23 April 2010

ENERGY STAR UPS Framework Document
Comments from the European Commission

We provide in the following comments from the European Commission to the framework document. We generally appreciate and support the contents of the document.

As a starting remark, we would like to refer to the EU Code of Conduct (CoC) on energy efficiency and quality of AC Uninterruptible Power Systems (UPS), which covers the larger UPSs. Please see the Code of Conduct: http://re.jrc.ec.europa.eu/energyefficiency/html/standby_initiative_UPS.htm.

We believe that the CoC work and the stakeholders involved in the work can provide valuable input for the ENERGY STAR specification development. A main stakeholder is the European organisation CEMEP (www.cemep.org), which represents the European manufacturers of UPS systems.

System Topology / Eligible Product Categories

We think that it is logical to use the same overall categories that is used by the industry and the IEC 62040-3 standard even though the standard does not define well the categories. E.g. paragraph 3.2.20 of the standard defines the operational mode "passive standby", and in Annex A, various UPS-types are described, but nothing exactly like the "passive standby" type.

In any case, we have considerations on the categories. First of all, we think it might be confusing to name a category "passive standby", which otherwise is used as name of a mode.

Secondly, the best principle would be to define the categories according to functionality and capability, e.g. how fast the UPS can start the emergency supply rather than to define them by technology. We however know that this is much more difficult, both in defining and in getting acceptance among the stakeholders.

Furthermore, if we define adders, e.g. as defined in the European CoC ("additional devices"), it is also preferable to be done through functionality if possible.

Our recommendation is in the short run to use the proposed categories, however, always making it clear when using the term "passive standby" whether it concerns the UPS system or the operational state. In the long run, we believe that functionality and capability can be used as categorisation.

We recommend to consider and discuss with the industry inclusion of DC output UPS and combined AC-DC output. These avoids losses in the inverter and then in the server for transforming to low voltage DC. In IEC62040-3, Annex A.1.4 describes UPS with DC output (in addition to AC output).

UPS Operational States and Test Methodology

We support the proposed operational states. In addition, we see two more states:

- Standby state: A state where mains supply is OK, the battery is fully charged, and the connected equipment draws no load. The mode hardly ever occurs in normal use, but could be used for measuring the power consumption of the internal support circuits of the UPS, that is the circuits with consumption not

proportional to the load. In all types of UPS, the losses will be from control circuitry (microcontrollers), bleed-resistor-loads, leak currents in filter capacitors and battery, and trickle charging.

- Charging mode: Is a state where mains supply is OK, the connected equipment draws no power and the battery is not fully charged. Energy-wise this mode is of less importance, since it by nature only occurs very seldom.

Similarly, the stored energy state should not have much energy importance since it also only occurs very seldom.

The most relevant state is the normal state, where the supply is OK, the battery is fully charged, and the connected equipment draws partial to full load. The other states may be relevant to include for the first round of test with the purpose of getting more information on the UPS losses even though they may not be included when setting criteria.

Losses in the UPS should be measured at 25 %, 50 %, 75 % and 100 %. These measurements will show both losses proportional and non-proportional to the load. The ability to handle overload peaks should be expressed in some way in the overall review of an UPS. The reason is that this ability enables a closer match to the full 100 % load where the efficiency is the best.

In the passive standby UPS, the losses will be from filters, transformer and all interconnections and switches.

In the line interactive UPS, the losses will be from filters, transformer, inverter to some extend, and all interconnections and switches.

In the double conversion UPS, the proportional losses will be from rectifier, inverter, filters and all interconnections and switches.

All semiconductors/solid-state-switch-elements have saturation voltage that will give losses proportional to the currents. This means that solid state switches also will show losses, and in some cases it is beneficial to use a mechanical bypass contactor when in a steady operational mode.

The saturation losses are the main reason for losses in the inverter, and vary with the chosen type switch-element. Driver circuits for the switching elements also produce significant losses. The inverter can contain a high frequency transformer (at the switching frequency) and this can produce losses depending on the quality.

Regarding the test procedures, we recommend to study the work going on under Cenelec, where an annex A11 to the IEC standard is under preparation:
http://tcelis.cenelec.be/pls/portal30/CELISPROC.RPT_WEB_PROJECT_D.SHOW?p_arg_names=project_number&p_arg_values=20691

Other Requirements

On larger UPS for server rooms, it is an important factor for cooling energy consumption that the battery can be separated from the rest of the UPS, in order to place the battery in the cooled data centre, and the power

consuming electronics outside in a utility room with free air cooling. This could be included as a future requirement.

General Remarks

For the questions for discussions on definitions, the answer to several of the questions could be to look at the VSD (variable speed drives) products. Many parts in VSD are similar to UPS, and test, measurement, classification, noise, etc. have been issues for many years.

The passive standby system is usually considered not as good as the other two types, and this is a pity since they have the best efficiency. Fast electronic switches could easily switch fast enough to avoid any power loss. The problem is perhaps more a question about how to define and determine when to switch.

Market segmentation by input power phase: Only the very big ones will be segmented this way, so we believe that system type and output rating will be better segmentation key.

Upcoming technologies may contain DC output systems and built-in power supplies with built-in UPS.