

Is Your Laboratory Prepared To Weather The Change? – Part II

With typically 1,000 tornadoes occurring annually in the United States, the National Weather Services – Storm Prediction Center (NOAA NWS SPC - Figure 1) reported over 501 of these severe weather events by mid-April, 2011. The NWS is investigating 267 preliminary tornado reports, over six (6) states, from the April 15-17, 2011 storm track. At this rate, the maximum number of mid-April occurrences (480) has been exceeded and we are on track to exceed the current record of 1,884 annual tornadoes. The highest number of recorded tornadoes is 543 during May 2003.

Average laboratory equipment downtime loss from power outage events varies between less than 5 to 30 minutes; with a single power disruption incident of as little as 20 milliseconds (msec.) causing unprotected instrumentation to fail. For severe storm events, the downtime can become hours due to damaged/shorted electrical power distribution lines from wind damage, fallen trees and transformer failures. Over 750,000 utility customers in the affected states were without electrical power due to the storm event of April 15-17, 2011.

“When long term disruptive events are predicted, primary operational continuity programs should be augmented by secondary emergency contingency plans.”

Source: Precision Power International, Inc.

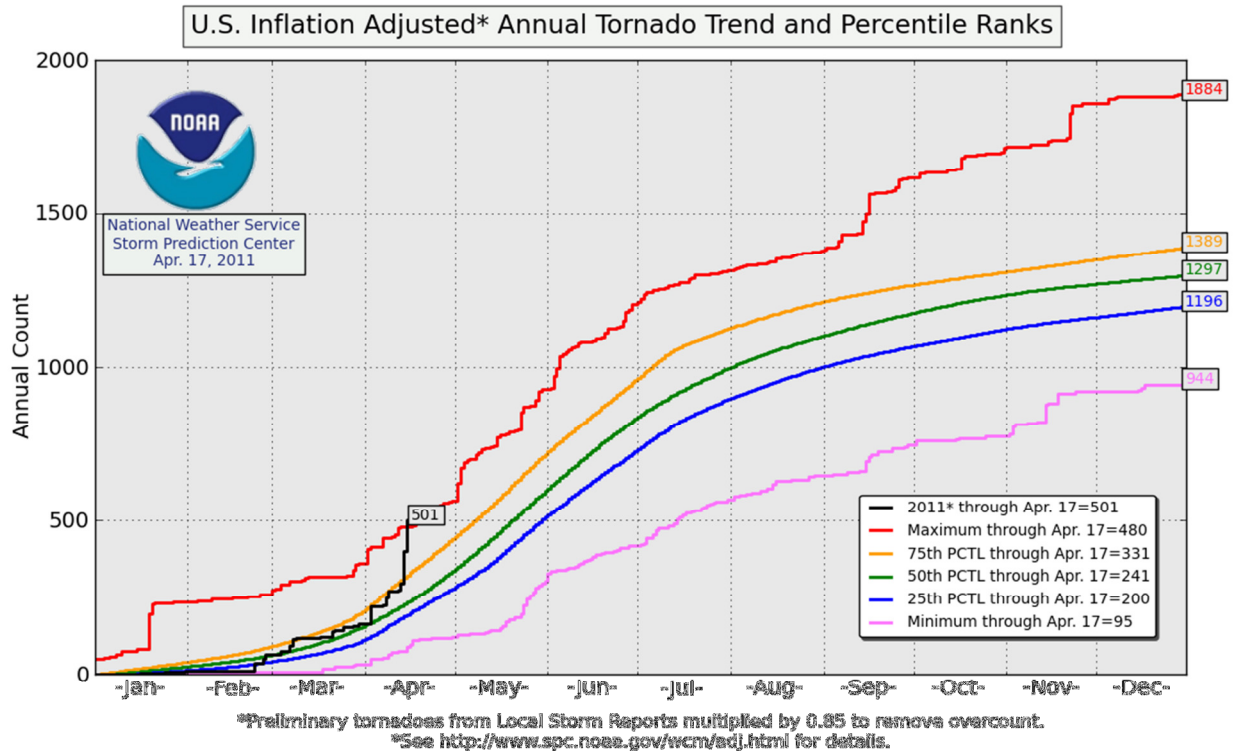


Figure 1 – Annual Tornado Trend (April 2011) / Source: U. S. Government, NOAA, NWS, SPC

Is your lab prepared for a severe weather related or utility induced power outage?

The most prevalent months for tornado outbreaks are April, May and June, with May holding the monthly record and April 1974 (Figure 2), the most devastating event. However, any month of the year can spawn a tornado or waterspout in the United States and Canada. The United States, due to its unique geographical features, generates nearly four-times as many tornadoes as Europe. Vigilance for the laboratory operator is a key watchword during the northern hemisphere's Spring and Autumn seasons, which are traditional weather transition months. Thunderstorm activity and intensity are primary factors in tornado genesis. Additionally, the United States' Gulf Coast and Eastern Seaboard are susceptible to hurricane activity between the months of June through late November. Severe frontal weather threats are omnipresent in North America. Forewarning (Figure 3) and climatology review are insightful first steps toward laboratory preparedness and risk management.

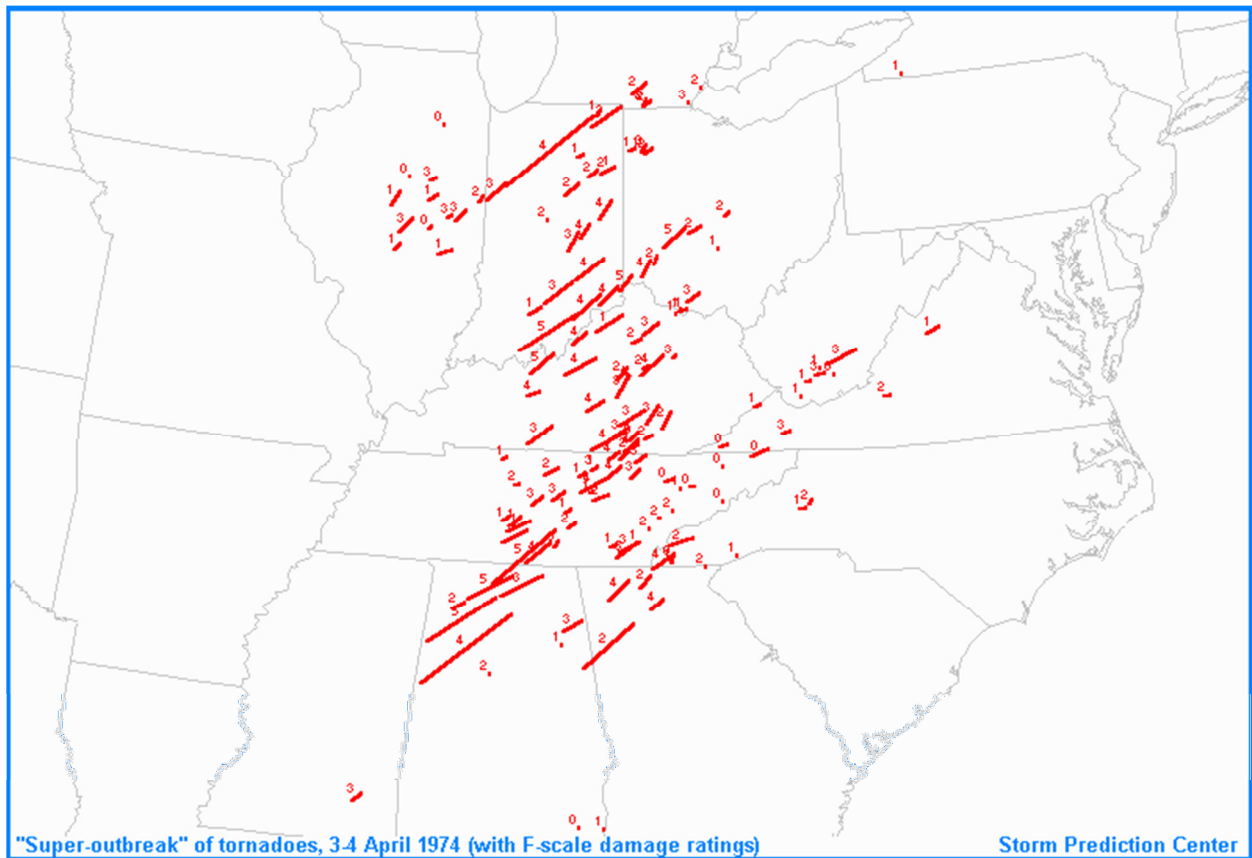


Figure 2 – "Super-Outbreak", 3-4 April 1974 - The Worst Tornado Activity and Damage Event of the 20th Century
Source: U. S. Government, NOAA, NWS, SPC

Coupled with the typical North American electric power utility reliability rate of 99.99% (“four 9s” due to generation/transmission [capacity] and switching/distribution [fault] limitations), **the laboratory operator can expect 53 minutes/year of power disruptions and discontinuity.** Electrical power is generated and “consumed” in real-time and is not an economically viable stored energy resource. The issue with our complete reliance on electricity to power our lives is that with 53 minutes of statistical power discontinuity per year, we need a plan to account for the effect and impact the 0.01% of unreliable power delivery has on our lives and business operations.

So what does all of this mean for the laboratory manager/operator? If we are aware of weather climatology, our geographic location, seasonal upper-level flow, storm prevalence, frequency and duration, as well as power delivery reliability, we have predictive tools to mitigate disruptive storm induced events and power outages.

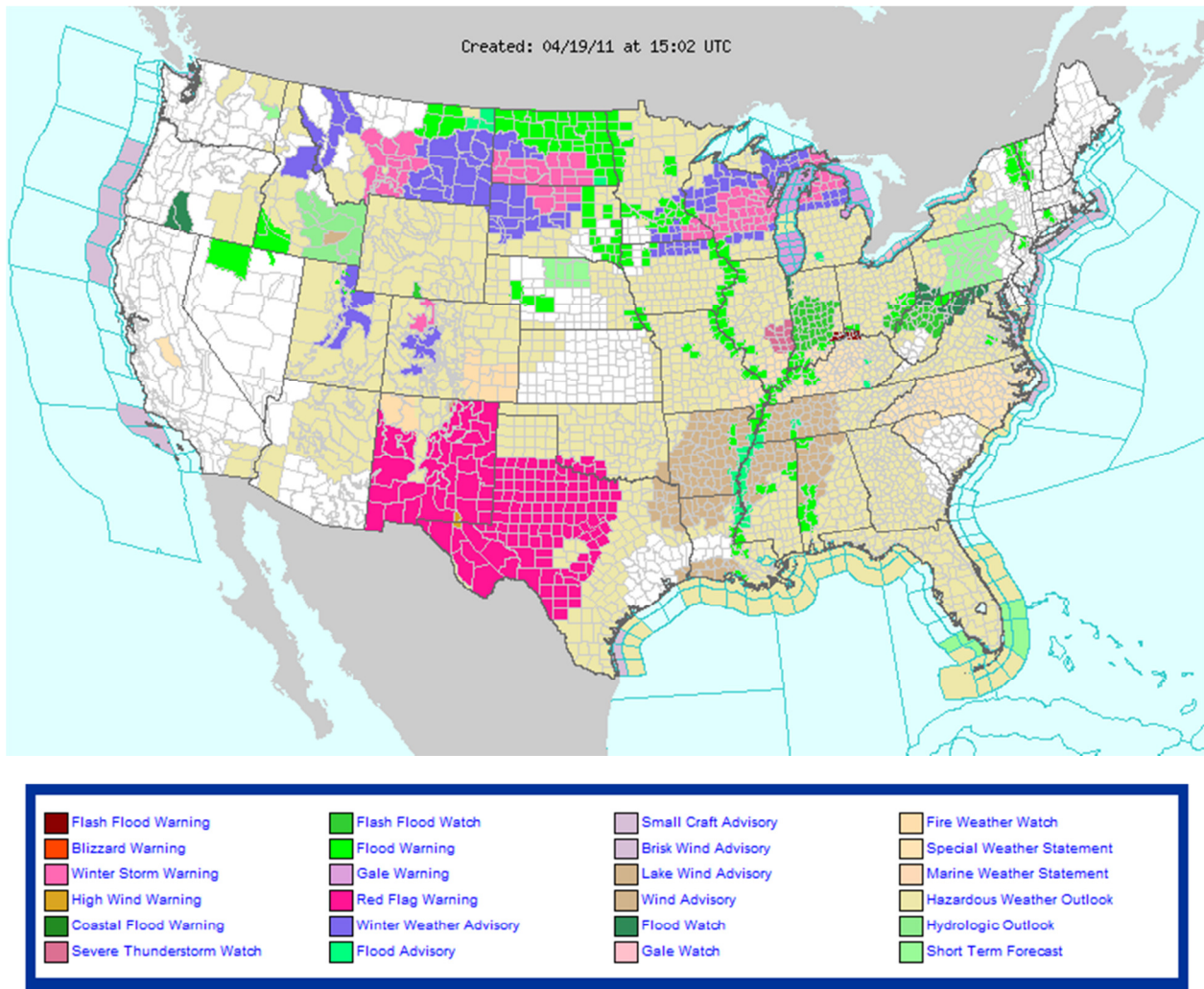


Figure 3 - Contiguous U. S. Real-Time Weather and Hazard Threats / Source: U. S. Government, NOAA, NWS, SPC

Preparing for a Power Failure in the Lab

Learning what to do and how to prepare for a laboratory power failure provides substantial savings in budget, supplies, personnel resources and equipment damage while bringing the operation back up to its normal capacity.

The following guidelines are general suggestions for laboratory preparedness before, during and after a power outage or loss event. Your laboratory operation may have a specific requirements and contingency plans, which supersede and replace those listed. Consult with your Risk Management Team to develop an approved plan.

1. Before the power fails

- Evaluate “mission critical” instrumentation and equipment (resources) that must be sustained through routine (planned), statistically predicted (utility reliability) and forecasted (weather related) power failures.
- Segregate “mission critical” resources into Classes (I, II and III) for emergency generator support, surge protection, and uninterruptable power system.
 - Class I – Emergency generator power support
 - Equipment that is capable of tolerating a limited time (< 60 second) power interrupts.
 - Class II – Electronically sensitive equipment requiring surge protection devices (SPD/TVSS).
 - Computer or microprocessor controlled devices with process (prescription) programming.
 - Class III – No power interruptions are tolerable at any time.
 - Instrumentation, automation and high value equipment in real-time operations.
 - Incorporate SPD/TVSS capability.
 - Utilize smart monitoring (SNMP) for real time monitoring, control and reporting.
- Consult with Facilities Engineering regarding power circuits for the classes above.
 - Install Class I equipment on emergency generator system circuits (red outlets).
 - Install Class II equipment on surge protection devices/transient voltage surge suppression (SPD/TVSS) circuits for sensitive electronics, in addition to long-term emergency power.
 - Install Class III equipment or electronic equipment that cannot tolerate a power interruption at any time on Instrument Power Protection Systems/Uninterruptable Power Sources (IPPS/UPS).
 - Evaluate equipment sensitivity to frequency variation while on emergency generator power.
 - The best long-term protection is an IPPS regenerating the power from an emergency source.
- Designate and emergency contact person (24 hour availability).
 - Advise your Area Safety Coordinator of your action plan and contact person(s).
 - Post emergency contact numbers and e-mail addresses for rapid response.
- Do not leave open chemicals or biologics in fume hoods when they are unattended.
- Make a list of equipment that must be reset, restarted, reprogrammed or recalibrated after utility power returns and is stabilized for normal operations.
 - Post that list in a conspicuous place or on the equipment, or both.
 - Program equipment that operates autonomously to shut down during a power failure.
 - Where practicable, program equipment not to restart automatically.
 - After a power outage, when power returns it is unstable due to transients and other conditions.
- Identify a source of dry ice for items that must remain cold.
 - Refrigerators and freezers will remain cold for hours if unopened.
 - Do not use dry ice (CO₂) in confined areas or in walk-in freezers or refrigerators.

2. While the power is out

- Shut down experiments and operations that involve hazardous materials or may present a hazard.
- Check fume hoods/biological safety cabinets and take appropriate and applicable precautions.
- Check equipment and instrumentation that is running on emergency power to assure it is operating properly and per specification.
- Anticipate power surges upon power restoration to the laboratory.
 - Turn off unnecessary electrical equipment, computers, monitors and lighting.
- If a large and persistent storm event (hurricane, thunderstorm or flooding) was forecasted, remove electrical power cords from the wall outlets to avoid high voltage and electric arc flash-over or other power surge transients from damaging electronic or high-value assets.

3. When the power returns and is stable (no longer on emergency generator power)

- Reset and restart equipment per approved procedures.
- Recalibrate and reprogram equipment as necessary or as required.
- Complete data and informatics integrity checks on computers and databanks.
- Contact Facilities Engineering if key environmental equipment and/or instrumentation fail to restart.
- Confirm fume hoods/biological safety cabinets are operating per specifications.

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.

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.