International Telecommunication Union

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

L.1304

(12/2020)

SERIES L: ENVIRONMENT AND ICTS, CLIMATE CHANGE, E-WASTE, ENERGY EFFICIENCY; CONSTRUCTION, INSTALLATION AND PROTECTION OF CABLES AND OTHER ELEMENTS OF OUTSIDE PLANT

Procurement criteria for sustainable data centres

Recommendation ITU-T L.1304

ITU-T L-SERIES RECOMMENDATIONS

ENVIRONMENT AND ICTS, CLIMATE CHANGE, E-WASTE, ENERGY EFFICIENCY; CONSTRUCTION, INSTALLATION AND PROTECTION OF CABLES AND OTHER ELEMENTS OF OUTSIDE PLANT

OPTICAL FIBRE CABLES	
Cable structure and characteristics	L.100–L.124
Cable evaluation	L.125–L.149
Guidance and installation technique	L.150–L.199
OPTICAL INFRASTRUCTURES	
Infrastructure including node elements (except cables)	L.200–L.249
General aspects and network design	L.250–L.299
MAINTENANCE AND OPERATION	
Optical fibre cable maintenance	L.300–L.329
Infrastructure maintenance	L.330–L.349
Operation support and infrastructure management	L.350–L.379
Disaster management	L.380–L.399
PASSIVE OPTICAL DEVICES	L.400–L.429
MARINIZED TERRESTRIAL CABLES	L.430–L.449

For further details, please refer to the list of ITU-T Recommendations.

Recommendation ITU-T L.1304

Procurement criteria for sustainable data centres

Summary

Recommendation ITU-T L.1304 aims to support public authorities in purchasing data centres related products, services and items with reduced environmental impacts through establishing a set of procurement criteria.

History

Edition	Recommendation	Approval	Study Group	Unique ID*
1.0	ITU-T L.1304	2020-12-14	5	11.1002/1000/14565

Keywords

Data centre, procurement criteria, sustainability.

* To access the Recommendation, type the URL http://handle.itu.int/ in the address field of your web browser, followed by the Recommendation's unique ID. For example, http://handle.itu.int/11.1002/1000/11830-en.

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications, information and communication technologies (ICTs). The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

Compliance with this Recommendation is voluntary. However, the Recommendation may contain certain mandatory provisions (to ensure, e.g., interoperability or applicability) and compliance with the Recommendation is achieved when all of these mandatory provisions are met. The words "shall" or some other obligatory language such as "must" and the negative equivalents are used to express requirements. The use of such words does not suggest that compliance with the Recommendation is required of any party.

INTELLECTUAL PROPERTY RIGHTS

ITU draws attention to the possibility that the practice or implementation of this Recommendation may involve the use of a claimed Intellectual Property Right. ITU takes no position concerning the evidence, validity or applicability of claimed Intellectual Property Rights, whether asserted by ITU members or others outside of the Recommendation development process.

As of the date of approval of this Recommendation, ITU had not received notice of intellectual property, protected by patents/software copyrights, which may be required to implement this Recommendation. However, implementers are cautioned that this may not represent the latest information and are therefore strongly urged to consult the appropriate ITU-T databases available via the ITU-T website at http://www.itu.int/ITU-T/ipr/.

Table of Contents

Recommendation ITU-T L.1304

Procurement criteria for sustainable data centres

1 Scope

This Recommendation aims to support public authorities in purchasing data centre related solution while taking in consideration a set of sustainable criteria.

This Recommendation considers energy efficiency solution for equipment and facilities. Different physical construction solutions are considered.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

[ITU-T L.1023] Recommendation ITU-T L.1023 (2020), *Assessment method for circular scoring*.

[ITU-T L.1300] Recommendation ITU-T L.1300 (2014), *Best practices for green data centres*.

[ITU-T L.1305] Recommendation ITU-T L.1305 (2019), *Data centre infrastructure management system based on big data and artificial intelligence technology*.

[ITU-T L.1310] Recommendation ITU-T L.1310 (2020), *Energy efficiency metrics and measurement methods for telecommunication equipment*.

[ITU-T L.1381] Recommendation ITU-T L.1381 (2020), *Smart energy solutions for data centres*.

[ITU-T L.1382] Recommendation ITU-T L.1382 (2020), *Smart energy solution for telecommunication rooms*.

[ITU-T L.1410] Recommendation ITU-T L.1410 (2014), *Methodology for environmental life cycle assessments of information and communication technology goods, networks and services*.

[ETSI EN 300 019-1-3] ETSI EN 300 019-1-3 V2.4.1 (2014), *Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment; Part 1-3: Classification of environmental conditions; Stationary use at weatherprotected locations*.

[ETSI EN 303 470] ETSI EN 303 470 V1.1.1 (2019), *Environmental Engineering (EE); Energy Efficiency measurement methodology and metrics for servers*.

[ETSI TS 103 586] ETSI TS 103 586 V1.1.1 (2019), *Environmental Engineering (EE); Liquid cooling solutions for Information and Communication Technology (ICT) infrastructure equipment*.

[ISO/IEC 21836] ISO/IEC 21836:2020), *Information technology – Data centres – Server energy effectiveness metric*.

[ISO/IEC TS 22237-1] ISO/IEC TS 22237-1:2018, *Information technology – Data centre facilities and infrastructures – Part 1: General concepts*.

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 infrastructure (facility) [ITU-T L.1302]: Equipment that supports information and communication technology (ICT) equipment, e.g., power delivery components and cooling system components.

3.1.2 ICT equipment [ITU-T L.1302]: Information and communication equipment (e.g., computing, storage and network equipment) used in data centres.

3.2 Terms defined in this Recommendation

This Recommendation defines the following term:

3.2.1 green data centre: A green or sustainable data centre can be defined as a repository for the storage, management, and dissemination of data in which the mechanical, lighting, electrical and computer systems are designed for maximum energy efficiency and minimum environmental impact.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

ICT Information and Communication Technology

IT Information Technology

UPS Uninterruptible Power Supply

5 Conventions

None.

6 Defining sustainable/green data centres

A data centre can be defined and evaluated based on the following criteria:

– Reliability,

– Availability,

– Environmental impact.

Taking the above into consideration, this Recommendation focuses on examining the environmental impact of a data centre, which is considered to be the main driving force behind selecting procurement items and solutions that are environmentally friendly.

The environmental impact of a data centre can be evaluated and defined in multiple ways. A detailed analysis of the environmental impact of an existing data centre can be performed using the methodologies contained in [ITU L.1410].

However, a full assessment of the environmental impact of a data centre using methodologies like [ITU-T L.1410] can be conducted only when the data centre already exists. This implies that this is not useful as procurement criteria if not as possible criteria for future data centre development, based

on the assessment of an existing one. Hence there is the need to develop a set of procurement criteria in order to implement sustainable data centre.

In this Recommendation, a sustainable data centre is defined as a data centre that has taken into consideration the following aspects:

– the location of the data centre,

– equipment that have achieved a low energy consumption,

– it is designed to reduce its total environmental impact.

In order to support stakeholders to meet the above criteria this Recommendation aims to set the requirement and provide suggestions for selecting IT equipment, facilities and other components, including the ones for the operational phase.

7 Procurement criteria for a sustainable data centre

7.1 Active equipment selection

Active equipment needs to be selected based on the following criteria:

– Working temperature,

– Energy efficiency,

– Air flow,

– End of life management.

7.1.1 Working temperature

Working temperature is an important parameter for active equipment like server, storage, router transmission equipment. In order to realize a sustainable data centre, those equipment needs to be able to work at higher temperature, like equipment able to work in the temperature range 3.1 of [ETSI EN 300 019-1-3] or similar specification from ASHRAE, with same reliability and lifetime, giving the possibility to set the temperature inside the data centre at a higher temperature, set-point.

The possibility to have a set point of the information technology (IT) room at a higher temperature allows for the use of less energy consumption cooling technology, as indirect free cooling and in any case reducing the energy need for the cooling of the data centre.

Active equipment needs to be selected with an operating temperature in line with class 3.1 of [ETSI 300 019-1-3]. Additional information on temperature range is available in [b-ASHRAE]where class A3 is equivalent to class 3.1 of [ETSI EN 300 019-3-1].

7.1.2 Air flow

Air flow of new equipment is another necessary consideration, especially when inserting new equipment into existing structure.

Equipment in the same rack or corridor needs to have the same air flow direction. The air flow direction is preferably from front to back.

Guidelines on how to manage equipment with different air flow are available in [b-ETSI TR 102 489].

7.1.3 Energy efficiency

Energy efficiency of equipment also needs to be considered. Currently, there are no standardized reference values for equipment energy consumption. The declared energy efficient of the different equipment shall be measured in line with [ETSI EN 303 470] or [ISO/IEC 21836] for server or [ITU-T L.1310] for telecommunication equipment.

7.1.4 End of life management

The end-of-life management of data centre equipment needs to be considered in a sustainable data centre. Equipment that takes circular economy criteria into consideration, like those established in [ITU-T L.1023], is preferred.

7.2 Data centre facility

A sustainable data centre needs to take into consideration multiple factors, including the total power consumption of IT equipment, their reliability, and the data centre's location.

[ITU-T L.1300] has provided a list of data centre best practices that are recommended to be taken into consideration.

The selection of reliability level, like tier 4 established by Uptime institute or class 4 defined by [ISO/IEC TS 22237-1] has an influence on the environmental impact of data centres. Normally a higher reliability level requires more redundancy in the facilities infrastructure and consequently a minimum increase of the losses in mechanical and electrical distributions.

Reliability level need be selected taking into consideration the real services that are implemented in the data centres, bearing in mind the different reliability levels for the different rooms according to the classification of the service provided by the data centre.

In the case that the realization of a new data centre also include the realization of a new building, prefabricate solutions need to be considered as this type of solution reduce the activity in field and reduce the civil and engineering work thus respecting the traditional construction of a building where the generation of pollution and waste are reduced. This is due to the fact that a prefabricated module is made in a controlled factory environment and can make use of all the waste management of industrial activities.

Cooling innovative solution as indirect free-cooling, as discussed in [ITU-T L.1381], needs to be implemented while taking into consideration the environmental condition of the data centre's location.

Liquid cooling solutions for information and communication technology (ICT) infrastructure equipment need to be taken into account according to the specifications in [ETSI TS 103 586].

Solution implementing the utilization of the heat generated inside the data centre, called waste heat reuse, need be considered in the realization. This can cover the utilization heat generated inside the data centre in other activities like agricultural, building for office or civil house.

Data centre shall be realized by IT module with containment of hot or cold air.

The power architecture of a data centre can greatly influence its total energy efficiency. Modular uninterruptible power supply (UPS) needs to be selected to facilitate the increase of the power of the energy equipment, UPS system efficiency shall be > of 96%.

In case of the need for direct current power for telecommunication equipment, the energy efficiency requirement of [ITU-T L.1382] need be considered.

Renewable energy solution should also be implemented if the location of the data centre permits.

7.3 Data centre operation and maintenance

Operation and maintenance impact are very important to realize a sustainable solution. It is strongly recommended to implement the smart solutions as contained in [ITU-T L. 1305] in order to improve the cooling operation and maintenance process.

Bibliography

[b-Ashrae] Ashrae Thermal Guidelines for Data Processing Environments, Fourth Edition.

[b-EU GPP] EU green public procurement criteria for data centres, server rooms and cloud services.
https://ec.europa.eu/environment/gpp/pdf/20032020_EU_GPP_criteria_for_data_centres_server_rooms_and%20cloud_services_SWD_(2020)_55_final.pdf

[b-ETSI TR 102 489] ETSI TR 102 489 (2004), *Environmental Engineering (EE); European telecommunications standard for equipment practice; Thermal Management Guidance for equipment and its deployment*.

SERIES OF ITU-T RECOMMENDATIONS

Series A	Organization of the work of ITU-T
Series D	Tariff and accounting principles and international telecommunication/ICT economic and policy issues
Series E	Overall network operation, telephone service, service operation and human factors
Series F	Non-telephone telecommunication services
Series G	Transmission systems and media, digital systems and networks
Series H	Audiovisual and multimedia systems
Series I	Integrated services digital network
Series J	Cable networks and transmission of television, sound programme and other multimedia signals
Series K	Protection against interference
Series L	**Environment and ICTs, climate change, e-waste, energy efficiency; construction, installation and protection of cables and other elements of outside plant**
Series M	Telecommunication management, including TMN and network maintenance
Series N	Maintenance: international sound programme and television transmission circuits
Series O	Specifications of measuring equipment
Series P	Telephone transmission quality, telephone installations, local line networks
Series Q	Switching and signalling, and associated measurements and tests
Series R	Telegraph transmission
Series S	Telegraph services terminal equipment
Series T	Terminals for telematic services
Series U	Telegraph switching
Series V	Data communication over the telephone network
Series X	Data networks, open system communications and security
Series Y	Global information infrastructure, Internet protocol aspects, next-generation networks, Internet of Things and smart cities
Series Z	Languages and general software aspects for telecommunication systems

Printed in Switzerland
Geneva, 2021