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Standardising the characteristics of electricity

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IEC 62510, which is a technical report, has been prepared by IEC technical committee 8: Systems aspects for electrical energy supply.

The text of this technical report is based on the following documents:

Enquiry draft	Report on voting
8/1226/DTR	8/1248/RVC

Full information on the voting for the approval of this technical report can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

INTRODUCTION

While standards exist in various countries for some of the characteristics of electricity supplied from public networks, IEC 61000-2-1, 1990, EN 50160 and IEEE 1159 are attempts to cover all of the characteristics more or less comprehensively. EN 50160 was a response to a formal declaration that electricity is a product – according to European Directive 85/374/EEC concerning liability for defective products.

The network operators have the responsibility of designing and operating the network with the required level of quality which may be defined by national laws, national or international standards.

The following text describes the nature of electricity and the relation between quality of supply and EMC. It is taken very largely from the EURELECTRIC PQ Report, 2nd Edition.

Quality of supply

Of all the basic services on which modern society relies for support, electricity supply is one of the most essential. In order to provide that support, several qualitative aspects are significant.

a) Constant availability is an important requirement, involving
   - for continuity of supply in day-to-day terms, an operating regime whereby the inevitable supply interruptions are prevented from being either unduly prolonged or unduly frequent;
   - for more long-term security of supply, a stable balance between user demand and the availability of generation, transmission and distribution assets as well as energy sources.

b) The utilisation of electricity requires both voltage and frequency to be standardised in order that the supply as delivered to the user is co-ordinated with the equipment by which it is utilised. It is very important to maintain the supply within reasonable range of the standard values that are adopted for voltage and frequency.

c) Notwithstanding acceptably stable levels of voltage and frequency, there are several quite short-term, low-amplitude or occasional irregularities superimposed on the voltage that can hinder the proper functioning of electrical equipment within manufacturers installations or on the electricity network itself.

NOTE There have been many different approaches to classifying the qualitative aspects of electricity supply, complicated further by the current practice of separating the functions of generation, supply, network operation, etc. For example, a recent report by the Council of European Electricity Regulators uses the following terms:

- ***commercial quality:*** concerning the business relationships between suppliers and users with respect to how well the various services are delivered (The services concerned are not confined to network operation);
- ***continuity of supply:*** concerning the extent to which customers find that their electricity supply is interrupted for various reasons – see a) above;
- ***voltage quality:*** concerning the technical characteristics of the supply with respect to the voltage delivered to customers, i.e. its magnitude and frequency, as in b) above, together with the potentially disturbing aspects referred to in c) above.

STANDARDISING THE CHARACTERISTICS OF ELECTRICITY

1 Scope

This technical report outlines the way in which electricity is now described as a product. Particularly, in Europe and several other areas, for example Brazil and Argentina, as well as in some states in the United States of America.

It is, however, rather a unique product because of its intangible and transient nature. Strictly, it is a product that exists only for an instant at a given point of delivery, comes into existence at the same instant at which it is being used and is replaced immediately by a new product with rather different characteristics. Its characteristics are different at each separate point of delivery. Moreover, it is a product whose quality depends not only on the elements that go into its production, but also in the way in which it is being used at any instant by the equipment of multiple users.

Therefore, the quality control that is possible for more tangible and concrete products is not applicable in the case of electricity. All that can be attempted is some control of the conditions under which it is produced, transmitted and distributed and those under which it is used. In particular, the capacity of utilisation equipment to impinge on the quality of electricity, including that delivered to other equipment, must be recognized.

Electrical equipment has become increasingly complex in terms of the functions it fulfils and the way in which it interacts with other electrical equipment. Frequently, that interaction takes place through the medium of the electricity network, which is the common energy source for all the equipment. It arises because the network, intended to be a common energy source, also provides a conducting path interlinking all equipment.

In effect, the electromagnetic phenomena arising from the behaviour of utilisation equipment are superimposed on the other characteristics of the electricity supply, and become part of the product that is delivered to the system user. They are joined also by phenomena arising from atmospheric and other external events and from the intrinsic response of a large electricity system to such events.