

Recommendation

ITU-T L.1028 (11/2024)

SERIES L: Environment and ICTs, climate change, e-waste, energy efficiency; construction, installation and protection of cables and other elements of outside plant

E-waste and circular economy

Evaluating the global-warming-potential impact of extending the operating lifetime of information and communication technology equipment

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Environment and ICTs, climate change, e-waste, energy efficiency; construction, installation and protection of cables and other elements of outside plant

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Recommendation ITU-T L.1028

Evaluating the global-warming-potential impact of extending the operating lifetime of information and communication technology equipment

Summary

Recommendation ITU-T L.1028 defines the ratio UER_{10} as an indicator for impact of information and communication technology equipment operating-lifetime extension on the resulting global-warming potential (GWP). UER_{10} can help the practitioner to estimate the relative significance of use-stage greenhouse gas (GHG) emissions versus embodied emissions of a product over its lifetime.

History*

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Introduction

Currently, the global ICT sector has two major areas of environmental impact. These impacts are raw-material consumption and the associated generation of waste electrical and electronic equipment (WEEE) [b-ITU-WEE Forum], and the increase in energy consumption and the associated potential increase in global-warming potential (GWP) [b-Grobe-1], respectively. Raw-material consumption is a challenge since some materials relevant to ICT are becoming scarce [b-EU-1] and recycling efficiencies are still limited [b-van Shaik].

It has been argued that a transition to a circular economy (CE) can reduce WEEE and improve material efficiency of products in order to avoid critical raw-material unavailability [b-Vanegas]. The main concept of CE is value retention, including concepts such as repair, reuse, refurbishment and recycling that together lead to increased product longevity [b-Reikea].

However, for certain ICT equipment, considerable use-phase or operating-lifetime extension, e.g., through refurbishment, may lead to increased total-lifetime GWP impact because of the use-phase impact, as has been pointed out in [b-NGMN] and [b-Andrae]. This can be true, e.g., for ICT equipment that is operated in a 24/7 always-on mode. The related products then can show strong use-phase dominance in lifecycle assessments (LCA) [b-Grobe-2].

LCA, e.g., [b-ITU-T L.1410], [b-ITU-T L.Sup.5], is the most well defined and widely used tool currently available to calculate the lifetime environmental impact of ICT goods, network and services, including the impact of ICT equipment operating-lifetime extension. Comparative LCA study can be used to assess ICT equipment operating-lifetime extension impact against the alternative scenarios to evaluate whether ICT operating-lifetime extension results in negative or positive outcome (see Appendix I for further information).

However, neither LCA, classification figures on CE, e.g., [b-ITU-T L.Sup.28], [b-ETSI TR 103 476] nor guidelines on Telecommunication Energy Efficiency Ratings (TEER), e.g., [b-ICTEGC] provide a simple yet solid metric that answers if ICT equipment should be given operating-lifetime extension or should be taken out of service in order to minimize resulting total-lifetime GWP impact. [b-Gro2022] proposed an indicator, UER_{10} , that can be used to approximate the GWP impact of operating-lifetime extension for different equipment classes, given that feasible data on the development of applicable electricity emission factors and the energy efficiency of the respective product are available.

The focus of this Recommendation is the UER_{10} indicator by which the impact of lifetime extension on GWP can be evaluated. UER_{10} gives an indication about the potential lifetime extension impact based on use-stage GHG emissions and embodied emissions. This can be used by equipment manufacturers and hardware designers for guiding ecodesign.

UER_{10} can be used as indicator for the do-no-significant-harm (DNSH) principle of the EU Taxonomy Regulation [b-EU-2]. This is true for operating-lifetime-extension activities that are claimed as taxonomy-aligned circular-economy activities. In this case, it must be shown that the respective circular-economy activity does not violate the other taxonomy regulation environmental objectives. Related to the climate-change-mitigation objective, this can be done using UER_{10} in cases where it indicates that the operating-lifetime extension does not lead to more GHG emissions.

The main limitations of the UER_{10} indicator are discussed in clause 7.4.

Recommendation ITU-T L.1028

Evaluating the global-warming-potential impact of extending the operating lifetime of information and communication technology equipment

1 Scope

The indicator UER_{10} , "ratio of use-phase emissions during 10 years over embodied emissions", as defined in this Recommendation, is applicable to all ICT equipment.

UER_{10} provides the ratio of use-stage GHG emissions versus embodied emissions as an indication of lifetime extension potential. It does not consider other LCA midpoint categories as input.

The indicator as described herein does not include operating-lifetime-extension actions within the 10-years period, which is used for the ratio UER_{10} , if these actions change the power consumption of the ICT equipment under consideration.

A 10-years period is used for the ratio UER_{10} . This period is independent from any average operating lifetime of the ICT equipment under consideration. The indicator does not consider whether any effects do not allow an operating lifetime of 10 years. It also does not consider whether the average operating lifetime of the equipment under consideration deviates significantly and, in particular, whether within the 10 years one or several replacements would typically happen. Especially with small input values, the practitioner needs to be careful since the output of the indicator can be highly sensitive to variation in the input values.

This Recommendation does not replace LCA and the comparative LCA assessments, e.g., [b-ITU-T L.1410]. LCA assessments are the most widely used and the best available methodology for the detailed lifecycle environmental impact assessment of ICT equipment and for assessing the impact of operating-lifetime extension of ICT equipment. This Recommendation uses LCA data (e.g., embodied GWP and use-stage GWP data of an item of equipment) as an input for quick approximation to provide a simple indicator. Clause 6.3 provides the advantages and limitations of the UER_{10} methodology compared with comparative analysis based on LCA. Moreover, this Recommendation does not provide an indication or calculation of the optimum operating lifetime of said equipment (given an optimum operating lifetime with regard to minimizing the resulting GWP exists).

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.

None.

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 circular economy [b-ITU-T L.1023]: A circular economy is restorative and regenerative by design, and aims to keep products, components, and materials at their highest utility and value at all