Ups output power factor

Ups output power factor

A UPS"s output rating is shown as 2000VA/1800W. I understand that the power factor here is 0.9, but the device or load I will connect to the UPS might have pf<0.9 or pf=1 (for light bulb.) From my understanding, the real and reactive power will vary based on my load"s pf. Then why does UPS specific a fixed pf? Isn"t it enough just to mention the VA rating?

With the loads presented to a domestic UPS being resistive (incandescent lamps) / inductive (ceiling fans) / capacitive (CFL / LED lamps), the probability of the reactances cancelling out does exist.

The UPS manufacturer may hence assume a power factor of 0.9 (midway between 0.8 & 1!) and give the rating in kW in addition to kVA.

There is no need to specify wattage for the UPS as VA rating is enough and complete. However, since a layman generally understands wattage best, the manufacturer has also specified its capacity as 1800 watts assuming a power factor of 0.9 for the load. If the load is theoretically assumed as completely resistive (power factor 1), the same 2000VA UPS will deliver 2000 watts.

First reason is redundancy/simplicity. Not everybody can calculate 2000 VA/1800 W = 0.9 PF. But more importantly, it is mentioned due to marketing reasons. Most early UPS systems were designed to handle output with 0.6 PF. Marketing people realized that people associate high PF values with better products so they use high PF numbers to justify higher prices.

UPS manufacturers first tried to lure buyers using higher VA ratings. In other words, higher VA rating = much more expensive unit. But, it is cheaper to add extra components to increase VA ratings, compared to increasing the W rating which is the actual power used by the load. Designing system which can give out more actual power also costs much more $$$. Using VA values was a way to inflate prices.

Marketing departments are now pushing that the higher power factor is worth paying more. In the past they could sell 2000 VA/1800 W UPS with a high price tag. Now they need to justify why 2000 VA/2000 W UPS costs even more.

Some even try to push 1800VA/1800W UPS more expensive than 2000 VA/1800 W UPS due to higher PF. Although, it should be cheaper to manufacture. In reality, one could just put 1800 VA/1800 W sticker on a 2000 VA/1800 W device.

Here is a quote from Peter Gross of APC (according to this article)

"When someone buys a 100 kVA UPS designed with a .8 power factor, inreality he is buying the equivalent of

an 80 kVA UPS that has unitypower factor rating," says Gross. "They pay for a 100 kVA UPS, but inreality, with the load approaching unity power factor, they only getan 80 kVA system, only 80% of the UPS capacity they thought they werebuying."

Unfortunately in that article there is some APC propaganda also. It is hard to find objective references nowadays. :(

Thanks for contributing an answer to Electrical Engineering Stack Exchange!