22nd February 2007

To: Mrs. Fay Geitona, Secretary General, CEER
by e-mail: voltagequality@ergeg.org

Dear Mrs. Geitona,

Please find below my comments on ERGEG Public Consultation Paper: Towards Voltage Quality Regulation in Europe", dated on the 6th of December 2006.

Regarding the proposed improvements of current dip definitions, page 27, Section 4.1:

- practical reasons, related to measurement applications, support the change of the threshold for distinguishing dips and interruptions from 1% to 10%; this will also help in harmonising EN 50160 with other related international standards; additionally, interruptions should be defined as the single-phase events, not exclusively as the three-phase events (i.e. events with all three phase voltages lower than the interruption threshold)
- the threshold for distinguishing dips and rapid voltage changes should not be changed from its current value of 90%; this limit is widely (i.e. internationally) accepted, and also used by a majority of equipment manufacturers as one of the built-in equipment immunity requirements
- it is documented that sub-cycle (i.e. very short) dips and interruption with the duration between 10ms and 20ms, or even shorter, could cause malfunction or tripping of some types of equipment (e.g. ac coil contactors, adjustable speed drives, etc.); this means that the ITIC requirements for equipment immunity are not always or universally applicable, and that the minimum duration of a voltage dip should not be increased; additionally, current definitions of dips are based on root mean square (rms) voltage values, which indeed could be both measured and calculated for dips longer than 10ms
- if rms voltages are used for characterisation of very short dips and interruptions (shorter than a few periods), this will results in errors for both dip magnitude and dip duration; stronger correlation of dip definitions with instantaneous voltages is, therefore, necessary if more precise information about dip events is required

Regarding the limits for voltage variations, page 28-29, Section 4.2: The "95%-of-time" clause should be avoided, together with long averaging intervals. This is an absolutely necessary prerequisite for more efficient and transparent definition, and use, of "minimum guaranteed voltage quality standards", and all other power quality limits and requirements.

Regarding the possible enlargement of the scope of EN50160 to high voltage (HV) and extra high voltage (EHV) systems, page 30, Section 4.3: It will be very hard to directly correlate voltage quality limits established at HV and EHV with equipment performance (customers rarely connect their equipment at HV and EHV levels). Voltage quality limits for HV and EHV levels, therefore, could/should be defined more from the system performance point of view (e.g. for benchmarking purposes, when different HV and EHV systems, and their performances, should be compared). Additionally, HV and EHV limits and requirements should be carefully correlated with corresponding MV and LV limits and requirements (i.e. HV and EHV limits and requirements should be more stringent). All of the formulated requirements should be mutually interchangeable and compatible.

Regarding the avoidance of ambiguous indicative values, page 30-31, Section 4.4, and improved classification and categorisation of dips and swells in one or more "voltage dip/swell tables", this should be done with respect to:

- all influenced voltages during the event, not just the minimum voltage during the dip and the maximum voltage during the swell; in other words, per-phase representation of dips and swells (and their combinations – dips in some phases and swells in the other) should be introduced; otherwise, there will be no distinction between, e.g. single-phase and three-phase dip/swell events
- effects of these events on equipment performance; in other words, those types of events that have different causes, but results in the same or similar effects on equipment performance, should be put in the same event categories; classification of events only with respect to their causes may be helpful from the system point of view (e.g. it allows easier counting of events), but severity of events is not determined by their causes – it is ultimately determined by their consequences

Regarding the consideration of duties in voltage quality regulation, and proposed concept of "responsibility sharing curve" (RSC), introduced in Fig. 6, page 31, Section 4.5: the RSC should be discussed and explained in more detail. For its use in three-phase supply systems, clear explanation should be provided as to what voltage should be used for establishing border lines: minimum of all concerned, or their average, and how voltage measurement should be performed: phase-to-neutral or phase-to-phase. It is important to explain what information on equipment immunity, among those available in e.g., international standards or equipment product specifications, should be used (and what should not be used) for the construction of the RSC, and why. In other words, the differences between the existing concepts for the assessment of equipment immunity (e.g., the ITIC curve, Fig. 1, page 10, Section 2.1) and the newly proposed RSC concept should be explained. Furthermore, different RSCs should be defined and used not just at different voltage levels, or for different system configurations and topologies, but also for at least few general classes of equipment (e.g. those mentioned in IEC 61000 series, where different requirements apply for different classes of equipment). Extension of the

RSC concept to different classes of equipment will also provide a good starting point in further negotiation of more specific power quality contracts between the customers and utilities. Finally, when several limits and voltage responsibility curves are defined and used, they should be carefully correlated, in order to provide the information about the overall system/customer performance.

Regarding the introduction of different limits in networks with different characteristics, page 33-34, Section 4.6: These limits should be additionally differentiated with respect to at least two general categories of equipment: a) equipment used in industrial environments, and b) equipment used in public networks (see IEC 61000-2-4 for equipment categorisation). This is especially important from the point of view of mitigation, as customers using equipment in public networks generally do not have necessary technical and engineering support for solving possible power quality problems, what is usually available in most of the industrial environments.

And finally, regarding the anticipated promotion and development of national and international monitoring campaigns and systems for collecting the data on actual levels of voltage quality: these actions should be strongly supported. For this, however, clear interpretation of recommended measurements techniques and procedures should be provided, in order to maximise the use and the exchange of all obtained information.

With kind regards,

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