ASCO Power Technologies™

The Value of Automated Power Compliance Reporting

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Life Is On Schneider Electric

The Value of Automated Power Compliance Reporting

At hospitals and healthcare facilities, backup systems provide power to ensure the safety and well-being of patients, staff, and visitors during utility outages. To ensure readiness, these facilities must regularly test power systems. Power management systems offer automated data logging and reporting capabilities that reduce the time and expense associated with power compliance testing. The following narrative explains these capabilities.

REASONS TO TEST

There are two primary reasons to exercise emergency power systems (Figure 1). The first is to ensure that the equipment can be relied upon in case of emergency. The second is to comply with laws, regulations, and industry standards for mitigating outage risks.

Figure 1: Emergency Power Supply Systems, including their engines and generators, must be tested periodically to verify readiness.

Verifying Proper Function

Without regular testing, standby power equipment may remain dormant for protractive periods of time. When inactive, there is no method for verifying that the equipment and systems are in a condition to function when an outage occurs. For this reason, emergency power systems must be periodically tested to verify their readiness and performance.

Complying with Testing Requirements

Emergency power systems for healthcare facilities are regulated by multiple industry codes. An important reference is the *Hospital Accreditation Standards* issued by The Joint Commission.[1] This document defines standards for accrediting hospital operations and facilities, including emergency power systems. For backup power, Section EC.02.05.07 states that "The hospital inspects, tests, and maintains emergency power systems," then lists elements of performance that can be used to evaluate compliance. ASCO summarizes these as follows:[2]

[1] The Joint Commission. 2019 Hospital Accreditation Standards. Joint Commission Resources, Inc. Oak Brook, IL, USA. 2019.
[2] Ibid. p. EC-35.

1. *At least monthly, the hospital tests each emergency generator under load for at least 30 continuous minutes, with a dynamic load of at least 30% of the generators' nameplate rating or otherwise sufficient to meet manufacturer-specified minimum exhaust temperatures.*
2. *If a test does not meet the criteria above, then the emergency generator must be tested every 12 months at 50% and 75% of the nameplate rating for 30 minutes and 60 minutes, respectively.*
3. *At least monthly, the hospital tests all automatic and manual transfer switches.*
4. *At least once every 36 months, the hospital tests each emergency generator for a minimum of 4 hours using a dynamic or static load that is 30% of nameplate rating.*[3]

Each Element of Performance in Section EC.02.05.07 of The Joint Commission standard refers to specific provisions of 2012 Edition of *NFPA 99 – Healthcare Facilities Code* and the *2010 Edition* of *NFPA 110 – Standard for Emergency and Standby Power Systems*.[4,5] For backup power equipment tests, The Joint Commission standard requires applying minimum amounts of load for specific minimum durations. For a more complete evaluation of standards that drive reporting compliance, review our document entitled ***Load Testing for Healthcare Compliance***.

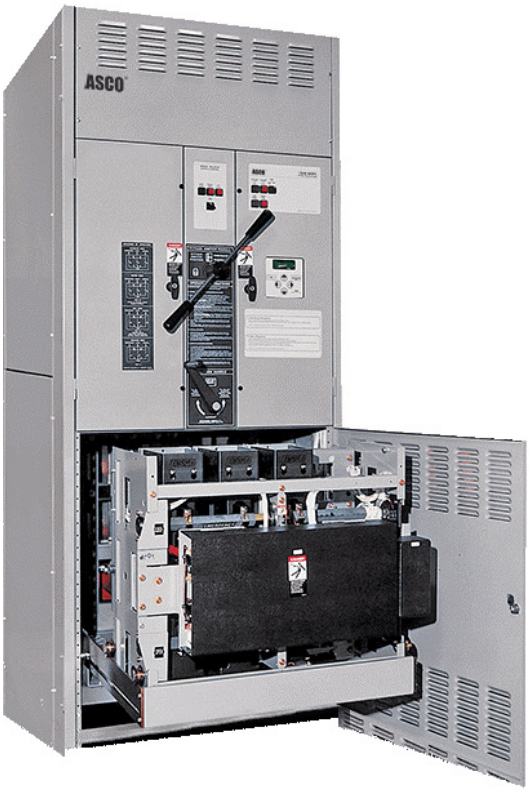

Figure 2: An ASCO 7000 SERIES Isolation-Bypass Automatic Transfer Switch

Information Required

NFPA Article 8.3.4 states that "A permanent record of the EPSS [Emergency Power Supply System] inspections, tests, exercising, operation, and repairs shall be maintained and readily available."[6] Failure to document testing leaves facilities without proof of compliance. Beyond the documentation requirement, however, there are no specific requirements about how data should be stored, summarized, reported, or distributed. Nonetheless, facilities that must obtain or maintain Joint Commission accreditation will presumably be subject to audits that include assessment of power testing compliance. Consequently, it is in a facility's best interests to make compliance status review and confirmation as simple and accessible as possible.

Editor's Note: *This document cites the 2012 Edition of NFPA 99 and the 2010 Edition of NFPA 110. While newer editions have been issued, the cited editions are referenced directly by the 2019 Joint Commission* ***Hospital Accreditation Standards****.*

[3] Ibid. p. EC-35-37.
[4] National Fire Protection Agency, NFPA® 99 – Health Care Facilities Code. 2012 Edition. Quincy, MA. 2012.
[5] National Fire Protection Agency, NFPA® 110 – Standard for Emergency and Standby Power Systems. 2010 Edition. Quincy, MA 2010.
[6] Ibid. p. 110-19.

INFORMATION TO RECORD

For Level 1 systems that serve life safety loads, backup power must be available within 10 seconds of the onset of an outage. Power must become available to other types of systems in the timeframes specified in the table below.[7] To document compliance, facilities must record and retain certain information during testing for both generators and transfer switches.

NEC EPSS Types	
Designation	**Power Restoration**
Type U	Basically Uninterruptible
Type 10	10 Seconds
Type 60	60 Seconds
Type 120	120 Seconds
Type M	Manual stationary or nonautomatic – no time limit

For every generator, needed information includes start and stop times as well as the cranking time following receipt of an engine start signal. In addition, the nameplate kilowatt capacity of the gen-set must be known so that load can be monitored against a 30% minimum load criterium.[8]

Engine data are typically recorded, such as exhaust temperature, oil pressure, and water temperature. The latter can used to determine when engines temperatures have stabilized during operation. For gen-set output, ac voltage, amperage, and frequency are also typically recorded. For transfer switches, it is necessary to record the times that transfers were initiated and completed.

DATA COLLECTION METHODS

The simplest way to monitor transfer times is to observe and record the times of operation of each generator and transfer switch is by using a stopwatch and clipboard. While this can be undertaken in a facility with a small quantity of critical power equipment, it is subject to human error and complex logistics. For facilities with additional devices, this can require activities by a number of individuals. Coordinating them can be difficult, time-consuming, expensive, and impractical.

[7] NFPA 110. Article 4.1. p. 110-8.
[8] Where exhaust temperature is measured, engine load can be monitored against the manufacturer's minimum temperature specification.

To avoid the complexities of manual monitoring, facilities that control networks of critical power equipment through a single interface can be equipped to simultaneously record test data from multiple power devices automatically. For example, devices such as an ASCO 5700 or 5900 Series PowerQuest Critical Power Monitoring System, ASCO 5705 8-Channel Annunciator, and the ASCO 5702 Power Management Gateway network appliance, can be programmed to initiate power tests from a switch on an ATS, a remote monitoring and control system, or a low voltage value on the Normal source. The resulting data from up to 256 devices is automatically stored for retrieval. In addition, these devices can be programmed to evaluate the data against test criteria and assign pass or fail status to the results. The same programs can automatically produce and format test reports and forward them electronically to recipients assigned by the user.

Automated reporting programs provide additional value for routine critical power system testing. In an actual utility outage, generator startups and load transfers are initiated by the loss of voltage on the Normal source. To replicate this condition in an operating facility, a circuit breaker for the Normal source of an automatic transfer switch can be opened. However, to avoid potential facility disruptions, compliance testing may occur with a live Normal source, initiated by using placing an ATS in test mode.

In such cases, protective features of the ATS, such as delay settings, could require additional time to affect transfer. For instance, where an in-phase monitor is present and the utility and alternate source frequencies vary only slightly, a significant delay could be incurred before phase differences are within an allowable range to transfer load. Automated reporting programs can query ATS controller program information and then subtract the delays to provide calculated transfer times (Figure 3). These reflect what would have occurred with a dead Normal source.

Generator's engine start was triggered by: ATS-L7 at 5/28/2019 7:42:56 AM							
Name	**Load Type**	**Total Transfer Time**	**Calculated Transfer Time**	**In Emergency (hh:mm:ss)**	**Transfer Inhibit Conditions**	**Maximum Passable Time**	**Result**
ATS-L7	LIFE SAFETY	10 sec	**9 sec.***	00:02:36	-	Level 1 (10 sec.)	Pass

All Transfer Switches							
Name	**Load Type**	**Total Transfer Time**	**Calculated Transfer Time**	**In Emergency (hh:mm:ss)**	**Transfer Inhibit Conditions**	**Maximum Passable Time**	**Result**
ATS-L7	LIFE SAFETY	10 sec	**9 sec.***	00:02:36	-	Level 1 (10 sec.)	Pass

Total Transfer Time is from loss of normal source to transferring to the alternate source. Calculated Transfer Time is the alternate source availability time plus preconfigured time delays.
*Time used to evaluate if the transfer of the load to the alternate source is at or under the Maximum Passable Time.

Figure 3: Reporting systems can record, asses, and report data from qualifying operational events automatically. This excerpt of a summary from an automated report, generated automatically from an ASCO CPMS, documents evidence of regulatory compliance that is easily retrieved and reviewed.

BENEFITS OF AUTOMATED DATA COLLECTION

Automated data collection from critical power equipment can benefit healthcare facilities in several ways. Each can directly or indirectly reduce costs when compared to facilities without automated data reporting capabilities.

Efficient Data Collection

The cost to collect data scale with the amount of power devices and the quantity of test events. For instance, a small outpatient facility with a single generator and a single transfer switch could easily be tested and monitored manually. However, the practicality and feasibility of manual data collection becomes much more complex as the scope of the electrical system increases. For a hospital system with multiple buildings, manually recording data for a dozen generators and scores of transfer switches would require either many staff or multiple rounds of testing. Automating the test allows a single operator to test all critical power equipment simultaneously from a single centralized location.

Comprehensive Data with Increased Accuracy

When tests are conducted, the data is automatically collected at specified rates. As a result, data collection is no longer subject to human error in the form of missed entries or incorrect values.

Streamlined Data Compilation, Assessment, and Reporting

During a test event, automated reporting features can aggregate measurements from many power devices into a single database. Testing programs can compare the data to criteria to assess compliance automatically. This can free resources that would otherwise be used to compile, review, assess, and document system-wide test results for each event.

Improved Compliance

Because automated testing and reporting is less burdensome and more efficient, facilities find it easier to complete regularly scheduled tests. Adhering to a test schedule and reducing errors can increase compliance with applicable standards, promote reliability, and result in better audit performance.

Potential for Fewer Test Events

The most essential characteristics of backup power equipment tests are that they maintain 30% of nameplate power for 30 minutes or more. Based on these criteria, events where generators operate for reasons other than testing can also qualify as test events. For example, a utility outage occurs for a one-hour period and critical power system starts and transfer loads. Provided that the load remains continuously above 30% of the gen-set nameplate rating, the data recorded from the event can be used to demonstrate compliance. As such, a monthly test event may no longer be needed, and the facility can show compliance by documenting system performance during the outage event. NFPA 110 specifically allows data from these types of operations to be used as test events.[9]

[9] NFPA 110. Article 8.4.1.1. p. 110-19.

NETWORKS FOR AUTOMATED DATA COLLECTION

The benefits of automated reporting can be used wherever critical power equipment are connected through a common communications network. Each power device must be able to communicate in the protocol used by the network. While some power devices may communicate in the necessary protocol directly, many will require signals to be converted using internal or external devices. For ASCO products, Accessory 72EE2, (a communication module that installs in an ATS) and the 516x Series Connectivity Units (remote terminal units that connect devices that use differing communication protocols) respectively provide interfaces for converting signals to protocols such as Modbus. To learn more about these networks, review the ASCO white paper entitled ***Data Communications for Critical Power Management Systems***.

Every automated reporting system is hosted by a platform capable of logging data, comparing it to criteria, and reporting the results. In ASCO's product lines, these functions can be performed by intelligent annunciators, network appliances, and server-based platforms. An example of each is shown as follows.

ANNUNCIATOR

ASCO 5705 8-Channel Annunciator
Up to 8 Devices

NETWORK APPLIANCE

ASCO 5702 Power Management Gateway
16 to 256 Devices

SERVER-BASED PLATFORM

ASCO 5700/5900 Critical Power Management Systems
Up to 256 Devices

Notably, the equipment and systems needed to support automated reporting may also communicate with upstream systems, where present. For instance, the ASCO devices above can interact with the Schneider Electric EcoStruxure environment and with common commercial building management systems. Consequently, they can enable automated critical power compliance reporting for an entire building, an entire campus, or multiple campuses from a centralized location.

SUMMARY

Codes and standards require that Emergency Power Supply Systems to be periodically tested for specified durations at required levels of load. For healthcare facilities to maintain accreditation, runtimes, load levels, and other information must be recorded, assessed, and documented. Completing these tasks manually can require significant resources and multiple rounds of testing.

Automated reporting systems improve testing accuracy and compliance streamlining data collection, assessment, and reporting. They also reduce the associated time and costs. In addition, automated systems recognize operational events that can supply data for compliance purposes, thus reducing the number test events need to verify operational readiness. Systems such as the ASCO Continuous Power Management System can provide these benefits and supply data to upstream building and power management systems.

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