

# Does your backup power meet guidelines and mandates?

By Michael A. Stout

**F**requently the Food and Drug Administration, Centers for Disease Control and Prevention (CDC), or Federal Emergency Management Agency guidelines and mandates specify that backup power is required to guarantee the viability of medical or laboratory equipment for critical applications. Often, guidelines and mandates fall short of specifying the full scope of the backup systems necessary for the applications. Equipment requirements differ by manufacturer, which leaves equipment implementation and the backup-power system details to be determined by the end-user or his engineers.

After an equipment implementation, one key question frequently left to be answered by time is, "Will the equipment or system powered by the primary and backup-power systems meet the intent and spirit of the specified guideline or mandate?" The following two illustrations outline the scope and issues related to real-world equipment installations.

## Vaccines for Children Program

A state agency purchased one large refrigerator for central storage of vaccines in support of the CDC Vaccines for Children Program (VFC), and three smaller refrigerators in which to store vaccines at three of its remote vaccination centers. Vaccines must be stored in refrigeration, below mandated temperatures, to maintain the viability and potency of the vaccines. The CDC states that the following three elements are necessary for vaccine management for the VFC program:

- "proper storage and handling procedures that maintain the viability of vaccine;"
- "procurement and ongoing replenishment of adequate vaccine inventory;" and
- "efficient distribution of vaccines to eligible providers, while maintaining the cold chain."



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The CDC also states, "The management of publicly purchased vaccine is one of the most important activities conducted by an immunization grantee." The CDC further defines the three main components of the cold chain as:

- "transport and storage equipment;"
- "trained personnel;" and
- "efficient management procedures."

The CDC also mandates that the refrigerators in which vaccines are stored must have their internal temperatures

continuously monitored and the data logged to a level that ensures vaccines remain viable. Finally, CDC demands, "If there is suspicion of a cold-chain failure or evidence that vaccine has been exposed to temperatures outside the recommended temperature range, vaccine should be marked 'DO NOT USE,' so that the vaccine is not used until a response indicating that the vaccine

is still potent has been received." The re-testing and re-certification of the vaccine in question can be a very costly process, especially if the vaccines must be destroyed.

The refrigerators purchased by the state agency all have local thermal chart recorders, an RS-232 port for connection of a local PC computer, and the ability to be monitored remotely using Ethernet local area network (LAN) connectivity.

The three methods of monitoring temperature may seem to be overkill; but with this design, if one of the methods becomes disabled or unreliable, two other data sources exist against which to compare.

State facilities where these four vaccine-storage refrigerators go have backup-power generators in the event of a utility power loss. While many people believe these generators should be enough to assure the viability of the vaccines, that is not the case. The local PC connected to the refrigerators' RS-232 port can crash during the time it takes generators to start up. PCs must be powered by uninterruptible power supplies (UPS) during the generator start-up period.

Additionally, the refrigerators have Ethernet ports connected to each facility's LAN. This situation demands that all LAN routers, switches, modems, and servers required to facilitate the refrigerators' data monitoring, logging, and storage be backed up with a central or distributed UPS to maintain LAN communication during generator start up. To truly meet the spirit and intent of the CDC VFC guidelines for proper vaccine storage involves a substantial engineering project, conducted by many departments inside (and outside) the state agency.

Often, IT department engineers and managers charged with purchasing UPS units — commonly referred to as offline or line-interactive designs — to meet these demands. Because they are not power engineers, they do not realize that all UPS products do not provide the same level of protection and may not operate reliably from generator power.

Avoid these inexpensive UPS products; in critical applications, use double conversion online, generator-compatible UPS models with low distortion and true sine wave AC output; and that provide the highest level of protection against the widest range of power problems while operating from utility, generator, or internal batteries.

### Childhood Lead Poisoning Prevention Program

The Lead Contamination Control Act of 1988 authorized the CDC to initiate program efforts to eliminate childhood lead poisoning in the United States. As a result, the CDC Childhood Lead Poisoning Prevention Program (CLPPP) was established. State and local agencies collaborate with the CDC in the prevention, detection, and Web-based tracking of lead poisoning in children.

As part of the program, the CDC distributes a proprietary CLPPP tracking, database, and Web-reporting software to all participating agencies. Ongoing database reliability for this program is essential. Directly related to the reliability is providing continuous clean power for all database workstations, servers, and LAN communications hardware.

As an example, the CDC's software supplier states: "The most common cause is an abnormal shutdown of

software due to a server crash, a *software crash*, a *computer-system crash*, or a *power spike*. When this happens, key files are not updated, so they can point to wrong or non-existent data." The critical data in the database may become corrupted and possibly could be lost if the right corrective action is not taken.

A backup generator alone will not provide the complete solution. With this widely distributed program, on-site backup-generator power may not be available. A UPS must be provided as a backup-power solution for database computers, servers, and LAN hardware. Special attention should also be paid to the CDC's reference to "power spikes." Low-cost offline and line-interactive UPS types will not provide adequate protection, since most utility-related power anomalies are passed directly through them to the connected equipment.

The use of a double conversion online UPS acts like an electronic firewall between the utility or generator source

and the sensitive computer and network hardware. It regenerates ultra-clean, tightly regulated, and uninterrupted AC power, offering the best insurance against power related data corruption.

A simple statement recommending or mandating backup power does not clearly define the types or level of backup systems required for a specific program or equipment installation. Regulations, program guidelines, and mandates, as well as risk assessments, should always be reviewed by IT engineers and facilities departments prior to purchasing critical equipment or software. This ensures that proper attention has been given to the overall backup-power requirements, yielding a true up-front cost of implementation and, most importantly, assuring compliance. □

Michael A. Stout is vice president of Engineering at Falcon Electric, Irwindale, CA, which provides a variety of backup power products. See [www.falconups.com](http://www.falconups.com). The CDC details vaccine storage and handling procedures at [www2a.cdc.gov/vaccines/ed/shtoolkit/pages/temp\\_monitoring.htm](http://www2a.cdc.gov/vaccines/ed/shtoolkit/pages/temp_monitoring.htm). Learn more about the Childhood Lead Poisoning Prevention Program at [www.cdc.gov/nceh/lead/about/program.htm](http://www.cdc.gov/nceh/lead/about/program.htm).



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