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The use of alternative energy solutions
in telecommunication installations

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Foreword

This Technical Report (TR) has been produced by ETSI Technical Committee Environmental Engineering (EE).

Introduction

As greenhouse effect and carbon footprint are becoming more common and well known to normal citizen; a lot of attention has been also pointed to the telecommunication community impact. The growing public attention to environmental issues leads industry to work on reducing environmental impacts of their business, also in a framework of Corporate Social Responsibility (CSR) and sustainable development.

High prices for oil and electrical energy, which are expected to persist, contribute to stimulate interest in new energy sources.

In telecommunication alternative energy sources are generally used in remote areas where the public mains is unavailable.

The introduction of new components and technologies on the market increases the energy efficiency of alternative sources and in some cases Governments support (economically) the use of these alternative energy sources.

The consequence of those two facts is a better convenience in the use of this type of energy, especially considering the continuous price increase for traditional fossil sources and electrical energy, beyond the attention that is necessary for reducing ecological impacts.

The need for alternative energy may come also to enable telecommunication services (areas with no power grid), to expand coverage and to deploy high data rate services (active equipment in the access network).

It becomes obvious that the use of alternative energy has to be considered with particular effort for only supplying energy efficient ICT equipment.

One important bibliographical reference is the international document produced by ITU-T (CCITT), in 1985 [i.1].

1 Scope

Due to new power and energy context such as greenhouse effect and other environmental issues, fuel depletion and electricity cost increase, new regulation and standards, telecom operators have to make efforts to use alternatives. The present document covers alternative energy sources completed by current and new energy storage that can be used in ICT. Such alternative energy sources are:

- fuel cells;
- photovoltaic generators;
- wind turbine generators;
- micro hydro generators;
- stirling machine;
- alternative cooling sources, e.g. geo-cooling, fresh air cooling (or free cooling), absorption machines.

It proposes an overview of practical solutions for power and cooling systems using alternative energy sources. Interoperability of heterogeneous alternative energy sources is the key issue. Hybrid systems reliability and efficiency is also in the scope of the present document.

Bearing in mind the availability and the maintainability of the power plants for TLC, the present document considers:

- the principle of energy converters operating from alternative energy sources;
- the minimum set of information on energy converters;
- the main sizing parameters;
- the architecture of the power systems using the energy converters either only one type or as a combination of two or more such devices;
- existing and new energy storage;
- cooling solutions from alternative sources (geo-cooling).

New (not traditional) solutions for cooling will be proposed and expanded in a separate document.

2 References

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at http://docbox.etsi.org/Reference.

NOTE: While any hyperlinks included in this clause were valid at the time of publication ETSI cannot guarantee their long term validity.

2.1 Normative references

The following referenced documents are necessary for the application of the present document.

Not applicable.

2.2 Informative references

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

[i.1] ITU-T (CCITT): "Handbook on Primary Sources of Energy for the Power Supply of Remote Telecommunication Systems", 1985.

[i.2] CENELEC EN 62282-2: "Fuel cell technologies. Part 2: Fuel cell modules".

[i.3] CENELEC EN 62282-3-2: "Fuel cell technologies - Part 3-2: Stationary fuel cell power systems - Performance test methods".

[i.4] Council Directive 87/404/EEC of 25 June 1987 on the harmonization of the laws of the Member States relating to simple pressure vessels.

[i.5] Council Directive 90/488/EEC of 17 September 1990 amending Directive 87/404/EEC on the harmonization of the laws of the Member States relating to simple pressure vessels.

[i.6] Council Directive 90/396/EEC of 29 June 1990 on the approximation of the laws of the Member States relating to appliances burning gaseous fuels.

[i.7] Council directive 1999/92/EC of 25 January 1999 on minimum requirements for improving the safety and health protection of workers potentially at risk from explosive atmospheres.

[i.8] Council directive 94/9/EC of 23 March 1994 on the approximation of the laws of the Member States concerning equipment and protective systems intended for use in potentially explosive atmospheres.

[i.9] Council directive 97/23/EC of 29 May 1997 on the approximation of the laws of the Member States concerning pressure equipment.

[i.10] CENELEC EN 62124: "Photovoltaic (PV) stand-alone systems. Design verification".

[i.11] CENELEC EN 60904-1: "Photovoltaic Devices Part 1: Measurement of Photovoltaic Current - Voltage Characteristics".

[i.12] CENELEC EN 60904-2: "Photovoltaic devices - part 2: requirements for reference solar devices".

[i.13] CENELEC EN 62093: "Balance-of-system components for photovoltaic systems - Design qualification natural environments".

[i.14] Council directive 2006/66/EC of the European parliament and of the council of 6 September 2006 on batteries and accumulators and waste batteries and accumulators and repealing Directive 91/157/EEC.

[i.15] CENELEC EN 50272-2: "Safety requirements for secondary batteries and battery installations - Part 2: Stationary batteries".

[i.16] ETSI ETS 300 132-1: "Equipment Engineering (EE); Power supply interface at the input to telecommunications equipment; Part 1: Operated by alternating current (ac) derived from direct current (dc) sources".

[i.17] ETSI EN 300 132-2: "Environmental Engineering (EE); Power supply interface at the input to telecommunications equipment; Part 2: Operated by direct current (dc)".

[i.18] CENELEC EN 61427: "Secondary cells and batteries for solar photovoltaic energy systems".

[i.19] IEC 61400-1: "Wind turbines - Part 1: Design requirements".

[i.20] Alsema, E., 2000. "Environmental life cycle assessment of Solar Home Systems". Tech. Rep. NWS-E-2000-15. Department of Science, Technology and Society, Utrecht University, Utrecht, The Netherlands.

[i.21] R. Garcia-Valverde et al. (2009): "Life cycle assessment study of a 4.2 kWp stand-alone photovoltaic system", Solar Energy 83: 1434-1445.