PRECISION POWER
INTERNATIONAL, INC.

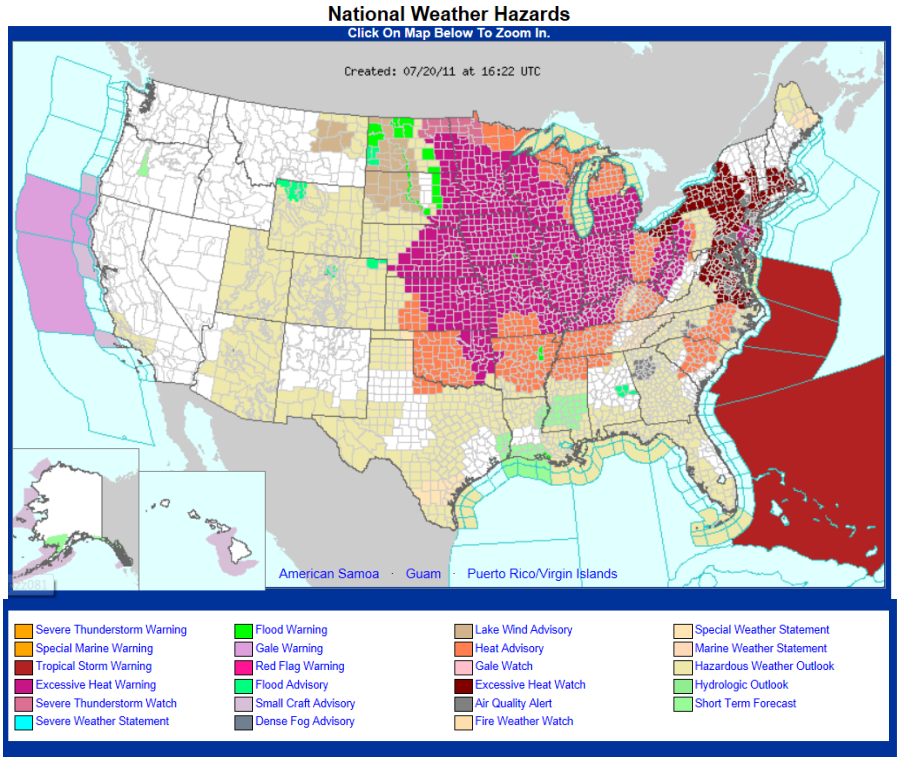
Laboratory Management - Weathering the Change Part III

Are you a Laboratory Manager who is **"Cool under fire"**?

Everyone loves the sun and the long days of summer, but when outside temperatures exceed 90° F and the heat index soars to 115° F + for long periods everyone is miserable, including your laboratory and key instrumentation/equipment. The National Weather Service recently issued heat stress warnings for over 40 states in the U.S. for an extended period of time. The lab manager who is "cool under fire" has planned for such circumstances. Labs that are well prepared to operate under severe environmental stress are also labs that enjoy uninterrupted levels of productivity making for an attractive bottom line.

To determine your lab's preparedness ask yourself the following three questions:

1. Is your laboratory environmental plan adequate?
2. How do you avert "heat-stroke" for your key laboratory equipment?
3. Will you be environmentally "cool under fire"?



National Weather Hazards – Source NOAA, National Weather Service - www.weather.gov

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1. Is your laboratory environmental plan adequate?

Newly constructed laboratories are designed to the latest LEED (Leadership in Energy and Environmental Design) standard for Green Building design. Environmentally, the lab is designed to keep key equipment, operational and personal workspace comfortable, efficient and productive, as well as generally including a "plan" for expansion. If you are fortunate to work in one of these award-winning labs you know all too well that after a few years, the lab's operational plan has changed with new equipment installations, high-throughput automation, more capable informatics, and changes in personnel work areas. The once efficient lab is now experiencing "environmental risk" factors, as are older labs.

During episodes of severe environmental stress from heat and humidity, the laboratory is at risk from electrical power starvation due to demands from other operations, businesses and personnel to satisfy their desire for environmental comfort and economic performance. The demand for "creature comfort" directly impacts the amount of power available to all. Increasing air-conditioning loads severely strains our electrical power generation and distribution systems resulting in high incident rates of short term transient spikes, a consequence of balancing real-time demand for power with generating and distribution capability.

Utilities respond by bringing "peaking units" (auxiliary generation systems) online to meet real-time demand. The continual switching of generating resources into and out of the distribution (grid and local) system produces fluctuations in power delivery. For the laboratory operator the end result is inconsistent and persistent power quality delivery issues. For the very sensitive and very expensive laboratory instrumentation, the end result can range from minor inconsistent data results all the way to catastrophic instrument failure.

Why doesn't the power company fix my problem?

A typical question asked by many laboratory business managers is "why doesn't the power company fix my power problem and deliver good power"? In reality the utility does deliver good power; as a limited oligopoly its output product meets very stringent regulations and requirements. As with other regulated utilities, such as your local water company, electricity is delivered to the "consumer" meeting specific generating criteria and is regulated by up to seven (7) federal and state agencies. In North America (United States, Canada and Mexico) harmonized national standards specify the nominal voltage and wave form (frequency) at the source (generating or distribution facility) at a nominal 120 Vac (Vac: alternating current), with an allowable tolerance range of 114 to 126 Vac (-5% to +5%). Over time 110, 115 and 117 volts (Vac) have been used a various locations in North America. Mains power is sometimes referred to as "110", where, 120 Vac is the nominal voltage. Other voltages are delivered to the consumer per demand specification.

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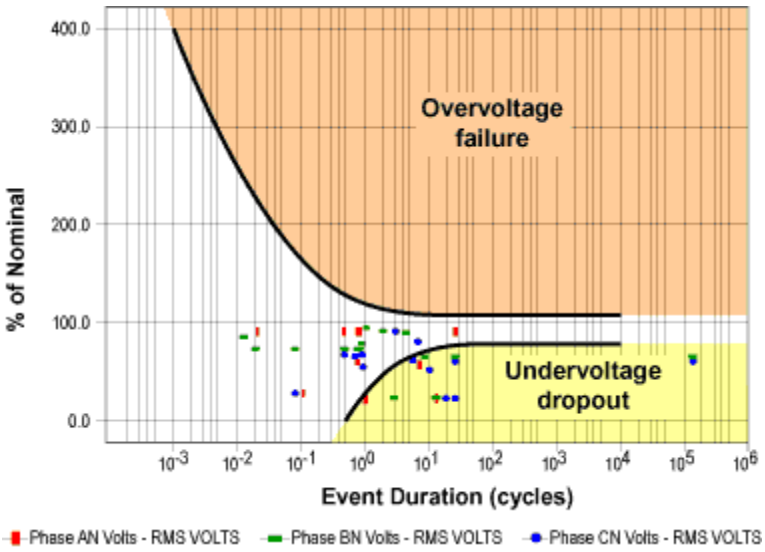
The voltage to your facility may be lower due to voltage drop, or higher due to your proximity to a step-down transformer. The voltage to your facility may have a tolerance of -10% to +10% or more depending upon your business contract with the utility.

Electricity is a shared communal resource like a party line for an Internet (DSL) connection. Increasing simultaneous users and demand of the resource increases the degradation ("reduced bandwidth") and the overall quality of the transmission. The issue with both electricity and water for the laboratory is the delivered "within specification" resource (power or water) does not readily meet the quality standards required for this particular business segment. Laboratories understand their water quality must be enhanced for a successful operation. Most frequently power quality is an overlooked resource that must also be corrected at point-of-use (laboratory or instrumentation system) to meet equipment manufacturer's specifications for successful operation.

2. How do you avert "heat-stroke" for your key laboratory equipment?

Years ago, the Information Technology Industry Council (formerly known as the Computer & Business Equipment Manufacturer's Association - CBEMA) developed an industry standard for electronic equipment. Your laboratory's computers, automation and instrumentation are designed to operate within this standard. If your facility and, most specifically, your laboratory instrumentation circuit(s) meet this power requirement standard, *no supplemental power quality mitigation equipment (TVSS/SPD/IPPS/UPS, et al) is required*. **The business reality is - the probability of your facility meeting this specification without local power quality remediation is approximately equal to your water company delivering reagent grade water directly from the tap**. You already know that water delivery probability is near zero ("0") and must be corrected locally at the point-of-use.



ITIC "CBEMA Curve" - Source: General Electric Energy (GE Power Quality)

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The study illustrated in the CBEMA Curve figure is from a particular informatics center, which indicated 1,115 power events. The most serious events are plotted on the CBEMA curves. Most of the events in this observed set are related to voltage sag (persistent low voltage condition).

Mission critical operations, such as laboratories and informatics/data centers, require uninterruptible noise-free power. Computer and other electronic equipment power quality safe operating boundaries are described by the CBEMA curves. The curves describe specifications for power supplies used in computers and other high value electronic assets. If your operating voltage is above the curve, there is an over-voltage condition that will damage the power supply. If the operating voltage is below the curve, your equipment may turn off due to insufficient voltage to the power supply.

Given that under normal operating conditions unmitigated utility power delivered to the laboratory is suspect at best, during conditions of environmental heat stress as we experience during peak summer and fall months in North America, the power quality and availability is even worse. Your laboratory instrumentation and supporting automation and informatics systems experience line sag, switching transients, drop outs and intentional (planned) rotating (blackout) outages. Line sag is especially dangerous to instrumentation as the required active power (Watts) can only be made up by pulling more current (amperes) through the circuit. Higher than specified amperage (A) delivered to an electronic device literally fries it. This analogy is equivalent to "heat stroke" for your instrumentation – an over temperature condition. Add a clash of air masses to high humidity weather conditions and you have summer frontal thunderstorms and the impact of lightning and wind damage on your power delivery. Localized summer heating also induces afternoon air mass thunderstorms, which are constant plagues to many regions.

To avert "heat-stroke" for your key laboratory equipment you need to assure that those circuits are protected by emergency generator systems, transient voltage surge suppressors (TVSS), surge protection devices (SPD) and *smart monitoring and reporting* technology "bridge power" such as instrument power protection systems (IPPS) or uninterruptible power systems (UPS) with reporting capability.

3. How do you remain environmentally cool under fire?

A laboratory manager remains ***cool under fire*** by a) advance planning, b) cost-effectiveness analysis (CEA) and c) understanding electrical power delivery to the business. Electrically clean emergency power is essential for long-term overall laboratory productivity. The most costly resource in the laboratory is idled personnel, which is followed by retesting to achieve a reportable result and finally equipment recalibration and/or repair if the loss of electrical power to the instrument was insipient (transient) or catastrophic. All of these costs are drains on operating budget and time to reportable result. Many labs are constrained by insufficient emergency power (red outlets) to power instrumentation. Good Risk Management Analysis suggests and recommends a thorough understanding of what makes the lab "tick" and how to keep productivity high with happy personnel and smoothly running equipment.

Attempting to troubleshoot temperamental equipment suffering from poor power quality is equivalent to chasing a spurious phantom around the lab. The effects of degraded power quality are transient and rarely reproducible. Without a clear understanding of your electrical power, the probability of running a consistently productive operation is like the reagent grade "directly out of the tap" water delivery analogy – next to zero ("0").

The next step to achieve consistent equipment performance

If key lab equipment is not protected by a combination of an IPPS/UPS and an emergency generator, consider adding "point-of-use" IPPS units to protect those "mission critical" laboratory assets. IPPS provide regenerated power technology (RPT) with "Smart Monitoring and Reporting" communication and control capability. Most power events last between 20 msec. and 5 minutes, which is well within the capability of these power quality mitigation products, their technology and autonomy (backup) time. If longer backup time is required, auxiliary battery extension cabinets are available to extend run times up to two (2) hours. A soft equipment shutdown is much preferred to a hard crash, due to a collapse of the utility (mains) power system.

IPPS units include surge protection (SPD/TVSS), true sine wave digital signal processing (DSP) and noise filtering circuits in their design. The best part of IPPS products is they are very affordable, at < 5% of equipment acquisition cost, and provide 24 x 7 protection for up to five (5) years on their original internal power reserves (batteries). If your laboratory has limited access to long-term emergency generator power, "point-of-use" IPPS products become a viable solution to your laboratory power management and contingency planning strategy. Precision Power International, Inc. (PPI) understands the laboratory market and has over 35 years of engineering expertise to assist in providing a certified IPPS in a timely manner that meets your needs and provides complete instrumentation system protection. The bottom line is your lab can now *produce consistent results with the lowest cost per reportable result, in timely manner and within budget*. After all, that is what business performance and continuity is all about – consistent performance and results, with high customer satisfaction. Your colleagues will be impressed how your lab operates at near perfection and you are environmentally cool under fire.

Precision Power International (PPI) is a developer and supplier of energy and power products to protect sensitive and costly laboratory instrumentation. The company also provides engineering services to assist laboratory managers in achieving the right power solutions for their unique applications. PPI specializes in value added systems engineering (VASE), software monitoring services (SMS), and consulting engineering services (CES) for the global energy, power technology, and large end-user technology markets. PPI offers "true" turnkey systems integration with "plug and play" designs for the scientific, technology specifier, and end user applications. Precision Power International's engineers design, integrate and certify product applications utilizing the best and most robust "world-class" technology available.

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