Irish Standard
I.S. EN 50600-4-3:2016

Information technology - Data centre facilities and infrastructures - Part 4-3: Renewable Energy Factor

I.S. EN 50600-4-3:2016

Incorporating amendments/corrigenda/National Annexes issued since publication:

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National Foreword

I.S. EN 50600-4-3:2016 is the adopted Irish version of the European Document EN 50600-4-3:2016, Information technology - Data centre facilities and infrastructures - Part 4-3: Renewable Energy Factor

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EUROPEAN STANDARD

NORME EUROPÉENNE

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English Version

Information technology - Data centre facilities and infrastructures - Part 4-3: Renewable Energy Factor

Technologie de l'information - Installation et infrastructures de centres de traitement de données - Partie 4-3 : Coefficient d'énergie renouvelable

Informationstechnik - Einrichtungen und Infrastrukturen von Rechenzentren - Teil 4-3: Anteil erneuerbarer Energien

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European foreword

This document (EN 50600-4-3:2016) has been prepared by CLC/TC 215 “Electrotechnical aspects of telecommunication equipment”.

The following dates are proposed:

- latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) [2017-09-10]
- latest date by which the national standards conflicting with this document have to be withdrawn (dow) [2019-10-10]

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Regarding the various parts in the EN 50600 series, see the Introduction.

1 Scope

This European Standard:

a) defines the Renewable Energy Factor (REF) of a data centre;

b) specifies a methodology to calculate and to present the REF;

c) provides information on the correct interpretation of the REF.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 50600-1, *Information technology - Data centre facilities and infrastructures - Part 1: General concepts*

ISO 8601, *Data elements and interchange formats — Information interchange — Representation of dates and times*

3 Terms, definitions, abbreviations and symbols

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 50600-1 and the following apply.

3.1.1
renewable energy
energy obtained from a renewable energy source

Note 1 to entry: Criteria to categorize an energy as renewable can differ amongst jurisdictions, based on local environmental or other reasons.

[SOURCE: EN ISO/IEC 13273-2:2016, 3.1.6, modified – The information regarding the changes that were brought to the original definition in IEC 60050-617:2009, 617-04-11 were removed.]

3.1.2
renewable energy certificate
tradable, contractual instrument that represents a proof that a certain amount of electricity (or other type of energy) was generated from a renewable energy source

3.1.3
Renewable Energy Factor
ratio of the renewable energy owned and controlled by a data centre to the total data centre energy

3.1.4
renewable energy source
energy source not depleted by extraction as it is naturally replenished at a rate faster than it is extracted

Note 1 to entry: Renewable energy source excludes recovered or wasted energy.

Note 2 to entry: Organic fraction of municipal waste may be considered as a renewable energy source.

Note 3 to entry: Whether the energy stored in a technical system is renewable or not depends upon the nature of the original energy source.

Note 4 to entry: Criteria to categorize an energy as renewable can differ amongst jurisdictions, based on local environmental or other reasons.

[SOURCE: EN ISO/IEC 13273-2:2016, 3.1.5, modified – The information regarding the changes that were brought to the original definition in CEN/CLC/TR 16103:2010, 4.1.3 were removed.]

3.1.5
total data centre energy consumption
total annual energy consumption for all energy types serving the data centre, measured in kWh at its boundary

Note 1 to entry: Energy measured with energy metering devices at the boundary of the data centre or point of generation within the boundary.

Note 2 to entry: This includes electricity, natural gas and district utilities such as supplied chilled water or condensed water.

Note 3 to entry: Total annual energy includes supporting infrastructure.

3.2 Abbreviations

For the purposes of this document, the abbreviations given in EN 50600-1 and the following apply.

KPI Key Performance Indicator

RE Renewable Energy

REF Renewable Energy Factor

3.3 Symbols

For the purposes of this document the following symbols apply.

E_{DC} total data centre energy consumption (annual) in kWh

E_{ren} renewable energy in kWh owned and controlled by a data centre

4 Relevance of Renewable Energy Factor

The Renewable Energy Factor (REF) metric describes the percentage of renewable energy (RE) over total data centre energy. REF provides an assessment of the mitigation of CO_2 emission originated from energy consumption in a data centre. REF is an effective KPI to monitor the use of RE and to increase the diversity of energy dependence and improve the sustainability of a data centre by enhancing use of RE.

5 Determination of Renewable Energy Factor

5.1 General

REF is defined as the ratio of renewable energy (RE) used in comparison with the total data centre energy consumption as shown in Formula (1):

$$\text{REF} = \frac{E_{\text{ren}}}{E_{\text{DC}}} \quad (1)$$

where:

E_{ren} is the RE in kWh owned and controlled by a data centre (i.e. any energy for which the data centre owns the legal right to the environmental attributes of renewable generation) including that:

a) generated on-site of the data centre and whose legal rights to the environmental attributes of RE are retired in the data centre (so, that is no longer a contractual instrument to be traded, or that is no longer a possession of the last owner or the renewable certificate system administrator);

NOTE 1 "Retired" is an official term that means "consumed".

b) obtained by procurement of RE certificates and retired in the data centre;

c) portion of utility electricity, defined as RE, provided the data centre has obtained documented written evidence from the source utility provider(s) that the energy supplied, for the reporting period in question;

NOTE 2 This excludes RE generated in a data centre site but whose legal rights to the environmental attributes of RE were sold to other parties or the market.

E_{DC} is the total data centre energy consumption (annual) in kWh.

REF shall have a maximum value of 1,00, indicating 100 % of the total data centre energy is RE.

On-site generation of RE beyond the need of the data centre shall not be accounted for REF. Therefore, a value greater than 1,00 is not possible.

Because the RE content of the KPI is based on legal ownership of the rights to the environmental benefits, it is important to clarify that the location of energy source does not change the calculation of the REF.

For example,

a) where a data centre has a solar panel on its roof to generate electricity and the data centre sells the RE certificates associated with this electricity, the contribution of the solar panel is excluded as RE within the calculation of the REF;

b) a data centre that receives electricity entirely from a coal-fired plant can purchase RE certificates to off-set the entire electric use, and these certificates are included as RE within the calculation of the REF.

Examples of REF calculation are included in Annex B.

5.2 Total data centre energy consumption

The data centre under consideration shall be viewed at as a system defined by interfaces through which energy flows.

The following forms of energy shall to be metered at the interfaces:

a) electricity;

b) gaseous fuel;

c) fluid fuel;

d) fluids for cooling (comprising water usage when returned fluid and not evaporated).

The following forms of energy are not required be metered at these interfaces:

1) air for cooling;

2) water from natural sources (i.e. requiring no energy consumption in its provision).

All forms of electrical energy at interfaces shall be metered to kWh. If any of the required forms of energy are not accounted for at the interfaces then E_{DC} is not determined and REF cannot be calculated.

Gaseous or liquid fuels shall be metered in kWh or converted into kWh using the heat of combustion values for the fuel used. Where information on combustion values is not available the following values shall be applied:

— diesel: 9,9 kWh/l;

— gas: 10,5 kWh/m^3;

— hydrogen: 38,9 kWh/kg;

— bioethanol: 6 kWh/l.

The energy contribution of fluids for cooling shall be measured using heat meters (providing information on flow rate and differential temperature) and multiplied by the relevant conversion factor of the system used to provide the fluid used.

If technical subsystems, e.g. on-site co-generation of heat and electricity, have meters at their output, they are considered external to the system. If technical subsystems have meters at their input or only have partial metering at their outputs, they are considered internal to the system.

5.3 Total data centre energy consumption in mixed-use buildings

The total data centre energy consumption for data centres in mixed-used buildings shall be calculated on the energy use of the data centre as system only if metering of all shared technical subsystems allows separation of energy usage.

If energy use of shared technical subsystems cannot be separated, total data centre energy usage shall comprise the building in total. The impact on REF should be counteracted by implementing the necessary meters for separation.

6 Measurement of Renewable Energy Factor

Measurements of E_{ren} and E_{DC} shall be undertaken using either:

a) “watt meters” with the capability to report energy use, or

b) kilowatt-hour (kWh) meters that report the “true” energy (true rms), via the simultaneous measurement of the voltage, current, and power factor over time.

NOTE Kilovolt-ampere (kVA), the product of voltage and current, is not an acceptable measurement. Although the product of volts and amperes mathematically results in watts, “true” energy is determined by integrating a power factor corrected value of volts and amperes. The frequency, phase variance and load reaction cause energy calculation difference between apparent energy and “true” energy. The error is inherently significant when power delivery includes alternating current (AC). Kilovolt-ampere (kVA) measurements can be used for other functions in the data centre; however, kVA is insufficient for efficiency measurements.

Energy input from local renewable sources also shall be measured with the same procedure as total data centre energy consumption.

REF shall be determined as an annualized value. The calculation of REF requires the recording and documenting of E_{DC} and E_{ren} over a coincident period of twelve months. This standard does not specify the frequency of measurements of E_{DC} and E_{ren}, since REF is calculated on an annual timeframe. However, the frequency of measurement employed will define the timing of subsequent PUE calculations on a rolling annual basis.

7 Directions for use of Renewable Energy Factor

The use of this KPI allows data centre managers to improve a data centre's energy procurement process and increase the diversity of energy dependence of a data centre. In addition, customers of data centres can use this KPI as a guide to select a data centre.

Furthermore, it is possible to establish a target value for the REF, measure its improvement during one year, publish the result and eventually disclose the data centre's energy diversity and its contribution to environmental sustainability.

8 Reporting of Renewable Energy Factor

In order for a reported REF to be meaningful, the reporting organization shall provide the following information:

a) the data centre (including the boundaries of the structure) under inspection;

b) the REF value;

c) the termination date of the period of measurement using the format of ISO 8601 (e.g. yyyy-mm-dd).

Due to regional differences in the RE, all public reporting of REF should include the following:

1) the basis of RE used in the context of the given reporting;

2) the entity/entities that has/have issued the RE certificates which are referred to in the context of the given reporting;

3) the annual amount of RE from on-site generation;

4) the annual RE certificates or written evidence obtained from the utility supplier(s) that the energy supplied during the reporting period complies with the definition of RE defined in 3.1.1.

Annex A
(informative)

Renewable Energy Factor and authorities issuing a renewable energy certificate

Specific definitions of Renewable Energy or a RE certificate authorized by a country or a regional authority can be used instead of 3.1.1 and/or 3.1.2. In such a case, additional information should be provided within parentheses following REF to identify the definition used. Table A.1 contains a number of authorities defining or issuing the equivalent of a RE certificate as described herein. This list is not comprehensive and is subject to change, as other regional bodies emerge that issue and track renewable certificates, that energy should also be counted as renewable for the purposes of this metric.

Table A.1 — Description of REF and authorities issuing a RE certificate

Region	Description	Regional authority /Issuer(s)	Link
UK	REF(EU, yyyy-mm-dd)	Department of Energy and Climate Change	https://www.gov.uk/government/publications/2010-to-2015-government-policy-low-carbon-technologies/2010-to-2015-government-policy-low-carbon-technologies#appendix-5-the-renewables-obligation-ro
Spain		The Green Certificate Company (GCC)	http://www.aib-net.org/portal/page/portal/AIB_HOME/ECS/Fact_Sheets (See Fact Sheet 4)
Denmark		Energinet.dk	
France		Powernext	
Germany		Umweltbundesamt (UBA)	
Sweden		Grexel	
Italy		Gestore Servizi Elettrici (GSE)	
Switzerland		Swissgrid	
Belgium		Brugel, VREG, CWaPE	
Austria		Eenrgie-Control	
Czech Republic		OTE	
Estonia		Elering	
Finland		Grexel	
Croatia		HROTE	
Iceland		Landsnet	
Luxembourg		ILR	
Netherlands		TenneT	
Norway		Statnett	
Portugal		REN	
Slovenia		Energy Agency	

Annex B
(informative)

Examples of Renewable Energy Factor calculation

This annex provides examples for the calculation of REF, taking into account different constellations of on-site renewable energy (RE) and RE certificate usage. These examples assume that the RE portion of the utility electricity is 0.

— **Example 1:**

With the configuration of Figure B.1, REF results in REF = 0,00.

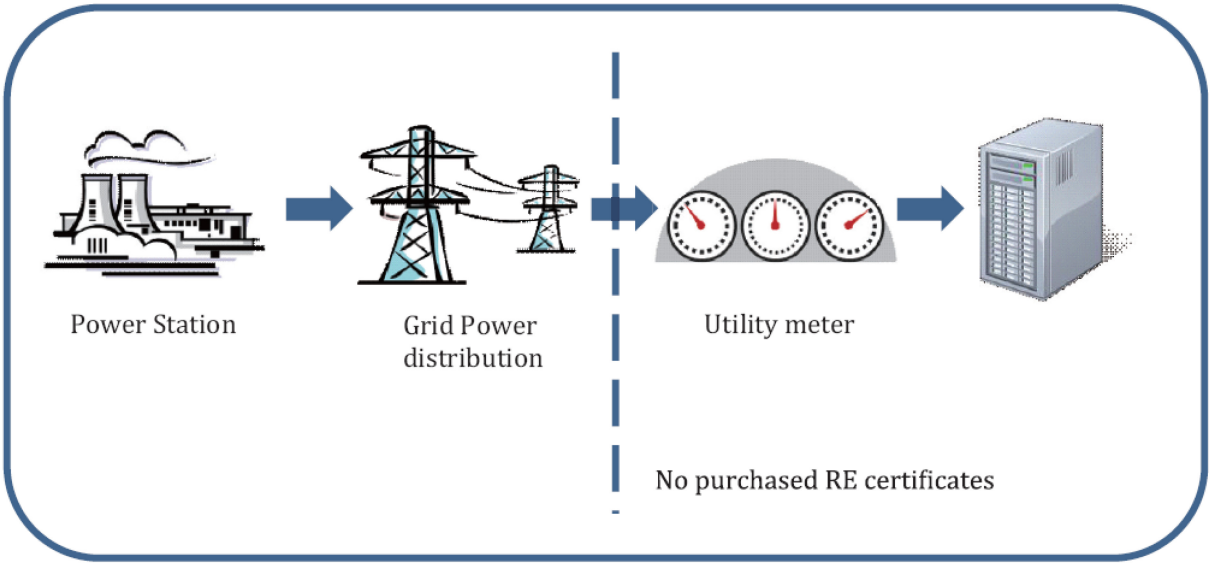

Figure B.1 — Grid energy purchased without RE certificates

— **Example 2:**

With the configuration of Figure B.2, REF results in REF = 0,20.