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Powering Down: An orderly process for switching off hospital electrical equipment

by David Stymiest, P.E., CHFM

An electrical shutdown is a carefully managed process whereby electrical equipment is switched off for various reasons, including crucial maintenance, training, expansion and repair; and then turned back on again with minimal impact to patients.

Electrical shutdowns can be performed safely and hospitals can gain added benefits from their electrical shutdowns if they also use them to train clinical and support staff in how to deal with power outages. Hospitals taking this approach are continuously improving their environment of care.

Planning is key to any electrical shutdown

The right time?

Hospitals need to plan electrical shutdowns whenever modifications must be made to the equipment. Industry experts will tell you that working "hot" is never a good idea if there is any other way. A well-planned shutdown is that other way, and it is required in many instances. For example, it should be planned shortly after completion of construction/renovation (C/R) activity in the vicinity of the electrical equipment, even if the electrical system itself is new.

Concrete dust will often get inside the electrical equipment after it is energized for startup and testing of other systems, and this can cause the electrical equipment to fail unexpectedly. If construction dust has to be cleaned off the floor and the window sills, it will likely have to be cleaned off electrical components as well, and knowledgeable owners require a planned shutdown to clean the new electrical equipment thoroughly right before the building's completion.

C/R project shutdowns are difficult to get permission for, but they must occur for the C/R project to move forward. When the hospital's C/R projects take infrastructure maintenance issues into account, everyone benefits. Hospitals should consider performing preventive maintenance (PM) of the de-energized equipment during the C/R shutdowns. This approach will allow the affected equipment to be kept in a state of higher reliability and will also reduce the overall PM shutdown scope and duration.

As with other hospital activities, a safe shutdown is about two-way communication.

Powering Down:
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(cont'd from page 1.0)

A shutdown should also be scheduled when predictive maintenance techniques show hot spots in the equipment that need rework. Excessive heat often indicates impending failure.

Finally, it should also be planned on a PM schedule similar to that recommended by National Fire Protection Association (NFPA) 72B, or the InterNational Electrical Testing Association (NETA) Maintenance Testing Specifications.

Activities and tools

Depending on the needs of the facility, the shutdown planning process can be one or two individuals canvassing all of the affected areas and services, or can involve official task forces and meetings. Both approaches can be effective and can result in safe shutdowns. The decision concerning which approach to use could be driven by the strengths of the individuals involved as well as by the hospital's culture. Some examples of effective shutdown activities include the following

- Detailed planning at several levels;
- A personalized walk-through of each affected area;
- Comprehensive multimedia communications;
- Brief, scheduled and localized power outages for assessment purposes;
- A focused assessment of the shutdown impact on each space and activity;
- Action plans for each unit or department;
- Shutdown contingency plans;
- Pre-shutdown work plans or checklists;
- A hold point list that permits clinical control of the process;
- Checklists of shutdown work scope;
- Group paging with e-mail responses for very effective rapid communication between the shutdown command center and the clinical units;
- Checklists of specific temporary grounds and temporary backup feeders to be removed;
- Feedback forms that formalize the continuous improvement process;
- An overall shutdown plan, also called the "shutdown white paper";
- Timely "lessons learned" critiques; and
- Official shutdown reports for the utility management record.

Information and action

When a shutdown is being planned, facilities management becomes the focal point for information and action. As with other hospital activities, a safe shutdown is about two-way communication. But facilities managers cannot do the shutdown alone. A shutdown task force should report to the safety committee, safety department, clinical groups and department heads. Reports during the shutdown planning process and again after the shutdown can be made at safety committee meetings to enable the safety committee to provide oversight, as well as for inclusion in the official hospital record.

Communication of a shutdown is critical. People need to know that the shutdown is about to happen, what the impact on their activities will be, and what they should be doing to prepare for it. Among the available communication vehicles are personal walk-throughs, e-mails, posters, individual letters, official memoranda, network computer sign-on screens, the white paper and voicemail systems

Planning for shutdown

A focused building systems working group will do the early shutdown planning and establish the

beginning scope of work. The group's work begins before the rest of the shutdown task force starts meeting, and should continue throughout the planning period. The group's activities include the following:

- Reviewing lessons already learned from previous outages and determining how those lessons impact shutdown planning in today's hospital because changes occur constantly.
- Reviewing both the utility management plan and the emergency management plan for the loss of electrical power and updating the plans to factor in new information brought to light during the shutdown planning process.
- Reviewing old Y2K contingency plans for long-term power outages to determine which extra equipment may have to be temporarily wired to the emergency power supply system (EPSS) for the shutdown. (When they were preparing for Y2K, many hospitals learned for the first time that code requirements alone usually did not provide for effective hospital operation.)
- Reviewing cost reduction and value engineering decisions that were made during the C/R of the spaces affected by the shutdown because those decisions will often point to problem areas requiring special attention during the shutdown.
- Reviewing what the power shutdown will do to other utilities such as domestic water; cell phones and other communication and data systems; vertical transportation; the nurse call system; patient care information system; and security access control systems.
- Identifying normal powered equipment and lighting to be shifted to one of the EPSS branches, or to receive a temporary backup normal power (NP) source from somewhere else during the shutdown. Examples of such equipment or areas include some cooling capacity, steam condensate return pumps, hot water circulating pumps, radiology procedure rooms and patient bathroom lighting.
- Identifying and evaluating the scope, schedule, time durations, cost, action assignments and overall impact of the required PM to be performed before, during and after the shutdown.
- Identifying and evaluating the need, scope, schedule, cost, action assignments and tracking progress of all infrastructure upgrades necessary before, during and after the shutdown.
- Reviewing and determining responses to requests for additional emergency lighting and power that come from the departments and areas affected by the shutdown.
- Keeping a strong handle on the growth of the EPSS load because of all of the above-mentioned factors. The last thing the hospital needs is an overloaded generator, emergency feeder or circuit breaker during the shutdown.
- Brainstorming ideas about what can go wrong during the shutdown and ensuring that there are contingency plans to cover each possibility. Reinforce staff training for these events. Examples include hidden swing bus designs, backfeeds, secondary spot networks, neutral currents circulating through transfer switches into NP switchgear, generator failures, transfer switch failures and circuit breaker failures.
- Creating detailed procedures or lists of things to remember and do, work quality checks, technical tasks, administrative tasks, worker safety issues and unusual situations. List all tools used and make sure they are all accounted for after the work. Make sure nothing is forgotten inside of the equipment where it can create problems.

The hardest part of the shutdown in some facilities will be building a consensus about the day of week and times for the shutdown. This requires that all parties collaborate as a team to determine the date and time that will have the least overall impact on the institution's patients, visitors, customers and staff. Gaining consensus of services with competing needs could require that backup feeders be installed to

Continued on back

Continued: *Powering Down*: An orderly process for switching off hospital electrical equipment

permit some services to have more flexibility in scheduling the shutdown.

The shutdown command station should be the location typically used for internal disaster control unless that location is part of the building being shut down.

The shutdown task force or safety committee might elect to use the commencement of the shutdown as a disaster drill. Although this approach is not necessarily part of a shutdown, it sometimes makes sense because people perform best in emergencies when they are doing what they do every day, and this approach provides more practice.

Finally, it is critical that a walk-through is conducted through all areas that will be affected by the shutdown. Get an official contact person to represent each floor or service. During the walk-through, differentiate between "must-have" requests and "would-like-to-have" requests. Both types of requests have value, but limited money and time may make it impossible to respond to all such requests. After the walk-through, send written documentation of your understandings to each contact person.

If everything seems adequate, say so in a confirming memo. Make sure to remind the contact person of his or her unit's responsibilities. Remember: Even office or clinic areas that may be closed during the shutdown and do not need emergency power are likely to have refrigerators that must be emptied and computer workstations that must be unplugged.

Wrapping it up

Planned shutdowns also include what emergency management policies call "recovery" (i.e., getting back to normal). This can be a burdensome process if a lot of temporary wiring or backfeeds were used to get through the shutdown. It may be necessary to have detailed procedures for switching back to the normal operation in order to minimize the potential for accidents. Equipment that had remained de-energized during the outage should also be shut off before recovery begins to minimize the possibility of damage to electronics from power surges during the initial power-up.

The final shutdown task force meeting, held a week after the shutdown, should be billed as a "lessons learned" meeting. This is an opportunity for people to report their perceptions and their recommendations for improving future shutdowns. It is important for many reasons (mission, programming future infrastructure and space upgrades, credibility and improving future shutdowns) that lessons learned in each shutdown be effectively used.

The results of this meeting should be entered into a cumulative database for future reference. "Lessons learned" are invaluable aids to improving the environment of care. Hospitals should critique the entire process and plan to adjust any procedures as appropriate.

Technical and political challenge

Planned electrical shutdowns can be technically and politically challenging, but they are a necessary part of hospital operations. If organized and performed correctly, they can satisfy safety and maintenance requirements and provide valuable experiences for every segment of a hospital's workforce.

SSR Smith Seckman Reid, Inc.

David Stymiest, P.E., CHFM
DStymiest@ssr-inc.com
504.232.1113