnormal voltage fluctuations, deteriorating insulation, or degraded power factor conditions long before they develop into failures. Equipment settings and performance thresholds can be customized based on facility requirements, providing operators with a precise and tailored view of system health.

Predictive maintenance takes this a step further by utilizing historical data and machine learning algorithms to forecast failures before they occur. By analyzing trends in temperature rise, phase imbalance, or load behavior, Sm@rtGear® IE can generate early alerts for components approaching their failure point. These alerts are presented through intuitive dashboards and can be linked to ERP systems, computerized maintenance management systems (CMMS), or mobile apps for fast response. This approach increases uptime, reduces emergency service calls, and enables just-in-time parts ordering, all of which reduce cost and complexity in maintenance operations.

Safety is elevated alongside performance. NFPA 70E places heavy emphasis on minimizing worker exposure to energized systems, and Sm@rtGear® IE aligns with this through robust remote access and diagnostics. Maintenance personnel can access real-time data, issue alerts, and review fault histories without opening energized panels or entering high-risk electrical rooms. When on-site work is required, the system provides detailed condition reports that support safer procedures, reducing the likelihood of arc flash incidents or human error. By combining CBM with remote visibility and predictive alerts, Sm@rtGear® IE helps organizations meet both NFPA 70B and NFPA 70E requirements through a unified, proactive maintenance strategy.

## Documentation, Architecture, and System Integration

One of the most often overlooked but critically important elements of NFPA 70B compliance is documentation. Under the updated standard, facilities are now expected to maintain detailed records of inspections, test results, fault histories, risk assessments, and corrective actions. These records must be accessible, consistent, and reviewable for audits, insurance verification, and internal quality systems. Manual processes, such as spreadsheets, clipboards, and decentralized files, are no longer sufficient. Sm@rtGear® IE solves this problem by automating documentation directly within the switchgear system itself.
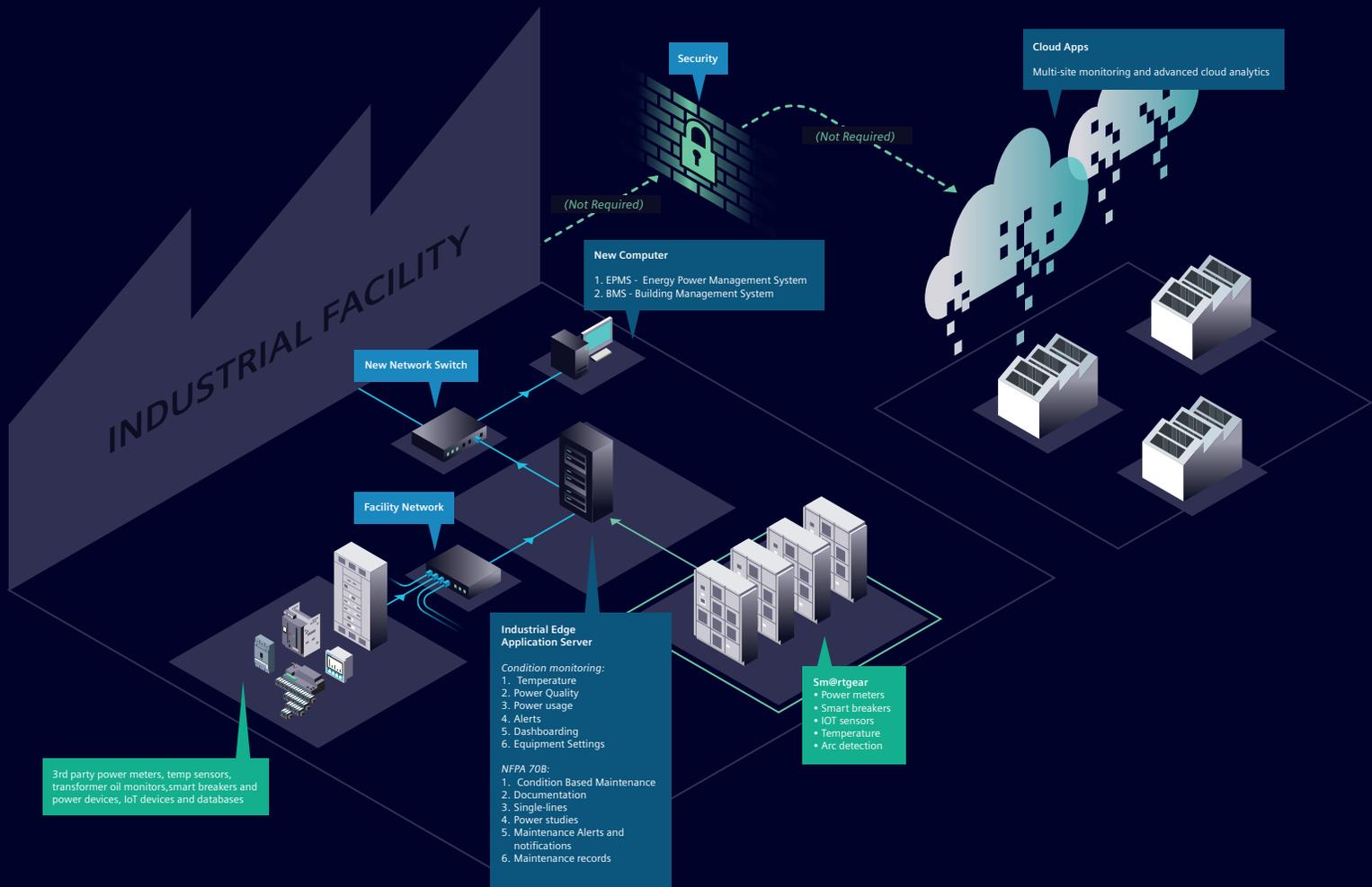
Every action performed by or detected through Sm@rtGear® IE is logged with time-stamped precision. This includes equipment configuration changes, alarm history, power quality trends, and maintenance actions triggered by alerts. The data is stored securely, backed up through encrypted protocols, and made instantly accessible to authorized users. During inspections or audits, teams can generate reports covering compliance history, asset health summaries, and maintenance effectiveness metrics. This eliminates guesswork and enables data-driven continuous improvement.

The functional architecture of Sm@rtGear® IE reflects its role as a cornerstone of the digital facility. At the hardware level, it supports integration with Siemens and non-Siemens smart breakers, metering devices, temperature sensors, transformer oil monitors, and power quality meters. The edge processor embedded within the system analyzes this data in real time and feeds actionable insights to local dashboards or cloud-based analytics engines. For multi-site organizations, Sm@rtGear® IE enables centralized monitoring, benchmark comparisons, and automated performance grading.

Importantly, the system interfaces with existing facility networks and IT infrastructure. It supports various communication protocols, including Modbus TCP/IP, OPC UA, and REST APIs, ensuring compatibility with energy management software, SCADA systems, building automation platforms, and enterprise resource planning tools. Whether a facility is outfitted with a Building Management System (BMS), an Energy Power Management System (EPMS), or both, Sm@rtGear® IE integrates seamlessly. This allows the electrical maintenance layer to become part of the broader data ecosystem, enabling organizations to link electrical reliability to sustainability metrics, production KPIs, and business continuity planning.

# Sm@rtGear® IE Functional Architecture

*Sm@rtGear® IE leverages industry 4.0 Architecture to introduce many functions that support systems reliability and safety and align with NFPA 70B.*

**Security**

**Cloud Apps**
Multi-site monitoring and advanced cloud analytics

*(Not Required)*

*(Not Required)*

INDUSTRIAL FACILITY

**New Computer**
1. EPMS - Energy Power Management System
2. BMS - Building Management System

**New Network Switch**

**Facility Network**

**Industrial Edge
Application Server**

*Condition monitoring:*
1. Temperature
2. Power Quality
3. Power usage
4. Alerts
5. Dashboarding
6. Equipment Settings

*NFPA 70B:*
1. Condition Based Maintenance
2. Documentation
3. Single-lines
4. Power studies
5. Maintenance Alerts and notifications
6. Maintenance records

**Sm@rtgear**
• Power meters
• Smart breakers
• IOT sensors
• Temperature
• Arc detection

3rd party power meters, temp sensors, transformer oil monitors,smart breakers and power devices, IoT devices and databases

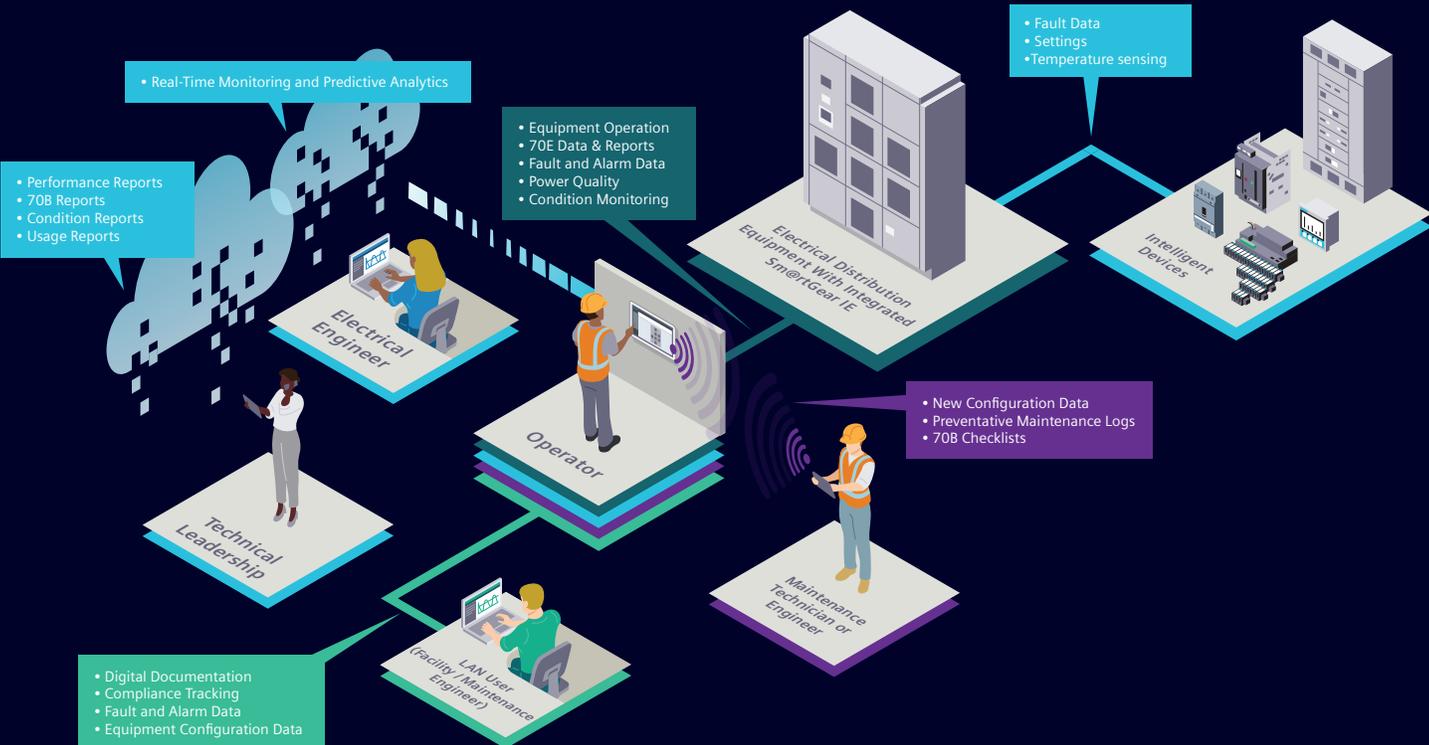## Business Value, Industry Applications, and Strategic Outlook

The decision to adopt Sm@rtGear® IE is not solely about compliance. It's a strategic investment in electrical reliability, asset optimization, and risk reduction. By providing visibility into real-time conditions, Sm@rtGear® IE reduces the likelihood of catastrophic equipment failure, which can disrupt operations and damage reputations. It also increases the lifespan of assets by ensuring they are serviced based on their needs rather than a schedule. These benefits translate directly into financial outcomes: lower maintenance costs, reduced emergency service expenditures, and improved overall productivity.

Industry case studies demonstrate the significant impact. In a global food and beverage processing facility, Sm@rtGear® IE was installed to address recurring voltage sags that caused production line disruptions. Within six months, outage frequency decreased by 85%, and power quality improvements resulted in improved refrigeration performance and energy savings. In an automotive manufacturing plant, the platform provided early warnings of thermal irregularities in a main feeder breaker. Repairs were made during scheduled downtime, preventing significant costs associated with a shutdown. In a data center, the system was integrated into the facility's Energy Power Management System (EPMS), allowing maintenance personnel to resolve 92% of issues remotely. This integration reduced risk and response time while achieving full NFPA 70E compliance.

Looking forward, Sm@rtGear® IE supports the broader transition to Industry 5.0, where technology is used not only to optimize machines but also to augment human performance. The system enables remote collaboration, provides mobile access to system data, and integrates with training tools and workflow automation. As maintenance becomes more intelligent, human operators become safer, more efficient, and more empowered.

For organizations facing tightening budgets, rising expectations for uptime, and an evolving regulatory environment, Sm@rtGear® IE offers a clear path forward. It meets the mandates of NFPA 70B. It aligns with the safety protocols outlined in NFPA 70E. And it delivers measurable business benefits that extend across departments, from engineering and operations to safety and sustainability. In a world where electrical reliability is foundational to performance, Sm@rtGear® IE transforms maintenance from a cost center into a competitive advantage.

# Leveraging Siemens Sm@rtGear® IE for an Industry 5.0 Solution for 70B



- Real-Time Monitoring and Predictive Analytics

- Performance Reports
- 70B Reports
- Condition Reports
- Usage Reports

- Equipment Operation
- 70E Data & Reports
- Fault and Alarm Data
- Power Quality
- Condition Monitoring

- Fault Data
- Settings
- Temperature sensing

Electrical Distribution Equipment With Integrated Sm@rtGear IE

Intelligent Devices

Electrical Engineer

Operator

Technical Leadership

- New Configuration Data
- Preventative Maintenance Logs
- 70B Checklists

Maintenance Technician or Engineer

LAN User (Facility / Maintenance Engineer)

- Digital Documentation
- Compliance Tracking
- Fault and Alarm Data
- Equipment Configuration Data

This document contains a general description of available technical options only, and its effectiveness will be subject to specific variables including field conditions and project parameters. Siemens does not make representations, warranties, or assurances as to the accuracy or completeness of the content contained herein. Siemens reserves the right to modify the technology and product specifications in its sole discretion without advance notice.