

MAXIMIZING DATA CENTER EFFICIENCY *by Linda J. Morrow*

The ability to contain costs is important for any business. In today's data centers, cost concerns encompass much more than the initial capital investment in real estate, construction, and equipment. Utility costs are every bit as important because they are recurring, ongoing expenses over the long-term, and efficiency plays a large role in minimizing utility costs. Uninterruptible Power Supply (UPS) systems are one of the core components of mission-critical infrastructure in a data center and are frequently regarded as one of the biggest offenders with respect to energy loss in power distribution. It is no wonder, then, that there has been increased interest in utilizing the most efficient UPS system available.

In the past, UPS systems were most efficient at peak loads. Since loads in various data centers can swing wildly based on fluctuating clientele needs, recent design efforts have resulted in the introduction of a UPS with a relatively flat efficiency curve. The aim for this new generation of UPSs is to be highly efficient regardless of the load, providing data center facility owners an attractive option for trimming operating costs. Therefore, it makes good economic sense to ask about the expected efficiencies of a UPS across all load levels when talking to UPS vendors. A good follow-up question would be to ask for proof. A vendor should be able to provide facility managers the ability to see how their UPS performs under realistic operating conditions; in many instances, this takes the form of a factory witness test conducted at a testing facility. Alternatively, a reputable UPS manufacturer should be able to supply case studies and/or client contact information to support their performance claims. One step beyond would be to ask for an efficiency guarantee.

With regards to efficiency, selecting a UPS that is merely 1% more efficient can lead to huge savings in power consumption over the lifetime of the UPS, which is typically 15 years. The actual savings possible is a factor of the utility rate and the load being supported, but conservative calculations estimate these savings to amount to hundreds of thousands of dollars. In addition, a less efficient UPS means that it is giving off more heat, which requires more cooling. An increase in cooling capacity runs up the operating costs further.

The need to improve data center efficiencies and minimize power consumption has gained the attention of the Environmental Protection Agency (EPA). In 2010, the agency initiated an ENERGY STAR Program specifically for data centers. ENERGY STAR products are independently certified to save energy without sacrificing features or functionality. The ENERGY STAR specification for UPSs establishes minimum average efficiencies. According to their website, an ENERGY STAR certified UPS can reduce energy losses by 30% to 55%. Considering only ENERGY STAR certified UPSs is prudent and will result in substantial savings on energy bills and also help protect the environment.

Another relevant factor to consider in the selection process is the power factor of the UPS. The power factor of an AC electrical system is defined as "the ratio of the real power flowing to the load to the apparent power in the circuit" and is dimensionless. In other words, does a UPS rated for 750 kVA actually deliver 750 KW of power? In the data center world, it is the kilowatt number that matters, because that represents the output power that can be delivered. It's of critical importance for a data center to maximize its KW, because it directly affects the number of clients they can support, and therefore the bottom line. The higher the power factor of the UPS, the more power the data center can deliver. Restricting UPS selection to those units with very high power factors (the closer to 1.0, the better) would be in the best interest of the data center owner.

Lastly, the physical size and weight of a UPS should also be given consideration. Modules with a smaller and lighter footprint will likely lead to an easier installation process and require minimal floor space. Furthermore, close attention should be paid to new designs on the horizon. Models are now available that incorporate the next generation of power modules and take performance and efficiencies to unprecedented levels. In addition, there are now UPS models that are truly expandable and can grow as the data center grows. Not only do these models make maximum use of floor space, but they present an attractive fiscal "pay as you go" option and minimize the capital investment required upfront.

Clearly, a little research upfront will pay long lasting dividends over time.