

## An All Too Common Story

There are BIG plans to add an Outpatient or Ambulatory Care Facility, upgrade the ER, build a new Clinical Tower, or build a replacement hospital. The hospital design and construction team along with the hospital imaging group, architects, consulting engineers, and medical equipment planners all review the requirements for the new Diagnostic Imaging equipment.



The discussion may cover the Cath Labs, EP Labs, IR Labs, MRI, CT, R&F rooms, Nuclear Medicine and/or LinAc. All of the different medical equipment vendors are considered and the space planning ensues. The hospital staff offers their design considerations to avoid the troublesome issues present in the existing space. The space requirements are considered for the imaging devices, the control room, the equipment room, the bathrooms, the patient flow patterns, and so on ... Many additional requirements are considered and discussed, such as mechanical, electrical, plumbing, and network communication.

*One item that is sometimes reviewed, but often pushed off for discussion until a later date, is the requirement for UPS protection of the Diagnostic Imaging equipment. This discussion is commonly re-introduced at the time when the medical equipment vendors and specific equipment models are selected for the given modality. This is a misguided approach toward providing proper protection for the Diagnostic Imaging equipment. This discussion must occur early in the planning stage to assure that space is properly allocated for a Central UPS that can support all Diagnostic Imaging equipment.*

In some cases, the MEP or Medical Equipment Planners delve into the UPS discussion in the early stages of the project and then the discussion is often shelved to a later date. In other cases, the project team may implement a Central UPS design to support the Diagnostic Imaging equipment, or a Central UPS for protection of all equipment in the hospital requiring UPS protection. In too many cases, the Central UPS is later “Value Engineered” out of the project as construction costs exceed the project budget. The UPS System may also be shifted to the Imaging budget in order to reduce the construction budget. The money shell game begins. The UPS design is often shifted to a partial UPS solution at this point in the process or is postponed until the medical equipment vendors are selected. The long-term ramifications of this decision are often overlooked. Shifting the UPS purchase to the Imaging budget may be required to meet the financial requirements of the project, but good engineering still needs to prevail. ***This is the point where the appropriate long-term engineering decision is frequently abandoned and the decision becomes financially driven for the wrong reasons.*** Let's first review the common path taken at this point in time.

**In too many cases, the Central UPS for Imaging was never included in the design process or is “Value Engineered” out of the project as construction costs exceed the project budget.**

If the Central UPS solution is abandoned, then the project continues to move forward until the point-in-time when the medical equipment vendor and specific models are selected. It is at this time that the UPS topic re-enters the discussion. Many medical equipment vendors will now recommend a partial UPS solution that may be buried in the equipment quote. The medical equipment vendors will often recommend their UPS solution to support Cardiology Labs, Nuclear Medicine, and some Radiology equipment. This recommendation is often a one-to-one partial solution that is not typically in the long-term best interest of the hospital. These partial UPS solutions can only be applied with that given vendor and specific modality. The Central UPS can be applied to support all future vendors, modalities, changes, upgrades, or additional equipment. The level of UPS protection varies based on the customer requirement for UPS Systems, the power quality at the new or existing hospital, the medical equipment vendor recommendation, the level of involvement of the Facilities and Clinical staff, or a host of other reasons.

Many times, the individual reviewing the bill of material feels good about a UPS being included and doesn't worry about the specific UPS details. Why bother reviewing the details when a UPS is a UPS is a UPS? Right! In other cases, someone on the hospital staff asks more detailed questions on the UPS line item and realizes how much

capital is being spent on individual, partial UPS Systems. At the same time, another realization often occurs—the UPS system requires space in the equipment room, or some other location, for the given modality. Of course, that space was removed sometime ago in the design phase to accommodate 10 lbs in a 5 lb space. This is the Quandary Point!

Many projects will make a quick decision based on the medical equipment vendor input. The medical equipment representative might comment as follows... *“The UPS system within the quotation provides our recommended level of protection and assures that the system warranty will be upheld. By accepting our recommended accessories along with the extended service contract we can assure maximum reliability and system uptime.”* In many cases, the UPS solution offered by the medical equipment vendor may not be the best long-term solution for the hospital, but is a trouble-free decision that assures the initial equipment warranty is not impacted.

In many cases, the UPS Systems provided are small to mid-size solutions that protect the data or some limited portion of the device. Most of these approaches do not offer protection for the X-Ray generator or gradient amplifier—the heart and soul of the medical imaging device. This partial solution does provide protection for the data. With some solutions, the Fluoro mode of operation is available for a short time period during a power outage allowing the cardiologist to safely back out of the procedure. These partial solutions do offer partial benefits. But, a better approach is available that offers *complete protection* for the whole device ensuring power protection for the X-Ray generator or gradient amplifier *and* the entire medical imaging device.

***Proper power protection for medical imaging applications has long been pushed to the back burner.***

***It is surprising that the hospital will spend \$2,000,000 to \$40,000,000 or more (depending on the size of the project) for Diagnostic Imaging equipment and undervalue the ramifications of improper, partial, or no Power Conditioning / UPS outage protection.***

In some cases, someone involved with the project realizes that the partial approach is not the best solution. CPN Power have been called into projects at this point-in-time. But, the opportunity for the appropriate solution has already passed. While a Central UPS solution can be offered, it is often less than ideal due lack of space, complications in the electrical distribution, or budget constraints. When applying the Central UPS at this stage in the game, there is always some compromise.

The ironic part of this discussion is that a Central UPS from CPN Power is typically lower in initial cost than a cluster of partial UPS solutions from the medical equipment vendor. Below is a chart comparing the medical equipment vendor partial UPS solution to the CPN Power Central UPS solution:

Medical Equipment Vendor (MEV) Partial UPS Solution	CPN Power Central UPS Solution
<ul style="list-style-type: none"> <li>Provides only partial protection</li> <li>No protection for major components, such as the X-Ray generator or gradient amplifier</li> <li>Limited to use with that particular MEV</li> <li>In most cases, the partial UPS cannot be used with future upgrades or changes to imaging equipment</li> <li>Definitively <b>cannot</b> be used when changing Vendors</li> </ul>	<ul style="list-style-type: none"> <li>Offers full protection of the given modality</li> <li>Full protection allows the procedure or scan to be completed without interruption</li> <li>Full protection also dramatically reduces long-term accumulative component damage</li> <li>Assures a much lower Total Cost of Ownership</li> <li>Allows for imaging equipment changes/upgrades over the 15-20 year life of the Central UPS</li> <li>Can support Multi-Modalities and Multi-Vendors and is Vendor Neutral</li> <li>Central UPS sizing allows for future modalities to be easily added to the UPS output</li> <li>Moves the UPS away from the imaging area of the hospital for better space utilization</li> <li>Central UPS is the best engineered solution</li> <li>Central UPS typically has a lower upfront cost due to load diversity and the resulting UPS size. It also provides for lower long-term maintenance and operational costs</li> </ul>

**Complete Protection:** Providing complete protection of the entire suite ensures continued operation through short-term power outages and monthly generator testing. The majority of power outages are less than 20 seconds. In fact, most power outages are less than 2 seconds. The use of flywheel energy storage, in lieu of batteries, continues to gain market acceptance for this reason. Flywheels typically provide ≈15-25 seconds of ride-through allowing enough time for the generator to start and the ATS to transfer power from the generator. Longer-term power protection can be achieved with batteries. Common sizing of the UPS batteries provides 10-20 minutes of backup protection for the given load. Providing complete protection of the entire suite avoids long-term accumulative component damage issues caused by power anomalies over time. The CPN Power UPS is an on-line double conversion design that first-and-foremost provides excellent power conditioning. Providing conditioned power to the medical equipment will not end the need to replace the \$100,000 - \$200,000 tubes or other components, but it will surely eliminate most of the power issues that impact the life of those components. The result of proper power conditioning will be longer component life. Accumulative component damage, in general, will be dramatically reduced resulting in a lower Total Cost of Ownership and improved uptime (fewer patient scheduling issues).

**Point-in-Case:** A hospital in Louisiana installed a CPN Power 225 kVA UPS to protect against regular deep voltage sags and short duration power outages. The power problems were causing equipment downtime and patient rescheduling. The hospital decided that installation of a UPS System was required for protection of the (2) CT Scanners and (1) MRI. The (2) CT Scanners were from different vendors. The hospital quickly realized the benefits of a Central UPS for all 3 modalities. The equipment downtime was dramatically reduced and virtually eliminated. Patient re-scheduling, due to equipment downtime, became a distant memory. Phantom problems were also dramatically reduced. The service engineer's phone number was removed from the speed dial list! But, the UPS value continued well beyond the initial benefits. After 2 years of reliable operation, CPN Power received a call from the local service engineer describing another long-term benefit of proper power protection. Prior to the UPS being installed, the site would regularly change the X-Ray tubes after one year of operation in both CT Scanners. Since the UPS System installation, the hospital had yet to replace the tube in either CT. We received a similar call after 3 years of successful operation with no tube replacement. (Results will vary from site to site.) Past experience shows that improved equipment operation is common to most sites after installation of a UPS System. With a cost savings of \$85,000 per tube, the UPS System Return on Investment (ROI) was 6 months for this particular installation.

### Central UPS Benefits vs Many Individual UPS Systems:

- Lower initial cost of power protection equipment and installation
- Reduced floor space requirements of power protection equipment
- Lower cost of air conditioning equipment and installation
- Lower cost of power protection equipment maintenance
- Lower cost of operation due to much higher energy efficiency
- Lower cost of battery replacement
- System sizing can allow for future modalities
- Protection is offered to the entire suite, not just partial protection of Fluoro mode or the CT table/gantry
- Lower medical equipment service costs due to complete protection from all power problems

DON'T GET CAUGHT IN THIS ALL-TO-COMMON SITUATION. UPS PROTECTION FOR IMAGING EQUIPMENT HAS NOW BECOME THE STANDARD AND PREFERRED APPROACH. CENTRAL UPS FOR DIAGNOSTIC IMAGING CAN PROVIDE HUGE COST SAVINGS INITIALLY AND LONG-TERM. AS THE OLD SAYING GOES, "AN OUNCE OF PREVENTION ..."

- The high cost of medical equipment justifies the level of protection
- Short-term outages can result in longer-than-acceptable equipment downtime
- New applications are more sensitive to voltage sags, power outages, and other power anomalies
- Eliminate potential liability of power failures during invasive procedures
- National power grids are becoming less reliable due to de-regulation
- Power problems can adversely affect image quality
- Installing power protection ensures that - "Power disturbances will no longer be the basis of a service issue."
- Monthly generator testing impacts medical equipment reliability
- Improved equipment operation, less patient re-scheduling, and fewer service issues guarantee increased revenue

September 2013