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Comments on UPS kWh Metering Debate

Our UPS customers (<100kVA) have found that energy loss in their computer rooms is negligible. Therefore, they have rarely requested energy surveys for UPS modules in this range. However, for UPS modules >100kVA (mostly on-line typologies), energy monitoring is extremely important. This is especially necessary for transformer-based designs. The follow information, therefore, is provided to add value to the current debate on energy monitoring and meter placement for on-line UPSes.

Approach #1: Internal-to-UPS Metering. Most reputable on-line UPS manufacturers already have about two-thirds of the necessary equipment within UPS to monitor kWh. It would only be a minor cost for them to add the additional gear to monitor kWh at both the *ac* input and *ac* output. A simple calculation can show total system efficiency based on actual percent load levels (efficiency varies with load level) and actual current and power factor. The UPS must be able to measure both apparent power (Watts) and reactive power (Vars). The manufacturer should NOT be allowed to assume power factor at rectifier input because of a presumed power profile of a type of rectifier technology. Please see Figure 1 for our recommendation on meter placement.

Approach #2: External-to-UPS Metering. Indeed, some on-line manufacturers already sell kWh power meters, albeit as an add-on, surmounting to purchase and installation cost of $10,000 (CDN). On average, this would require six to eight hours to install. There are already several revenue grade meters in the market that vary considerably in price. E.g., Dranetz, TOSHIBA, etc. This should be an end-user decision since most of these meters measure kWh.

Meter Placement. If data centre managers are merely interested in kWh, then metering should only be at the UPS input because this is the only metric seen by utility. However, if efficiency performance ratings of on-line UPS are needed, an additional meter needs to be placed at the output. See Figure 1. Metering is not necessary anywhere else, unless other circuits are deemed necessary for metering by Energy Star, such as line interactive and economy mode circuits.

UPS Typology Transparency. In our experience, we have encountered many disgruntled clients with line interactive or “economy mode” UPSes. This is because some of the respective UPS manufactures or vendors are claiming 99% UPS efficiency ratings for their UPSes but are not clearly indicating that this efficiency calculation bypasses the rectifier and inverter dual conversion circuit. Our clients have found this marketing to be extremely misleading. Furthermore, our clients have repeatedly indicated to us that

these economy modes are unreliable for their 'critical' systems. Only true on-line, all load in inverter, UPSes are considered in our industry to be a reliable mode of operation that effectively isolates the 'critical' load from utility aberrations, especially in industrial manufacturing sites and data centres. Therefore, we recommend to Energy Star that manufactures and vendors disclose full transparency of their UPSes to include truthful specs. E.g., instead of marketing their 'UPS' as 99% efficient, they should market their 'economy mode' circuit as 99% efficient but not in dual conversion mode. This transparency should be evident on the new Energy Star specification for UPSes. This would save a lot of headache to end-users.

Figure 1: On-Line UPS Configuration