



Sustainability for a Connected Future

Criteria for the Sustainability Assessment of Network Equipment for the Global Electronics Council EPEAT® Ecolabel and the TÜV Rheinland Green Product Mark

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Table of Contents

Foreword	4
Introduction	5
1 Scope	5
2 Normative references	6
3 Terms and definitions	12
3.1 Special terms, acronyms and abbreviations	12
3.2 Definitions	13
Environment and Social Criteria	18
4 Reduction of Chemicals of Concern	18
4.1 Reduction of substances of concern	18
4.1.1 Required – Conformance with provisions of European Union RoHS Directive	18
4.1.2 Required - Conformance with substance restriction requirements of the European Union Battery Directive	19
4.1.3 Required - Reduction of Bromine and Chlorine content of plastic parts > 25 grams	19
4.1.4 Optional - Further reduction of Bromine and Chlorine content of plastic parts > 25 grams	20
4.1.5 Required - Conformance with supply chain communication provisions of European Union REACH Regulation	21
4.1.6 Optional - Reduction of substances on the European Union REACH Regulation Annex XIV (authorization list)	21
4.2 Inventory and assessment of substances	22
4.2.1 Optional – Record of declarable substances	22
4.2.2 Optional - Disclosure of declarable substances	22
4.2.3 Optional - Requesting full substance inventory	23
4.2.4 Optional - Acquiring substance inventory	23
4.2.5 Optional – Substance hazard assessment	24
4.2.6 Optional - Making safer substance use hazard assessments publicly available	26
4.3 Reduction of substances of concern in packaging	26
4.3.1 Required – Elimination of added heavy metals in packaging	26
4.3.2 Required—Restriction on the use of elemental chlorine as a bleaching agent in paper-based packaging material	27
4.3.3 Optional – Restriction on the use of chlorine compounds in processing packaging materials	27
5 Sustainable Use of Resources	28
5.1 Product recycled content	28
5.1.1 Required - Declaration of postconsumer recycled plastic content	28
5.1.2 Optional- Minimum Postconsumer recycled content in external enclosures for SNE	29
5.1.3 Optional - Postconsumer recycled content of rare earth elements in hard drive(s) in product	29

- 5.2 Resource efficiency of product packaging 30
 - 5.2.1 Required - Enhancing recyclability of packaging materials 30
 - 5.2.2 Required - Recycled fiber in corrugated packaging 31
 - 5.2.3 Optional – Higher recycled fiber content in corrugated packaging for LNE 31
 - 5.2.4 Optional – Bulk packaging for SNE 32
 - 5.2.5 Optional – Recycled content wood fiber-based packaging for SNE 33
- 5.3 Design for repair, reuse, and recycling 33
 - 5.3.1 Required – Design for repair, reuse, and recycling 33
 - 5.3.2 Required – Design for plastics recycling 34
 - 5.3.3 Optional – Further design for plastics recycling 35
- 5.4 Information and tools for reuse and recycling 36
 - 5.4.1 Required - Information and reporting in preparation for reuse and recycling 36
 - 5.4.2 Optional – Further information and reporting in preparation for reuse and recycling . 36
 - 5.4.3 Optional – Product marked to identify components and materials requiring selective treatment 37
 - 5.4.4 Optional - Functionality testing software tools 38
- 5.5 Product longevity 38
 - 5.5.1 Required – Product service and, or replacement components availability 38
 - 5.5.2 Required – Secure data deletion 39
- 5.6 End-of-life management 40
 - 5.6.1 Required – Provision of product take-back service 40
 - 5.6.2 Optional – Manufacturer take-back service for deinstalled network equipment 41
 - 5.6.3 Required – End-of-life processing requirements 42
 - 5.6.4 Optional – Publicly available record of the reuse / recycling achievement 45
- 6 Climate Change Mitigation 46
 - 6.1 Internal power supply efficiency 46
 - 6.1.1 Required - Energy efficiency of internal power supplies 46
 - 6.1.2 Optional - Energy efficiency of internal power supplies 47
 - 6.2 External power supply efficiency 48
 - 6.2.1 Required —Energy efficiency for external power supplies 48
 - 6.2.2 Optional—Energy efficiency for external power supplies 49
 - 6.3 Energy Efficiency of Small Network Equipment 49
 - 6.3.1 Required – Energy efficiency of Small Network Equipment 49
 - 6.3.2 Optional – Small Network Equipment load dependent power management 50
 - 6.4 Energy efficiency of Large Network Equipment 50
 - 6.4.1 Required – Energy efficiency of large network equipment 50
 - 6.5 Supply chain energy efficiency 51
 - 6.5.1 Optional – Energy efficient supply chains 51
 - 6.6 Manufacturing chemicals 53

- 6.6.1 Optional – Mitigation and inventory of process fluorinated greenhouse gas emissions resulting from semiconductor manufacturing 53
- 6.7 Environmental impact of product transportation 55
 - 6.7.1 Optional – Environmental impact of product transportation 55
- 7 Corporate Environment, Social and Governance (ESG) Performance 57
 - 7.1 Environmental management system 57
 - 7.1.1 Required – Environmental management system (EMS) 57
 - 7.1.2 Optional – Environmental management system (EMS) certification 57
 - 7.2 Supply chain reporting 58
 - 7.2.1 Optional – Environmental and social responsibility reporting on nine suppliers..... 58
 - 7.2.2 Optional – Environmental and social responsibility reporting on suppliers..... 60
 - 7.3 Responsible mineral sourcing 61
 - 7.3.1 Required – Public disclosure of use of conflict materials in products (corporate)..... 61
 - 7.3.2 Optional – Sourcing from validated conflict free smelters..... 62
 - 7.3.3 Optional – Participation in in-region conflict-free sourcing program 63
 - 7.4 Compliance with occupational health and safety and social responsibility performance Standards 64
 - 7.4.1 Required – Manufacturer conformance with occupational health and safety performance..... 64
 - 7.4.2 Optional – Supply chain conformance to occupational health and safety performance standards..... 65
 - 7.4.3 Optional – Certification to social responsibility performance standard..... 65
 - 7.5 Product life cycle assessment 67
 - 7.5.1 Optional – Conduct life cycle assessment..... 67
 - 7.5.2 Optional - Public disclosure of LCA results..... 68
- Normative Annex 1 70
 - Table of criteria and optional points..... 70
- Normative Annex 2 73
 - Figure 2. Life-cycle assessment example flow, section 7.5.1 system boundaries 73
- Informative Annex 1 74

Criteria for the Sustainability Assessment of Network Equipment for the Global Electronics Council EPEAT® Ecolabel and the TÜV Rheinland Green Product Mark

Foreword

The principles and procedures applied to develop this document are based on the following normative documents:

- ISO/IEC Directives, Part 1 and Part 2
- ISO/IEC Guide 21, Part 1 and Part 2
- ISO Guide 64
- ISO Guide 82
- ISO 14024
- US OMB Circular A-119
- US EPA Guidelines for Environmental Performance Standards and Ecolabels for Use in Federal Procurement
- ISEAL Code of Good Practice for Setting Social and Environmental Standards

A prior study was conducted to determine the feasibility of criteria development for network equipment, and to identify primary environmental and social impacts of network equipment. The findings and considerations arising from this study guided the criteria development work.

This document was developed using a multi-stakeholder approach involving experts from multiple stakeholder groups including but not limited to manufacturers; other industry, such as suppliers and their trade associations, recyclers and their trade associations, telecom and data center operators and their trade associations, and other types of businesses commercially engaged with the product; sustainability advocates and regulators; and purchasers and ecolabeling criteria users. Reasonable efforts were made to achieve balanced representation of the above interest categories with no one interest category representing more than 1/3 of voting members, and to achieve consensus throughout the process.

Public consultation was implemented to allow additional stakeholders the opportunity to provide comments on the criteria, and modification of criteria, as appropriate.

The criteria development work is carried out through the technical governance bodies jointly established by TÜV Rheinland and the Global Electronics Council (GEC).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. TÜV Rheinland and GEC shall not be held responsible for identifying any or all such patent rights.

Introduction

Product sustainability labeling programs award their sustainability labels to products that meet a set of social and environmental requirements predetermined for a product and associated manufacturers. EPEAT® and the Green Product Mark are voluntary sustainability labelling schemes operating in accordance with ISO 14020 *Environmental labels and declarations – General principles* and ISO 14024 *Environmental labels and declarations – Type I environmental labelling – Principles and procedures*. Through the communication of verifiable and accurate information on sustainability aspects of products, EPEAT and Green Product Mark aim to stimulate the potential for market-driven continuous improvement.

EPEAT, managed by the Global Electronics Council (GEC), is the leading global ecolabel for IT products. GEC is a mission driven non-profit organization that collaborates to achieve a world in which only sustainable IT products are designed, manufactured, and purchased. The Green Product Mark certification scheme is owned by TÜV Rheinland, a leading international technical service provider who has been developing solutions to ensure the safety, quality and economic efficiency of the interaction between man, technology and the environment.

This document is intended to convey clear and unambiguous requirements to be fulfilled for network equipment products to be awarded the EPEAT Ecolabel and, or the Green Product Mark. Please refer to EPEAT¹ and the Green Product Mark² scheme requirements for further information on conformance, certification and authorized use of these criteria.

1 Scope

Products within the scope of these criteria include large and small network equipment. Network equipment are devices whose primary function is to pass Internet Protocol traffic among various network interfaces/ports. Large network equipment is mountable in a standard equipment rack, supports network management protocols (e.g., SNMP) and contains more than eleven (11) physical network ports and, or total aggregate port throughput greater than 12 Gb/s. Small network equipment is designed for stationary operation, contains no more than eleven (11) wired physical network ports and is primarily configured for operation outside standard equipment racks.³

This document provides life cycle-based criteria, from raw material extraction to component and product manufacturing and end of life, organized by the following four sustainability impact areas:

- Reduction of chemicals of concern;

¹ About the EPEAT scheme - <https://globalelectronicscouncil.org/ecolabels/>

² About the Green Product Mark - <https://www.tuv.com/content-media-files/master-content/services/products/1293-tuv-rheinland-green-product-mark/tuv-rheinland-green-product-mark-scheme-summary-en.pdf>

³ ENERGY STAR® [Large Network Equipment](#) and [Small Network Equipment](#) specifications

- Sustainable use of resources;
- Climate change mitigation; and
- Corporate environment, social and governance (ESG) performance.

Criteria address the product and product packaging.

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. European Union Directives, which contain the adoption date in their title, are not be treated as “dated references” (as described above). Unless explicitly indicated otherwise, when a European Union Directive is referenced in this document, a new or updated European Union Directive shall apply upon its enforcement date unless otherwise noted in the criteria.

80 Plus^{®4}

ANSI/AIHA/ASSE Z10, *Occupational Health and Safety Management System*^{5,6}

ASTM D256, *Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics*⁷

ASTM D7611/D7611M, *Standard Practice for Coding Plastic Manufactured Articles for Resin Identification*⁷

California Health and Safety Code Section 25214.11-25214.26⁸

Code of Conduct on Energy Consumption of Broadband Equipment Version 7.1 and Reporting sheet CoC BB equipment⁹

⁴ Ecova Plug Load Solutions. 5000 North Atlantic Street, Suite 1313, Spokane, Washington USA 99201. <www.plugloadsolutions.com>

⁵ American Industrial Hygiene Association. 3141 Fairview Park Drive, Suite 777, Falls Church, VA 22042. <www.aiha.org>

⁶ ASSE International. 18927 Hickory Creek Drive, Suite 220, Mokena, IL 60448. <www.asse-plumbing.org>

⁷ ASTM International. 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959. <www.astm.org>

⁸ California Health and Safety Code, Article 10.4. Toxics in Packaging Prevention Act, https://leginfo.ca.gov/faces/codes_displayText.xhtml?lawCode=HSC&division=20.&title=&part=&chapter=6.5.&article=10.4.

⁹ EU Code of Conduct for Energy Consumption of Broadband Equipment Version 7.1, <https://e3p.jrc.ec.europa.eu/publications/eu-code-conduct-energy-consumption-broadband-equipment-version-7-0>

Conflict Free Tin Initiative¹⁰

ChemForward¹¹

Cradle to Cradle Certified™¹²

DIN 6120-1, *Marking of packaging and packaging materials for recycling purposes – Plastics packaging and packaging materials – Part 1: Graphical symbols*¹³

EcoTransIT¹⁴

ECMA-341, *Environmental Design Considerations for ICT & CE Products*, 4th Edition / December 2010¹⁵

EN 16258, *Methodology for calculation and declaration of energy consumption and GHG emissions of transport services (freight and passengers)*¹⁶

EN 50581, *Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances*¹⁶

EN 50625, *Collection, logistics & treatment requirements for WEEE*¹⁶

ENERGY STAR®, *Program Requirements for Large Network Equipment*¹⁷

ENERGY STAR®, *Program Requirements for Small Network Equipment*¹⁸

e-Stewards, *Standard for Responsible Recycling and Reuse of Electronic Equipment*¹⁹

¹⁰ Resolve. 1255 23rd Street NW, Suite 275, Washington, DC 20037. www.resolve.ngo/site-cfti

¹¹ ChemForward - <https://www.chemforward.org/>

¹² Cradle to Cradle Certified - <https://www.c2ccertified.org/get-certified/product-certification>

¹³ German Institute for Standardisation (Deutsches Institut für Normung)

¹⁴ EcoTransIT World. IVE mbH Lützerodestraße 10, 30161 Hanover, Germany. <www.ecotransit.org>

¹⁵ ECMA International. Rue du Rhône 114, 1204 Geneva, Switzerland. www.ecma-international.org

¹⁶ European Normative Standard, https://europa.eu/youreurope/business/product-requirements/standards/standards-in-europe/index_en.htm#shortcut-2

¹⁷ ENERGY STAR® Large Network Equipment Specification, https://www.energystar.gov/products/spec/large_network_equipment_specification_version_1_0_pd

¹⁸ ENERGY STAR® Small Network Equipment Specification, https://www.energystar.gov/products/spec/small_network_equipment_specification_version_1_0_pd

¹⁹ e-Stewards. 80 Yesler Way, Suite 300, Seattle, WA 98104. <www.e-stewards.org>

European Commission Joint Research Centre, *International reference Life Cycle Data System (ILCD) Handbook*²⁰

European LCA Platform Database²¹

European Union, Eco-Management and Audit Scheme (EMAS)²²

European Union, European Commission Directive 2006/66/EC of 6 September 2006 on batteries and accumulators and waste batteries and accumulators and repealing Directive 91/157/EEC²³

European Union, European Commission Directive 2012/19/EU of the European Parliament and of the Council on waste electrical and electronic equipment (WEEE)²³

European Union, European Commission Directive 94/62/EC of the European Parliament and of the Council on Packaging and Packaging Waste²³

European Union, European Council former Directive 2002/95/EC as amended by 2005/618/EC and 2011/65/EU of the European Parliament and of the Council on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS)²³

European Union Product Environmental Footprint Guide²⁴

European Union Regulation (EC) No. 1907/2006, *Registration, Evaluation, Authorization and Restriction of Chemicals (REACH)*²³

Global Logistics Emissions Council (GLEC) Framework²⁵

Global Reporting Initiative²⁶

GreenScreen® for Safer Chemicals methodology²⁷

²⁰ European Commission Joint Research Centre. Rue du Champ de Mars 21, 1050 Brussels, Belgium. <eplca.jrc.ec.europa.eu>

²¹ European Commission Platform on Life Cycle Assessment, <https://eplca.jrc.ec.europa.eu/>

²² European Commission Environment. B-1049 Brussels, Belgium. <www.ec.europa.eu/environment/emas>

²³ European Union legislation is available at www.europa.eu; <https://eur-lex.europa.eu/homepage.html>

²⁴ European Union Product Environmental Footprint Guide. https://ec.europa.eu/environment/eussd/smgp/dev_methods.htm

²⁵ Global Logistics Emissions Council. Keizersgracht 560, Amsterdam, Netherlands. <www.smartfreightcentre.org>

²⁶ Global Reporting Initiative. PO Box 10039, 1001 EA, Amsterdam, The Netherlands. <www.globalreporting.org>

²⁷ Clean Production Action. 1310 Broadway, Suite 101, Somerville, MA 02144. www.greenscreenchemicals.org

IEC 62321-3-1, *Determination of certain substances in electrotechnical products - Part 3-1: Screening - Lead, mercury, cadmium, total chromium and total bromine using X-ray fluorescence spectrometry*²⁸

IEC 62321-3-2, *Determination of certain substances in electrotechnical products - 3-2: Screening - Total bromine in polymers and electronics by Combustion - Ion Chromatography*²⁸

IEC 62474, *Material declaration for products of and for the electrotechnical industry*²⁸

IEC 63000, *Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances*²⁸

IEEE 802.3az Energy Efficiency of Small Network Equipment²⁹

IEEE 1874 – IEEE Standard for Documentation Schema for Repair and Assembly of Electronic Devices / Manual³⁰

International Accreditation Forum (IAF)³¹

International Air Transportation Association (IATA), RP 1678³²

International Maritime Organization (IMO)³³

Interstate Chemicals Clearinghouse (IC2), *Alternatives Assessment Guide, Hybrid or Sequential Frameworks*³⁴

IPCC, *Guidelines for National Greenhouse Gas Inventories, 2006*³⁵

ISO 179, *Plastics – Determination of Charpy impact properties*³⁶

²⁸ International Electrotechnical Commission. 3, rue de Varembé, 1st floor, PO Box 131, CH – 1211, Geneva 20, Switzerland. <www.iec.ch>

²⁹ IEEE 802.3az Energy Efficiency of Small Network Equipment, https://standards.ieee.org/standard/802_3az-2010.html

³⁰ Institute for Electrical and Electronics Engineers (IEEE), Piscataway, NJ, <https://standards.ieee.org/>; <https://standards.ieee.org/standard/1874-2013.html>;

³¹ International Accreditation Forum. PO Box 819, Cherrybrook 2126 NSW, Australia. <www.iaf.nu>

³² International Air Transportation Association. IATA USA, 703 Waterford Way, Suite 600, Miami, FL 33126. <www.iata.org>.

³³ International Maritime Organization. 4, Albert Embankment, London SE1 7SR, United Kingdom. <www.imo.org>

³⁴ Interstate Chemicals Clearinghouse. 89 South Street, Suite 600, Boston, MA 02111-2651. <www.theic2.org>

³⁵ Intergovernmental Panel on Climate Change. 7 bis Avenue de la Paix, C.P. 2300, CH-1211, Geneva 2, Switzerland. <www.ipcc.ch>

³⁶ International Organization for Standardization. Chemin de Blandonnet 8, Case Postale 401, 1214 Vernier, Geneva, Switzerland. <www.iso.org>

ISO 180, *Plastics – Determination of Izod impact strength*³⁶

ISO 1043, *Plastics – Symbols and Abbreviated Terms*³⁶

ISO 11469, *Plastics – Generic identification and marking of plastics products*³⁶

ISO 14001, *Environmental management systems – Requirements with guidance for use*³⁶

ISO 14025, *Environmental labels and declarations – Type III environmental declarations – Principles and procedures*³⁶

ISO 14040, *Environmental management – Life cycle assessment – Principles and framework*³⁶

ISO 14044, *Environmental management – Life cycle assessment – Requirements and guidelines*³⁶

ISO/IEC 17065, *Conformity assessment – Requirements for bodies certifying products, processes and services*^{36,28}

ISO 45001, *Occupational Health and Safety Management Systems*³⁶

ISO 50001, *Energy management systems – Requirements with guidance for use*³⁶

Korea Energy Management System (EnMS) Program³⁷

LCA Society of Japan, *Life-cycle Impact Assessment Method based on Endpoint modeling*³⁸

Model Toxics in Packaging Legislation [compilation was developed by CONEG and is administered by the Toxics in Packaging Clearinghouse (TPCH)]³⁹

OECD, *Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High-Risk Areas*⁴⁰

OHSAS 18001, *Occupational Health and Safety Management*⁴¹

Pharos⁴²

³⁷ Korea Energy Agency, Energy Management System. 323 Jongga-ro, Jung-gu, Ulsan (#528-1 Ujeong-dong), Republic of Korea 44538. www.energy.or.kr/renew_eng/energy/industry/enms.aspx

³⁸ LCA Society of Japan. LCA Development Office, 2-1, Kajicho 2-chome, Chiyoda-ku, Tokyo, 101-0044. <lca-forum.org/english>

³⁹ Model Toxics in Packaging Legislation. c/o NERC. 139 Main Street, Suite 401, Brattleboro, VT 05301. <www.toxicsinpackaging.org>

⁴⁰ Organisation for Economic Cooperation and Development. 2, rue André Pascal, 75775 Paris Cedex 16, France. <mneguidelines.oecd.org>; <https://www.oecd.org/daf/inv/mne/OECD-Due-Diligence-Guidance-Minerals-Edition3.pdf>

⁴¹ OHSAS 18001, BSI Group. 389 Chiswick High Road, London W4 4AL, United Kingdom. <www.bsigroup.com>

⁴² Pharos. 1710 Connecticut Ave NW, 4th Floor Washington DC 20009 <pharosproject.net>

Public Private Alliance for Responsible Mineral Trade⁴³

Responsible Business Association (RBA) Code of Conduct⁴⁴

Scivera Chemical Hazard Assessment⁴⁵

SmartWay Program⁴⁶

Social Accountability International (SA) 8000⁴⁷

Sustainable Electronics Recycling International, *Responsible Recycling (R2) Standard for Electronics Recyclers*⁴⁸

UL ECVP 2809, *Environmental Claim Validation Procedure (ECVP) for Recycled Content*, 5th edition⁴⁹

University of Leiden Institute of Environmental Sciences (CML), *Handbook on LCA*⁵⁰

US DOE 50001, *Superior Energy Performance (50001 SEP)*⁵¹

US EPA, GHG Reporting Rule, Subpart I⁵²

US EPA, *Life Cycle Assessment: Principles and Practice, Office of Research and Development. National Risk Management Research Laboratory, Editor 2006*, US EPA: Cincinnati, OH⁵²

US EPA *Tool for the Reduction and Assessment of Chemical and other Environmental Impacts (TRACI) 2.1*⁵²

⁴³ Public-Private Alliance for Responsible Minerals Trade. www.resolv.org/site-ppa

⁴⁴ Responsible Business Alliance. 1737 King Street, Suite 330, Alexandria, VA 22314. <www.responsiblebusiness.org>

⁴⁵ Scivera, <https://www.scivera.com/>

⁴⁶ US EPA, SmartWay Program. SmartWay Transport Partnership, 2000 Traverwood Drive, Ann Arbor, MI 48105. <www.epa.gov/smartway>

⁴⁷ Social Accountability International. 9 East 37th Street, 10th Floor, New York, NY 10016. <www.sa-intl.org>

⁴⁸ Sustainable Electronics Recycling International. PO Box 721, Hastings, MN 55033. <sustainableelectronics.org/r2-standard>

⁴⁹ UL LLC. 33 Pflingsten Road, Northbrook, IL 60062. <www.ul.com>

⁵⁰ Universiteit Leiden, Institute of Environmental Sciences. PO Box 9500, 2300 RA Leiden, The Netherlands. <www.cml.leiden.edu>

⁵¹ US Department of Energy. 1000 Independence Avenue SW, Washington, DC 20585. <www.energy.gov> <https://www.energy.gov/eere/amo/50001-ready-program>

⁵² US Environmental Protection Agency. 1200 Pennsylvania Avenue NW, Washington, DC 20004. www.epa.gov; <https://www.epa.gov/ghgreporting/subpart-i-electronics-manufacturing>; https://cfpub.epa.gov/si/si_public_record_report.cfm?Lab=NRML&dirEntryId=155087; <https://www.epa.gov/chemical-research/tool-reduction-and-assessment-chemicals-and-other-environmental-impacts-traci>

US Life Cycle Inventory (LCI) Database⁵³

US Securities Exchange Act of 1934, Rule 13p-1⁵⁴

3 Terms and definitions

3.1 Special terms, acronyms and abbreviations

ANAB: ANSI National Accreditation Board

ASTM: Refers to “ASTM International”, formerly the American Society for Testing and Materials

BIOS: basic input / output system

CAS: chemical abstract number

CPU: processor or central processing unit

CSR: corporate sustainability report

DDR: double data rate

DIMMs: dual in-line memory modules

DIN: German Institute for Standardisation (Deutsches Institut für Normung)

DOE: Department of Energy

DRC: Democratic Republic of Congo

DRE: Destruction or Removal Efficiency

EC: European community number

ECF: elemental chlorine free

ECMA: Refers to “ECMA International”, formerly the European Computer Manufacturers Association

EICC: Electronic Industry Citizenship Coalition

EMAS: European Union Eco-Management and Audit Scheme

EMI: electromagnetic interference

EMS: environmental management system

EN: European norm

EnMS: energy management system

EPA: Environmental Protection Agency

ESD: electrostatic discharge

F-GHG: fluorinated greenhouse gas

GHG: greenhouse gas

GLEC: Global Logistics Emissions Council

GRI: Global Reporting Initiative

HTML: hypertext markup language

IAF: International Accreditation Forum

IEC: International Electrotechnical Commission

IEEE: Institute of Electrical and Electronics Engineers

IPSA: independent private sector audit

IATA: International Air Transportation Association

ILCD: International Reference Life Cycle Data System

⁵³ The National Renewable Energy Laboratory or the U.S. Department of Energy, operated by the Alliance for Sustainable Energy, LLC, <https://www.nrel.gov/lci/>

⁵⁴ US Securities and Exchange Commission. 100 F Street, NE, Washington, DC 20549. <www.sec.gov>

IMO: International Maritime Organization
ISO: International Organization for Standardization
LCA: life cycle assessment
LNE: large network equipment
MITI: Ministry of International Trade and Industry
NIST: National Institute of Standards and Technology
OECD: Organisation for Economic Co-operation and Development
OS: operating system
PCR: postconsumer recycled
PCF: processed chlorine free
PDF: portable document format
PSU: power supply unit
QR: quick response
REACH: Registration, Evaluation, Authorization and Restriction of Chemicals
RoHS: restriction of hazardous substances
SASB: Sustainability Accounting Standards Board
SEC: Securities and Exchange Commission
SNE: small network equipment
TCF: totally chlorine free
TRACI: Tool for the Reduction and Assessment of Chemical and other environmental Impacts
URL(s): uniform resource locator(s)
WEEE: waste electrical and electronic equipment
XML: extensible markup language
VAP: validated audit process

3.2 Definitions

additives and fillers: Substances or compounds such as pigments and stabilizers added to polymers to improve processing, properties and end use performance.

article: An object which during production is given a special shape, surface or design that determines its function to a greater degree than its chemical composition.²³

agent: An entity acting on behalf of a manufacturer.

battery: Any source of electrical energy generated by direct conversion of chemical energy and consisting of one or more primary battery cells (non-rechargeable) or consisting of one or more secondary battery cells (rechargeable).²³

bezel: Partial or full front facing cover of a product unit that may include openings for one or more drives or other replaceable devices.

NOTE — When extra drives or other replaceable devices are not installed, these bays are usually filled with blanks (see *cosmetic blank / dummy*) which are not technically part of the bezel.

bulk packaging: Single primary package used to ship more than one product.

central processing unit (CPU): The logic circuitry that responds to and processes the basic instructions that drive network equipment. A typical CPU is a physical package to be installed on the server motherboard via a socket or direct solder attachment. The CPU package may include one or more processor cores.

commonly available tools: A hand operated tool which is readily available for purchase by any individual or business without restrictions.

conflict free: A product that does not contain minerals that directly or indirectly finance or benefit armed groups in the Democratic Republic of the Congo (DRC) or an adjoining country.⁵⁴

NOTE 1 — Conflict minerals that a manufacturer or its supplier(s) obtains from recycled or scrap sources, are considered conflict free.

NOTE 2 — The term “armed group” means an armed group that is identified as perpetrators of serious human rights abuses in the annual Country Reports on Human Rights Practices under sections 116(d) and 502B(b) of the Foreign Assistance Act of 1961 (22 USC. 2151n(d) and 2304(b)) relating to the Democratic Republic of the Congo or an adjoining country.

conflict minerals:

- columbite-tantalite (coltan), cassiterite, gold, wolframite, or their derivatives, which are limited to tantalum, tin, and tungsten; and
- any other mineral or its derivatives determined by the US Secretary of State to be financing conflict in the DRC or an adjoining country.⁵⁴

conformance assurance process: Process used by the manufacturer to manage compliance of the product to a restricted substance requirement. The process includes:

- a description of how supplier, materials, parts, and, or subassemblies risk factors are evaluated and allocated;
- the utilization of risk rating (or high-risk status) to determine what evidence is required for suppliers, materials, parts, and, or subassemblies, as determined to be applicable by the manufacturer;
- the collection and evaluation of the evidence determined necessary for applicability, quality and accuracy, and associated action taken for a negative result; and

NOTE — Analytical testing is an option but is not required.

- a procedure to refresh the evidence as appropriate, based on the manufacturer’s evaluation of risk.

deinstalled: Unplugged equipment that is destined for, or intended to be destined for, removal from a customer site.

direct reuse: The using again, by a person other than its previous owner, of equipment and components that are not waste for the same purpose for which they were conceived without the necessity of repair, refurbishment, or hardware upgrading.

disclosure: Information made available to the audience specified in criterion (e.g., purchasers, public, etc.).

disposal: Any operation which does not lead to materials recovery, recycling, reclamation, or reuse of equipment or components, with or without energy reclamation. This includes operations which result in the deposition of waste into, or on, land or water, or treatment via incineration.

documentation: Information to be provided at time of verification or certification.

electronic components: An individual part or combination of parts that, when together, perform a design function(s) and are typically directly attached to a printed circuit board.

NOTE — Examples include cables, connectors, sockets, printed circuit board components and integrated circuits.

elemental chlorine free (ECF): Packaging material produced with pulp from virgin content that has been bleached using a chlorine derivative such as chlorine dioxide (ClO₂), but without the use of elemental chlorine (Cl) or has not been bleached with chlorine compounds.

end of life: Life cycle stage of electronic equipment and components when they are no longer intended for use and are destined, or intended to be destined for, dismantling, material recovery, recycling or disposal.

energy recovery: An operation where the material is used principally as a fuel or to generate energy.

ENERGY STAR certified: A product has been found to be in conformance with the ENERGY STAR Large Network Equipment eligibility criteria by an ENERGY STAR approved third-party certification body, and the product is listed on the ENERGY STAR Qualified Product List located at www.energystar.gov.

environmental management system: Part of the management system used to manage environmental aspects, fulfil compliance obligations, and address risks and opportunities.

NOTE 1 — **Management system:** Set of interrelated or interacting elements of an organization to establish policies and objectives and processes to achieve those objectives. A management system can address a single discipline or several disciplines (e.g., quality, environment, occupational health and safety, energy, financial management). The system elements include the organization's structure, roles and responsibilities, planning and operation, performance evaluation and improvement. The scope of a management system can include the whole of the organization, specific and identified functions of the organization, specific and identified sections of the organization, or one or more functions across a group of organizations.

NOTE 2 — **Environmental aspects:** Element of an organization's activities or products or services that interacts or can interact with the environment.

external enclosure: The outside casing of the product that houses its components.

fan: An instrument for producing a current of air, comprised of (1) an impeller, or assembly of blades attached to an integral hub; and (2) an enclosure that surrounds the blades and hub and attaches to the hub.

feedstock: Raw material used in a manufacturing process.

fiber-based: Cellulose material derived from trees and other plants, including but not limited to wood, hemp, kenaf, palm, bamboo, straw, and bagasse.

final disposition: The last facility or operation managing equipment and/or components and materials derived from them at which they either:

- cease to be a waste by being processed into materials that will be used directly in manufacturing new products or processes; or
- have arrived for disposal and are finally disposed.

firmware: Combination of a hardware device and computer instructions or computer data that reside as read-only software on the hardware device.

first customer: Organization or individual who first acquires (purchases, leases, receives by donation, etc.) and then uses the new product.

impact assessment categories: Classifications of human health and environmental effects caused by a product throughout its life cycle.

initial service providers: Companies who contract directly with manufacturers or companies who contract with an agent acting on behalf of the manufacturer to provide one or more of the following take-back services: preparation for reuse, or treatment of product / equipment / components.

inventory data: The identification and quantification of energy, resource usage, and environmental emissions for a particular product, process, or activity.

large network equipment (LNE): Network equipment that is mountable in a standard equipment rack, supports network management protocols (e.g., SNMP) and contain more than eleven (11) physical network ports and, or total aggregate port throughput greater than 12 Gb/s.⁵⁵

life cycle assessment (LCA): Compilation and evaluation of the inputs, outputs, and the potential environmental impacts of a product system throughout its life cycle.

manufacturer: Any natural, legal person or entity who:

- manufactures a product;
- has a product designed or manufactured; or
- places a brand label on a ready-made product; and
- places it on the market under their own name or trademark.

market (in context of first placed on the market): A product is placed on the market when it is made available for the first time on the market, i.e., when it is first supplied for distribution, consumption or use on the market in the course of a commercial activity, whether in return for payment or free of charge.²³

network equipment: Devices whose primary function is to pass Internet Protocol traffic among various network interfaces/ports.⁵⁶

optical components: An individual part or combination of parts that are used in the creation, transmission, manipulation, or detection of light.

packaging: All materials of any nature to be used for the containment, protection, handling, delivery, and presentation of products from the manufacturer to the user or the customer.

NOTE — For the purposes of this Criteria Document, unless otherwise noted, the term “packaging” only applies to sales packaging or primary packaging, i.e., packaging that contains and protects, and is designed to deliver a product unit to the final user or customer, and does not include pallets or the mechanism such as nails, screws, and bolts that is used to temporarily attach primary packaging to pallets.

packaging component: Any individual assembled part of packaging such as, but not limited to, any interior or exterior blocking, bracing, cushioning, weatherproofing, exterior strapping, coatings, closures, inks, and labels.

postconsumer recycled content: Material generated by households or by commercial, industrial, and institutional facilities, which can no longer be used for its intended purpose. This includes returns of material from the distribution chain.³⁶

NOTE — This definition applies to materials such as plastic, fiber, metal, etc.

⁵⁵ ENERGY STAR® [Large Network Equipment](#)

⁵⁶ ENERGY STAR® [Large Network Equipment](#) and [Small Network Equipment](#) specifications.

prepared for reuse: Equipment and components that have been checked, tested, cleaned, and/or repaired, and determined to be safe and fully functional with the intent to be placed back on the market in their original use or in their upgraded state, without further processing.

printed circuit board: A thin board made of fiberglass, composite epoxy, or other laminate material with conductive pathways etched or “printed” onto the board, with the purpose of, or to be used for, the connection of different components on the board, such as transistors, resistors, and integrated circuits.

processed chlorine free (PCF): Packaging material produced with pulp from virgin and/or recycled content that has been bleached without any type of chlorine, or that has not been bleached at all. Recycled content may have originally been bleached with chlorine or chlorine derivatives.

processor: See *central processing unit* (CPU).

product: Networking equipment within the scope of the most current version of ENERGY STAR® Program Requirements for Small Network Equipment (SNE) and Large Network Equipment (LNE) as applicable.⁵⁷

publicly available: Obtainable by the public without restriction of access; for example, cannot require member only access. A requirement to provide a name and/or organization to obtain access is not considered a “restriction of access”.

recovery: Operations that are part of a process to recapture elements, compounds, or materials, and transform them into commodities.

recycled content: Proportion, by weight, of recycled material in a product or packaging. Only preconsumer and postconsumer materials shall be considered as recycled content.

recycling: Operations by which products, components, materials, or waste are processed and converted into raw materials for use in the production of new products or in processes, not including energy recovery or disposal.

refurbishment: Functional or aesthetic maintenance or repair of a product to restore to original or upgraded functional state.

reuse: Using again, equipment or components for the originally intended purpose, a similar purpose, or in an upgraded state, possibly after refurbishment, repair or hardware upgrading.

reuse operator: The entity responsible for preparing equipment or components for reuse.

secure data deletion: means the effective erasure of all traces of existing data from a data storage device, overwriting the data completely in such a way that access to the original data, or parts of them, becomes infeasible for a given level of effort. ⁵⁷

small network equipment (SNE): Network equipment that is designed for stationary operation, contains no more than eleven (11) wired physical network ports and is primarily configured for

⁵⁷ Ecodesign Commission Regulation (EU) 2019/424

operation outside standard equipment racks.⁵⁸

supplier: Entity that provides goods or services to the manufacturer.

totally chlorine free (TCF): Packaging material produced with pulp from virgin content that has been bleached without any type of chlorine, or that has not been bleached at all.

treatment: Material recovery or disposal operations, including preparation prior to recovery or disposal.

treatment facility: Location where end-of-life equipment, components, or materials undergo treatment.

treatment operator: The entity responsible for the treatment of equipment or components.

Environment and Social Criteria

4 Reduction of Chemicals of Concern

4.1 Reduction of substances of concern

4.1.1 Required – Conformance with provisions of European Union RoHS Directive

The product shall meet the substance restriction requirements of the European Union RoHS Directive and its amendments in effect on the date of product manufacture. All exemptions to the substance restrictions as defined by the Directive are applicable.

Verification requirements:

- a) documentation of a conformance assurance process that demonstrates conformity to this criterion through effective control of the supply chain;
Or
- b) technical documentation in accordance with EN 50581 or IEC 63000 as required by the European Union RoHS Directive.

References and details: The European Union RoHS Directive stipulates maximum concentration values (MCVs) by weight for the presence of each substance within homogeneous materials.

Technical documentation, as required in Article 7(b) of the European Union RoHS Directive, can be generated per Standard EN 50581, Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances or IEC 63000, Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances.

⁵⁸ ENERGY STAR® [Small Network Equipment](https://www.energystar.gov/products/spec/small_network_equipment_specification_version_1_0_pd) specification, https://www.energystar.gov/products/spec/small_network_equipment_specification_version_1_0_pd

4.1.2 Required - Conformance with substance restriction requirements of the European Union Battery Directive

Batteries in the product shall meet the substance restriction requirements of the European Union Battery Directive in effect at the date of battery manufacture.

If the product does not contain batteries, “Not Applicable” may be declared.

Verification requirements:

- a) list of batteries in the product, including their chemistry (e.g., lithium ion, nickel metal hydride, etc.)
- b) at least one of the following:
 - i. test results demonstrating that battery(ies) in the product meets the substance requirements of the European Union Battery Directive;
 - ii. statement from the battery supplier indicating that the product meets the substance requirements of the European Union Battery Directive; or
 - iii. Material Declaration and Disclosure from the supplier.

References and details: This criterion only applies to those substances for which the European Union Battery Directive establishes threshold limits on the amount of the substance in batteries. This criterion does not apply to those substances only subject to the European Union Battery Directive labeling requirements.

4.1.3 Required - Reduction of Bromine and Chlorine content of plastic parts > 25 grams

Plastic parts exceeding 25 g shall not contain greater than 1000 ppm chlorine or greater than 1000 ppm bromine⁵⁹. Parts that exceed 25% postconsumer recycled content shall contain a maximum of 5000 ppm chlorine and 5000 ppm bromine.

The following exceptions apply:

- printed circuit boards, cables and wiring, fans, and electronic components.
- parts for which the manufacturer has performed an alternative assessment in accordance with requirements set forth in 4.2.5 Substance Hazard Assessment on the substance(s) responsible for exceeding the bromine and chlorine levels and demonstrates that the substance was determined to be safer than, or as safe as, the available alternatives.

If the product does not contain plastic parts > 25 g, “Not Applicable” may be declared.

Verification requirements:

- a) a list of plastic parts exceeding 25 g.
- b) documentation that each plastic part exceeding 25 g meets one of the four options below:
 - i. test data showing that the part contains less than 1000 ppm chlorine and less than 1000 ppm bromine by an applicable test method that is included in the laboratory’s ISO 17025 scope of accreditation. Applicable test methods include, but are not limited to, IEC 62321-3-1 and IEC 62321-3-2.

⁵⁹ Based on chlorine and bromine thresholds specified in IEC 62474 Material declaration for products of and for the electrotechnical industry.

- Or
- ii. documentation of a conformance assurance process that demonstrates conformity to this criterion through effective control of the supply chain;
Or
- iii. if the part contains greater than 25% PCR:
 - supplier letter supporting the greater than 25% PCR; and,
 - test data showing that the part contains less than 5000 ppm chlorine and less than 5000 ppm bromine;
 Or
 - documentation of a conformance assurance process that demonstrates conformity to this criterion through effective control of the supply chain;
 Or
- iv. demonstration that an alternative assessment was conducted, using the methodology outlined in 4.2.5 on the substance responsible for the observed bromine and/or chlorine levels and the possible alternatives and the substance was determined to be safer than, or as safe as, the available alternatives.

References and details: None

4.1.4 Optional - Further reduction of Bromine and Chlorine content of plastic parts > 25 grams

Plastic parts exceeding 25 g shall not contain greater than 1000 ppm chlorine or greater than 1000 ppm bromine, in accordance with Table 4.1.4, with the following exception:

- parts which exceed 25% postconsumer recycled content may contain a maximum of 5000 ppm chlorine and a maximum of 5000 ppm bromine.

If the product does not contain plastic parts > 25 g, “Not Applicable” may be declared.

Table 4.1.4

Plastic parts	Points
At least one of the following: <ul style="list-style-type: none"> — printed circuit board laminates (excluding components soldered or affixed to the printed circuit board) — fans 	1
All plastic parts (including electronic components) > 25 g	2

Point value: 1 or 2 (maximum of 2 points)

Verification requirements:

- a) a list of plastic parts exceeding 25 g.
- b) documentation that plastic parts per Table 4.1.4 exceeding 25 g meets one of the three options below:
 - i. test data showing that the part contains less than 1000 ppm chlorine and less than 1000 ppm bromine by an applicable test method that is included in the laboratory’s ISO 17025 scope of accreditation. Applicable test methods include, but are not limited to, IEC 62321-3-1 and IEC 62321-3-2.
 Or

- ii. documentation of a conformance assurance process that demonstrates conformity to this criterion through effective control of the supply chain;
- Or
- iii. if the part contains greater than 25% PCR:
 - supplier letter supporting the greater than 25% PCR; and
 - test data showing that the part contains less than 5000 ppm chlorine and less than 5000 ppm bromine;
- Or
- documentation of a conformance assurance process that demonstrates conformity to this criterion through effective control of the supply chain.

References and details: None

4.1.5 Required - Conformance with supply chain communication provisions of European Union REACH Regulation

Manufacturer shall disclose in accordance with the Article 33 requirements of the European Union REACH Regulation in effect at the time the product is declared to conform to this Criteria Document.

Verification requirements:

- a) disclosure of substances on REACH candidate list present in any article in the product above the threshold, as applicable.

References and details: European Union Regulation (EC) No 1907/2006

4.1.6 Optional - Reduction of substances on the European Union REACH Regulation Annex XIV (authorization list)

The product shall not contain applicable substances on the European Union REACH Annex XIV (List of Substances Subject to Authorization) above 0.1% per substance by weight per “article”, or specified threshold in Annex XIV. Applicable substances are those on the REACH Authorization List (Annex XIV) after their respective sunset dates specified in Annex XIV at the date of product manufacture.

In order to identify substances that may be constituents of electronics, manufacturers may pre-screen the European Union REACH Annex XIV using IEC 62474 Material Declaration for Products of and for the Electrotechnical Industry.

Manufacturer shall utilize a conformance assurance process to ensure that the product does not contain applicable substances above 0.1% by weight per “article”.

Point value: 1

Verification requirements:

- a) documentation of method for determining applicable substances.
- b) documentation of a conformance assurance process that demonstrates conformity to this criterion through effective control of the supply chain.

References and details: IEC 62474 declarable substances and groups.

4.2 Inventory and assessment of substances

4.2.1 Optional – Record of declarable substances

Manufacturer shall record the presence of IEC 62474 declarable substance groups and declarable substances in the product at or above the reporting threshold amounts stated in the IEC 62474 database at the time the product is declared to conform to this Criteria Document. The record shall include all declarable substance groups and declarable substances designated criteria 1, 2, and 3 in the IEC 62474 database.

The manufacturer shall have one or both of the following:

- a process to manage, maintain, and update all data received on declarable substances listed in IEC 62474.
- a conformance assurance process used to ensure that the product does not contain these substances.

The criterion does not require public disclosure.

Point value: 1

Verification requirements:

- a) record of IEC 62474 declarable substance groups and declarable substances (designated 1, 2, and 3) in the product at or above the reporting threshold.
- b) documentation of a process to manage, maintain and update data received on declarable substances listed in IEC 62474.
Or
- c) documentation of a conformance assurance process that demonstrates conformity to this criterion through effective control of the supply chain.

References and details: IEC 62474 declarable substances and groups.

4.2.2 Optional - Disclosure of declarable substances

Manufacturer shall make publicly available on their website the record of IEC 62474 declarable substance groups and declarable substances in the product. The inventory shall contain the CAS number for each declarable substance (not including declarable substance groups). The link to the record shall be placed on the product specification or documentation web page. The URL(s) for the manufacturer's public website disclosing this information shall be provided during product registration and certification, and made publicly available.

Point value: 1

Verification requirements:

- a) URL(s) of the public disclosure.
- b) record generated for conformance with Criterion 4.2.1, that:
 - i. includes the CAS number for each declarable substance, and
 - ii. is located on the product specification or documentation web page.

References and details: None

4.2.3 Optional - Requesting full substance inventory

The manufacturer shall request (or otherwise have access to) information from suppliers on the inventory of substances in the substances, components, and parts contained in the product. The supplier requests shall cover either:

- materials, components, and parts encompassing at least 90% of the total product mass, or
- at least 90% of the directly contracted suppliers of substances, components, and parts.

The manufacturer shall have a documented process, and a system or tool, to record the collected information, and to calculate the percentages stated above.

Manufacturer shall request suppliers to disclose the standardized number (e.g., CAS, EC, MITI), for the inventory of substances.

“Request” means one or more of the following:

- the manufacturer, or an agent or supplier of the manufacturer, has requested this information in writing from the supplier directly (e.g., email, letter); or
- a contract, agreement, or purchase order between the supplier and the manufacturer (or between the supplier and an intermediary supplier [e.g., contract manufacturer]) requires the supplier to provide this information; or
- a specification or other document to which the supplier is held by the manufacturer or an intermediary supplier that requests this information.

Point value: 1

Verification requirements:

- a) documentation of process for collecting the information requested in accordance with this criterion.
- b) documentation of process for an information management system or tool adequate to address the nature and quantity of parts, suppliers, and information relevant to the requested substance information.
- c) summary of information used to calculate percentages achieved of requested information from suppliers.

References and details: None

4.2.4 Optional - Acquiring substance inventory

The manufacturer shall demonstrate that it has in the system or tool required in 4.2.1, a complete list of the substances in the products/components supplied to the manufacturer from its suppliers, as specified in the table below.

The following equation shall be used to calculate the percentage:

$$\% \text{ mass of inventory of substances of the product} = \frac{\text{Mass of substances inventoried}}{\text{Total mass of the product}} \times 100$$

In the calculation, only the portion of materials, components, and parts for which substance inventory information is received from the supplier shall be counted in the numerator. If a supplier withholds disclosure on the basis of confidential business information, the mass of the undisclosed substances shall not be included in the numerator.

For instances where there are multiple suppliers for a given material, component, or part, at a minimum the manufacturer shall select which inventoried supplier mass(es) to include in the calculation.

Manufacturer may claim the points associated with only one level in Table 4.2.4

Table 4.2.4

Data acquired on substance inventory	Points
Minimum of 75% of total product mass	1
Minimum of 90% of total product mass	2

The manufacturer shall have a system for validating reports or other substance ingredient declarations from its suppliers.

Point value: 1 or 2

Verification requirements:

- a) documentation that the system or tool utilized, includes a complete list of the substances in the products/components supplied to the manufacturer from its suppliers.
- b) calculation demonstrating the percentage of total product mass for which the manufacturer has a complete list of the substances.
- c) evidence supporting the existence of a system for validating reports or other substance ingredient declarations from its suppliers.

References and details: None

4.2.5 Optional – Substance hazard assessment

Manufacturer shall demonstrate that a hazard assessment has been conducted using a comparative hazard assessment tool on each substance that serves the following functions in the product and provide the hazard assessment summary table or score assigned.

- 1) flame retardants $\geq 0.1\%$ by weight in homogenous materials of plastic parts ≥ 25 g
- 2) plasticizers $\geq 0.1\%$ by weight in homogenous materials of plastic parts ≥ 25 g

Exceptions: The manufacturer may exclude flame retardants and plasticizers used in the following parts from this requirement for conducting hazard assessments: printed circuit boards, cables, wires, connectors, fans, and power supplies.

The manufacturer shall only use hazard assessments completed no more than 5 years prior to when the product is declared conformant to this criterion and the assessment methodology utilized must be made available for third-party peer review.

Assessments shall be performed by assessors with the following qualifications⁶⁰:

- a degree in chemistry, chemical engineering, biology, toxicology, environmental sciences, or related fields relevant to the subject matter in the assessment.
- received training in conducting hazard assessments, provided by recognized experts in conducting such assessments.
- experience conducting at least one assessment that has been peer-reviewed by recognized experts in the field or published in relevant journals or in repositories of assessments.

The assessments shall include the following information:

- name of assessor.
- documentation of the assessor qualifications listed above.
- indication of whether the assessment has been verified by the applicable verification program.
- date of the assessment and date of expiration.
- level of ingredient disclosure and reporting in the assessments.
- demonstration that the assessment considers product end-of-life management.

Optional Points are assigned based on the hazard assessment of the substances used to serve the functions above and are to be awarded as follows (maximum 2 points total):

Table 4.2.5

Performance	Total points earned
Substances are not in the highest hazard category; examples include, but not limited to: <ul style="list-style-type: none"> • GreenScreen® - not Benchmark 1 • Scivera’s GHS+ Chemical Hazard Assessment - not Hazard Category Black or Red 	1
Substances are not in the next highest hazard categories; examples include, but not limited to: <ul style="list-style-type: none"> • GreenScreen®- not Benchmark 1 or 2 • Scivera’s GHS+ Chemical Hazard Assessment - not Hazard Categories Black, Red or Yellow • Cradle to Cradle Certified™- not x-CMR or x-PBT 	2

Note: to achieve 2-point maximum, all substances assessed must meet the requirements for 2 points.

For products that do not contain individual plastic parts containing flame retardants or plasticizers weighing greater than or equal to 25 g, other than the above stated exceptions, the manufacturer may declare “Not Applicable” for this criterion.

Point value: 1 or 2

Verification requirements:

⁶⁰ Clean Production Action Licensed GreenScreen® Profilers and Authorized GreenScreen® Practitioners meet this requirement.

- a) list of applicable plastic parts ≥ 25 g and the flame retardant and plasticizer substances used and their hazard assessment score.
- b) demonstration that each of those substances have:
 - i. been assessed by an assessor with the qualifications listed in the criterion;
 - Or
 - ii. publicly available assessments such as those available on the Clean Production Action website⁶¹ or the Interstate Chemicals Clearinghouse Chemical Hazard Assessment Database (IC2)⁶² Pharos⁶³, or ChemForward⁶⁴.
- c) demonstration that the assessments contain the information as required in the criterion.

References and details: None

4.2.6 Optional - Making safer substance use hazard assessments publicly available

The manufacturer shall publicly disclose the hazard assessment results in accordance with criterion 4.2.5.

The URL(s) for the public website disclosing this information shall be provided during product registration and certification, and made publicly available.

Point value: 1

Verification requirements:

- a) URL(s) of public disclosure on the manufacturer or other public website.
- b) public disclosure of the hazard assessment results in accordance with criterion 4.2.5.

References and details: None

4.3 Reduction of substances of concern in packaging

4.3.1 Required – Elimination of added heavy metals in packaging

Heavy metals – lead, cadmium, mercury, and hexavalent chromium – shall not be intentionally added to any package or packaging component. For incidental presence, the sum of the combined concentrations of lead, cadmium, mercury, and hexavalent chromium present in any packaging component shall not exceed 100 ppm by weight.

Pallets are excluded for the purposes of this criterion.

⁶¹ Clean Production Action. 1310 Broadway, Suite 101 Somerville, MA 02144 <www.greenscreenchemicals.org>

⁶² Interstate Chemicals Clearinghouse. 89 South Street, Suite 600 Boston, MA 02111-2651 <www.theic2.org>

⁶³ Pharos. 1710 Connecticut Ave NW, 4th Floor Washington DC 20009 <pharosproject.net>

⁶⁴ ChemForward. <<https://www.chemforward.org/alternatives>>

Geographic applicability: This criterion shall be declared the same in all countries or regions for which the product is declared to conform to this Criteria Document. The approach used to conform to this criterion may vary by country or region.

Verification requirements:

- a) supplier statement for each packaging component or packaging material provided by the supplier that includes:
 - i. the specified heavy metals have not been intentionally added to any package or packaging component;
 - And
 - ii. the sum of the combined concentration of the four metals present in any packaging component does not exceed 100 ppm by weight.

OR

- b) documentation of a conformance assurance process (CAP) that demonstrates conformity to this criterion through effective control of the supply chain.

References and details: The requirements in this criterion are based on Model Toxics in Packaging legislation, European Parliament and Council Directive 94/62/EC, and California Health and Safety Code Section 25214.11-25214.26.

Analytical testing of the packaging for the product declared to conform to this Criteria Document is not required for verification to this criterion. However, it is implied that supplier statements or manufacturer programs are based on a conformance assurance system that includes periodic analytical testing.

4.3.2 Required—Restriction on the use of elemental chlorine as a bleaching agent in paper-based packaging material

Manufacturer shall state in the manufacturer’s environmental packaging requirement that elemental chlorine shall not be used as a bleaching agent to bleach virgin or recovered content fibers used in paper-based product packaging.

Product packaging that is made Elemental Chlorine Free (ECF), Totally Chlorine Free (TCF), or Processed Chlorine Free (PCF) meets the requirements of this criterion.

Additionally, recycled content that may have been previously bleached with chlorine or chlorine derivatives meets the requirements of this criterion.

Verification requirements:

- a) copy of manufacturer’s environmental packaging requirement as provided to packaging supplier.

References and details: None

4.3.3 Optional – Restriction on the use of chlorine compounds in processing packaging materials

Manufacturer shall document that any fiber-based materials (virgin or recovered) used in packaging was not bleached with chlorine compounds. Unbleached packaging is also eligible for this optional point. This requirement applies to the bleaching of fiber-based materials and their fabrication into

packaging for network equipment products declared to conform to this Criteria Document. The use of recovered fibers that were previously bleached is acceptable.

Point value: 1

Verification requirements:

- a) documentation that fiber-based materials are not bleached with chlorine compounds (e.g., supplier letter or supplier data submission to manufacturer). Documentation that packaging is made Totally Chlorine Free (TCF) or Processed Chlorine Free (PCF) meets this verification requirement.

References and details: None.

5 Sustainable Use of Resources

5.1 Product recycled content

5.1.1 Required - Declaration of postconsumer recycled plastic content

Manufacturer shall declare the minimum percentage of plastic derived from the use of postconsumer recycled plastic in plastic parts in the product. Individual parts greater than or equal to 25 g shall be included in the calculation. The manufacturer may choose to include individual parts less than 25 g in the calculation.

The declaration shall be provided either

- 1) on a publicly available registry; or
- 2) on the third-party certification organization website or manufacturer's website in the form of a certification report, or equivalent, issued by the certifying organization; or
- 3) on the manufacturer's website, if the product is self-declared to conform to the Criteria Document.

Calculation: The minimum percentage is calculated as the minimum weight of postconsumer recycled resins in the included plastic parts (numerator) divided by the total weight of all included plastic parts (denominator). Only the weight of postconsumer recycled content in the commercial resin shall be included in the numerator.

Additives or fillers in plastic formulations shall not contribute to the weight of recycled content, except in the case where the additives or fillers are derived from a recycled feedstock.

Exceptions: The manufacturer may also exclude any of the following items from the calculation: printed circuit boards, labels, cables, connectors, electronic components, optical components, electrostatic discharge (ESD) components, electromagnetic interference (EMI) components, fans, and biobased plastic content.

For products that do not contain individual plastic parts weighing greater than or equal to 25 g, the manufacturer may declare "Not Applicable" for this criterion.

Verification requirements:

- a) supplier documentation stating minimum percentage of postconsumer recycled plastic content in material supplied to manufacturer or to manufacturer's part supplier.
- b) documentation of a calculation that includes a list of the included plastic component part name(s) or other part identifier that contains the postconsumer recycled plastic content, weight (g) of postconsumer recycled plastic in the component part, and postconsumer recycled plastic resin type. If the part identifier is not descriptive, a description of the type of part shall be provided.

References and details: None

5.1.2 Optional- Minimum Postconsumer recycled content in external enclosures for SNE

External enclosure of Small Network Equipment shall consist of a minimum 10% postconsumer recycled (PCR) plastic content. External enclosure parts < 50 g may be excluded from this requirement. For the purpose of this criterion, bezels, latches, brand badges, labels, and mounting brackets are not considered part of the enclosure.

Calculation: The minimum percentage is calculated as the minimum weight of postconsumer recycled resins in the included plastic parts (numerator) divided by the total weight of all included plastic parts (denominator). Only the weight of postconsumer recycled content in the commercial resin shall be included in the numerator.

Additives or fillers in plastic formulations shall not contribute to the weight of recycled content, except in the case where the additives or fillers are derived from a recycled feedstock.

For products that do not contain individual plastic parts weighing greater than or equal to 50 g, the manufacturer may declare "Not Applicable" for this criterion.

Point value: 1**Verification requirements:**

- a) supplier documentation stating minimum percentage of postconsumer recycled plastic content in material supplied to manufacturer or to manufacturer's part supplier.
- b) documentation of a calculation that includes a list of the included plastic component part name(s) or other part identifier that contains the postconsumer recycled plastic content, weight (g) of postconsumer recycled plastic in the component part, and postconsumer recycled plastic resin type. If the part identifier is not descriptive, a description of the type of part shall be provided.

References and details: None

5.1.3 Optional - Postconsumer recycled content of rare earth elements in hard drive(s) in product

Products that contain a hard drive(s) with actuator / voice coil or spindle magnets shall contain 5% or more PCR content neodymium or dysprosium by weight of neodymium or dysprosium in the magnet.

The neodymium or dysprosium shall be provided through the recycling of magnets from used devices, not limited to electronic devices.

If the product does not contain a hard drive with magnets that contain these rare earth elements, “Not Applicable” may be declared.

Point value: 2

Verification requirements:

- a) evidence from hard drive manufacturer(s) that the magnets in the hard drives contain 5% or more PCR content neodymium or dysprosium and documentation of its source through means such as one or more of the following:
 - i. documentation of audits of magnet suppliers and purchasing records.
 - ii. identification of the source(s) material type of recovered rare earth elements (does not require disclosure of supplier).
 - iii. certification attesting to the minimum PCR content of neodymium or dysprosium using UL 2809 Environmental Claim Validation Procedure (ECVP) or equivalent chain-of-custody procedure.

References and details: None

5.2 Resource efficiency of product packaging

5.2.1 Required - Enhancing recyclability of packaging materials

Product packaging shall meet the following requirements:

- a) all non-reusable packaging components ≥ 25 g shall be separable by material type, including by plastic material type as specified in b) below, using only commonly available tools. The following are exempt from this requirement: plastic parts smaller than 50 cm², labels affixed to plastics bags or wraps, tape, staples, co-laminated materials for purposes of moisture or ESD barrier protection, and plastic bags over expanded foam.
- b) all plastic packaging components ≥ 25 g shall be clearly marked with material type in accordance with ISO 11469/1043⁶⁵, ASTM D7611/D7611M⁶⁶, or DIN6120⁶⁷ or equivalent markings relevant to the geographic location in which the product is being sold. The following are exempt from this requirement: plastic protective films, stretch wraps, strapping, and expanded polyurethane foam. For products with packaging that does not contain any plastic components ≥ 25 g, manufacturer may declare “Not Applicable” for requirement b) in this criterion.

⁶⁵ International Organization for Standardization. Chemin de Blandonnet 8, Case Postale 401, 1214 Vernier, Geneva, Switzerland. www.iso.org

⁶⁶ ASTM D7611/D7611M-20, <https://www.astm.org/Standards/D7611.htm>

⁶⁷ DIN 6120:2019, Marking of packaging and packaging materials, https://infostore.saiglobal.com/en-us/Standards/DIN-6120-2019-378508_SAIG_DIN_DIN_2710377/

Verification requirements:

- a) documentation from manufacturer:
 - i. for requirement a) manufacturer's packaging part or assembly/disassembly drawing, or photographs.
 - ii. for requirement b) photographs or physical evidence of plastic markings.

References and details: None

5.2.2 Required - Recycled fiber in corrugated packaging

Corrugated fiber-based packaging materials shall contain a minimum of 25% recycled fiber content (by fiber weight).

If the product packaging does not contain corrugated fiber-based materials, "Not Applicable" may be declared.

Verification requirements:

- a) list of applicable packaging materials and weights.
- b) supplier documentation with recycled content percentage from each applicable packaging material where recycled content percentage is claimed from suppliers.

References and details: None

5.2.3 Optional – Higher recycled fiber content in corrugated packaging for LNE

Corrugated packaging materials shall contain a minimum of 50% recycled fiber content (by fiber weight). Manufacturers shall also state a preference in specifications, which are applicable to the product, for a minimum 25% postconsumer recycled fiber content (by fiber weight). Fiber-based packaging materials derived from alternative sources to traditional paper mill products are exempt from this recycled fiber requirement and shall not be included in the calculation of recycled content.

Point value: 1

Geographic applicability: A manufacturer may declare this criterion differently in each country or region for which the product is declared to conform to this Criteria Document.

Verification requirements:

- a) list of applicable packaging materials and weights.
- b) supplier documentation with average recycled content percentage from each applicable packaging material where recycled content percentage is claimed from suppliers.
- c) documentation to supplier indicating minimum average recycled content.

References and details: Examples of alternative sources include, but are not limited to, bamboo and mushrooms.

5.2.4 Optional – Bulk packaging for SNE

Manufacturer shall offer a bulk packaging option to institutional customers that reduces the amount of packaging:

- by bulk packaging weight, as compared on a per unit basis to the single unit packaging; or
- by bulk packaging volume, as compared on a per unit volume basis to single unit packaging.

The bulk packaging option shall be offered to institutional customers through the same ordering process as typically used by institutional purchasers.

Bulk packaging shall function as the primary packaging from the point of final assembly of the product through delivery to the institutional customer. Re-boxing of a finished product from single unit packaging to bulk packaging does not meet the requirements of this criterion.

Manufacturer may declare “Not Applicable” for a region or country if bulk packaging for the product is prohibited by law.

Point value: 1

Verification requirements:

- a) engineering specification or schematic for the bulk packaging option(s).
- b) demonstration that bulk packaging option(s) is offered to institutional customers as an alternative to single unit packaging in the primary ordering process used by institutional purchasers. Demonstration may include, for example, marketing materials, customer order form, screenshot of an order screen, or sales contract.
- c) to demonstrate reduction in packaging mass or volume, the manufacturer shall:
 - i. define a base packaging configuration for a single unit of the registered product (including external components as determined by the manufacturer).
 - ii. define a bulk packaging configuration for shipping multiple units of the registered product (including any external components as determined by the manufacturer in the bullet above).
 - iii. calculations demonstrating that the bulk package has a lower mass or volume of packaging on a per unit basis as compared to the single unit packaging such that:

$$\frac{\textit{Total mass or total volume of bulk packaging}}{\textit{quantity of product units contained in the packaging}} < \frac{\textit{total mass or total volume of the single unit}}{\textit{unit}}$$

- d) statements from the party that applies the bulk packaging at the point of final product assembly, and the party that ships the product in the bulk packaging to the institutional customer, if different, or other documentation demonstrating that the bulk packaging is the primary packaging at point of final product assembly and shipment to customer, and that the product(s) is not re-packaged from a single unit packaging.
- e) documentation of law prohibiting bulk packaging, if applicable.

References and details:

Total volume calculations should be determined by the outer dimensions of the packaging (e.g., bulk packaging or single unit packaging.)

A packaging “configuration” is the combination of packaging materials and how they are assembled (configured) to contain product(s).

The manufacturer determines:

- a) the bulk packaging option(s) (for example, the number of product units per single bulk packaging) for products declared to conform to this criterion. The bulk packaging option(s) can vary by product type. The bulk packaging option(s) may include the shipment of 2 or more units of 2 or more different product types;
- b) which external components that are included in the packaging for both the single unit base packaging configuration and the base bulk packaging configuration. The only stipulation is that the single unit packaging and the bulk packaging have the same included external components.

5.2.5 Optional – Recycled content wood fiber-based packaging for SNE

Wood fiber-based packaging materials shall contain a minimum 65% recycled content fiber (by fiber weight). Wood fiber-based packaging materials derived from alternative sources to traditional paper mill products (including, but not limited to, bamboo, mushrooms, bagasse, and straw) are exempt from this recycled fiber requirement and shall not be included in the calculation of recycled content.

A manufacturer may declare this criterion differently in each country or region for which the product is declared to conform to this Criteria Document.

Point value: 1

Verification requirements:

- a) list of applicable packaging materials and weights; and
- b) supplier documentation with recycled content percentage for each applicable packaging material.

References and details: None

5.3 Design for repair, reuse, and recycling

5.3.1 Required – Design for repair, reuse, and recycling

The product shall be designed with the following features to facilitate repair, preparation for reuse, recycling, and safe handling, unless otherwise required as part of compliance with safety regulations, safety standards or as part of a safety certification:

- external enclosures, or those portions of the enclosures that must be removed to accomplish repair, reuse, recycling, or safe handling, shall be removable by hand or with commonly available tools, without destruction of the enclosure;
- components requiring selective treatment listed in the European Union WEEE

Directive 2012/19/EU Annex VII shall be identified and removable by hand or with commonly available tools;

- at a minimum, if present in the product, data drives or cards, memory DIMMs, internal power supply, hard disc drive (HDD), mass storage module (SSD, etc.), fans, rechargeable batteries, and I/O cards, shall be replaceable by hand or with commonly available tools; and
- wires and cables that connect to external sources of power or data shall be removable from the products by hand or with commonly available tools without cutting either the wire or cable, or the product being rendered unusable, unless required for technical or safety reasons.

In order for a component to be considered “identified” for the purposes of this criterion either the component shall be called out in the product documentation called for in criterion 5.4.1, Information and reporting in preparation for reuse and recycling, or marked with a visual display as called for in 5.4.3, Product marked to identify components and materials requiring selective treatment.

Verification requirements:

- a) documentation that the product meets each of the required design features to facilitate repair, preparation for reuse, recycling, and safe handling.
- b) if one or more of the required features is not included in the product design, justification that this is due to compliance with safety regulations, safety standards or as part of a safety certification.

References and details: None

5.3.2 Required – Design for plastics recycling

All plastic parts > 100 g shall meet the following requirements:

- clearly marked with material type in accordance with ISO 11469/1043;
- separable by hand or with commonly available tools, such that plastic parts can be separated into “compatible” or “compatible with limitations” material types, per Annex B in ECMA-341 Environmental Design Considerations for ICT & CE Products, 4th Edition / December 2010. If a plastic part is made up of more than one resin, and “good compatibility” or “limited compatibility” cannot be determined because one or more of the resins is not reflected in ECMA-341 Annex B, the manufacturer shall demonstrate that the plastic part is compatible with recycling. Printed circuit boards, connectors, wire and cables are excluded from this requirement.

If the product does not contain plastic parts weighing > 100 g, “Not Applicable” may be declared.

NOTE — For components containing plastic parts, the 100 g threshold applies to the plastic part only.

Verification requirements:

- a) documentation stating each part number or name for plastic parts >100 g.
- b) visual documentation such as photos documenting material type marking on each plastic part

>100 g.

- c) provide instruction or diagram for separation of the plastic parts by hand or with commonly available tools, including a list of commonly available tools needed, if any.

References and details: None

5.3.3 Optional – Further design for plastics recycling

Plastic parts > 50 g for SNE and > 100 g for LNE, with the exception of printed circuit boards, connectors, wire and cables, shall not have:

- molded, glued or otherwise attached metal inserts or metal fasteners, unless the metal component can be completely snapped off manually or entirely removed with commonly available tools; and
- adhesives, coatings, paints, or finishes that have a significant impact on the physical or mechanical properties of the plastic when it is recycled.

If the product does not contain plastic parts weighing >50 g for SNE and >100 g for LNE, “Not Applicable” may be declared.

Point value: 1

Verification requirements:

- a) documentation stating each part number or name for plastic parts > 50 g for SNE and > 100 g for LNE.
- b) documentation that each plastic part > 50 g for SNE and > 100 g for LNE meets the requirements of bullet 1 in the criterion. If the product contains molded, glued or otherwise attached metal inserts or metal fasteners, a letter from a recycler confirming that the metal components can be completely snapped off manually or entirely removed with commonly available tools is an option to demonstrate conformity.
- c) documentation that each plastic part > 50 g for SNE and > 100 g for LNE meets the requirements of bullet 2 in the criterion including either:
- i. test results showing no more than a 25% reduction in either the notched Izod impact at room temperature between a test sample made from the original plastic without adhesives, coatings, paints, or finishes and test sample made from the plastic with adhesives, coatings, paints, or finishes, as measured using ASTM D256 or ISO 180, or the Charpy impact for the same test samples as measured using ISO 179; or
 - ii. peer reviewed published literature concluding no significant impact.

References and details: None

5.4 Information and tools for reuse and recycling

5.4.1 Required - Information and reporting in preparation for reuse and recycling

The manufacturer shall publish product information, consistent with Article 15 of the European Union WEEE Directive 2012/19/EU for use by third-party reuse and recycling organizations, in a language of the manufacturer’s choice. The information shall be made available to reuse and recycling organizations upon request.

The manufacturer shall have a written procedure that requires the information to be available for a minimum of 7 years following the end of production of the product.

Verification requirements:

- a) documentation that demonstrates that the information is available in all regions or countries in which the criterion is declared.
- b) a written procedure that assures that the information is available for 7 years following the end of production of the product.
- c) demonstration that the information complies with requirements of Article 15 of the European Union WEEE Directive 2012/19/EU.

References and details: None

5.4.2 Optional – Further information and reporting in preparation for reuse and recycling

The manufacturer shall make publicly available the additional information about preparation for reuse and recycling listed in Table 5.4.2, including the same information as provided by the manufacturer for use by its technicians for the same purposes.

Table 5.4.2

Information made publicly available
<ul style="list-style-type: none"> — information provided in conformance with criterion 5.4.1 — disassembly information that includes, at a minimum, step-by-step disassembly instructions with required tools for field replaceable components and assemblies; and — description and manufacturer part numbers for field replaceable components and assemblies; and — product trouble shooting information as provided to manufacturers’ authorized repair and refurbishment suppliers

The information shall be available in one or more of the following formats:

- online viewing on the web; or
- downloadable PDFs for offline viewing; or
- machine to machine file format: either HTML, XML or *IEEE 1874 – IEEE Standard for Documentation Schema for Repair and Assembly of Electronic Devices*.

The URL(s) for the manufacturer’s public website disclosing this information shall be provided at the time of product registration and certification, and thereby made publicly available. The manufacturer may exclude information for safety reasons and any information that is

confidential business information.

Point value: 1

Verification requirements:

- a) URL(s) for public disclosure on manufacturer's website.
- b) documentation that demonstrates that the information is available in all regions or countries in which the criterion is declared.
- c) demonstration that all of the required information is provided.
- d) demonstration that the format meets the specified requirements.

References and details: None

5.4.3 Optional – Product marked to identify components and materials requiring selective treatment

The presence and location of all components and materials requiring selective treatment as identified in the European WEEE Directive 2012/19/EU Annex VII shall be visually displayed on the product. The information shall be provided on a label or other permanent marking located on the product or visible upon removal of the external enclosure in order to clearly identify the presence before any treatment. Each component requiring selective treatment need not be labeled, but only a single label need be on the product.

The visual display shall either include the required information on the label or permanent marking, or shall link to the required information on a website that identifies the presence and location of the components and materials requiring selective treatment. The code shall be either a Quick Response (QR) code, or other code, at the choice of the manufacturer, that is in common use with available apps for utilization on mobile devices.

The label, or permanent marking, shall not interfere with the recyclability of the material on which it is affixed. If the label or marking is on a part made of plastic, that part with the label or marking shall meet the requirements of criterion 5.3.3, Further design for plastics recycling.

For products that do not contain components requiring selective treatment, a label or other permanent marking shall be located on the product that indicates the absence of components requiring selective treatment and the product shall be awarded 1 point.

Point value: 1

Verification requirements:

- a) visual documentation showing either a label or permanent marking that is a readable QR code, or other code, or that includes the required information on the label. A photo of the label satisfies this requirement.
- b) if a code is used, demonstration that it links to the required information.

- c) documentation of how the label or permanent marking is compatible with the recyclability of the material on which it is placed as required in criterion 5.3.3, Further design for plastics recycling.

References and details: None

5.4.4 Optional - Functionality testing software tools

The manufacturer shall make publicly available and provide access to the necessary hardware functionality testing software tools and applicable updates that would be necessary to ensure the product meets operating specifications and can be returned to service. Hardware functionality testing software tools developed by a third party may be utilized to meet this requirement, provided the software tools are publicly available and the manufacturer provides information on their accessibility and applicable updates.

Manufacturer shall also make available and provide ability to maintain:

- any system or peripheral firmware (BIOS, etc.),
- feature, functionality, maintenance, and security updates, and
- drivers for the network equipment.

Test software, updates, drivers, and firmware do not have to support versions of the OS newer than the last version officially supported by the manufacturer. Peripheral support only needs to cover peripherals sold and supported by the manufacturer.

The manufacturer shall have a written commitment or policy that makes all of these items available for a minimum of 5 years from the date of sale of the product and identifies if there is a cost. The manufacturer shall declare if there will be any cost associated with the provision of the functionality testing software tool.

The URL(s) for the manufacturer’s public website disclosing this information shall be provided during product registration and certification, and made publicly available.

Point value: 1

Verification requirements:

- a) public disclosure URL(s) demonstrating that the required software tools are publicly available.
- b) documentation of the required written commitment or policy, including identification if there is a cost.

References and details: None

5.5 Product longevity

5.5.1 Required – Product service and, or replacement components availability

An option to purchase product service and, or replacement components through the manufacturer or an authorized third party for at least two years for SNE and five years for LNE

from date of product sale shall be made available. This option may be available free of charge or at separate charge.⁶⁸

Manufacture shall demonstrate a commitment to replacement part availability for at least two years for SNE and five years for LNE from the date of sale.

Replacement components shall include, at a minimum, if present in the product, power supplies, fans or other mechanical cooling devices, hard drives, memory, processors (CPUs) and printed circuit board assemblies.

The URL(s) for the manufacturer's public website disclosing this information shall be provided during product registration and certification, and made publicly available.

For the purposes of this criterion, date of sale refers to the date of sale from the manufacturer or their authorized reseller.

Verification requirements:

- a) manufacturer's website URL(s).
- b) demonstration that the website contains information regarding:
 - i. the availability of product service and, or product replacement components for at least 2-years for SNE and 5-years for LNE after date of sale.
 - ii. how to obtain product service and, or replacement components through the manufacturer or an authorized third party.
- c) demonstration of commitment may include:
 - i. company policy on availability of service and, or replacement parts or
 - ii. contract specifying availability of service and, or replacement part

References and details: None

5.5.2 Required – Secure data deletion

Manufacturer shall ensure that the user has access to functionality for the secure deletion of customer data (including non-volatile memory) contained in the network device, without purchasing separate software, for the purpose of reuse or recycling. Instructions on how to use this functionality, the techniques used and the supported secure data deletion standard(s) must be provided to the user. The functionality for data erasure must conform with the guidelines of NIST 800-88 Revision 1, at a minimum, for the level of "Clear", or equivalent, in accordance with the products storage technology.

Functionality for secure data deletion can be implemented by means of technical solutions such as, but not limited to:

- a functionality implemented in firmware, typically in the Basic Input/Output System (BIOS);
- a functionality implemented in the software included in a self-contained bootable environment such as a bootable compact disc read-only memory (CD-ROM); or

⁶⁸ Note that availability of a warranty or service agreement would meet this verification requirement if it includes the requirements of this criterion.

- digital versatile disc (DVD) or universal serial bus (USB) memory storage device included with the product, or in software installable in the supported operating systems provided with the product.

For SNE, the device shall provide a software function that resets the device so the device can be reused or repurposed.

Verification requirements:

- a) Specifications of the data erasure functionality provided with the product, including reference to compliance with a secure data deletion standard as per the requirements of the criterion.

Types of data include:

- i. Transactional data (e.g., session data);
- ii. Reporting data (consolidated data); and
- iii. Non-volatile memory (routing table) (NVM) – write over with erasable programmable read-only memory (EPROM) & base programming data; firmware data.

References and details: None

5.6 End-of-life management

5.6.1 Required – Provision of product take-back service

Manufacturers shall provide a country-wide or region-wide product take-back service for reuse, refurbishment, and/or recycling for products declared and formerly declared to conform to this Criteria Document, either directly, or through a contracted third party. The reuse, refurbishment, and recycling programs should consider the hierarchy of management of used and end-of-life electronic equipment and components disposal, which prioritizes reuse and refurbishment of equipment and components, then materials recovery. If reuse and/or recovery are not possible, energy recovery and/or disposal may be considered.

The manufacturer shall take responsibility for the provision of the product take-back service. Manufacturer shall inform customers in product promotional materials (e.g., web-based sales information, product specifications) of the availability of the take-back service, and make available information describing the product take-back service, including how to utilize the service, on the manufacturer's public website. The URL(s) for the manufacturer's public website describing the product take-back service shall be provided during product registration and certification, and made publicly available.

Manufacturer shall make information available to the customer and final owner that identifies if there are any direct costs associated with use of the product take-back service. This information may be provided on the public website or upon request.

In jurisdictions where there are existing laws and/or regulations which establish a program for the collection and recycling of registered and formerly registered products, demonstration of compliance with those legal requirements meets the requirements of this criterion.

This criterion is applicable only in countries or regions for which the product is declared to conform to this Criteria Document.

Geographic applicability: This criterion shall be declared the same in all countries or regions for which the product is declared to conform to this Criteria Document. The approach used to conform to this criterion may vary by country or region.

Verification requirements:

- a) in jurisdictions within a country or region where the product is declared to conform to this Criteria Document and where there are existing laws and/or regulations which establish a program for the collection and recycling of registered products, the manufacturer shall demonstrate compliance to those laws and/or regulations.
- b) in jurisdictions within a country or region where the product is declared to conform to this Criteria Document and where there are no existing laws and/or regulations which establish a program for the collection and recycling of products declared to conform to these criteria, the following shall apply:
 - i. demonstration that product take-back service is provided for products declared and formerly declared to conform to this Criteria Document;
 - ii. URL(s) for the manufacturer's public website that describes the product take-back service, including how to utilize the service;
 - iii. evidence that customers are informed of the product take-back service in product promotional materials, and
 - iv. demonstration that information is made available to customers and final owners identifying if there are any direct costs associated with use of the product take-back service. This information identifying if there are any direct costs can be available on the public website, but is not required to be publicly available, provided it is available upon request.

References and details: Manufacturer is not obligated to demonstrate utilization of product take-back management services.

5.6.2 Optional – Manufacturer take-back service for deinstalled network equipment

Manufacturer shall offer, either directly or through a third party, a country-wide or region-wide take-back service to remove and process network equipment and components for which conformance has not been declared and network equipment from other manufacturers that are deinstalled at the customer site, for reuse and, or end-of-life management when new, equivalent network equipment for which conformance has been declared are sold. Manufacturer shall offer the take-back service option either directly or through its distribution channels to the first customer; the customer may choose to utilize the take-back service option or not.

Manufacturer shall inform customers in product promotional materials (e.g., web-based sales information, product specifications) of the availability of the take-back service for deinstalled network equipment, and make available information describing the product take-back service, including how to utilize the service, on the manufacturer's public website.

Manufacturer shall ensure that the network equipment recovered under this criterion are managed in accordance with the management hierarchy and conformance evidence requirements of Sections 5.6.1, Required - Provision of product take-back service, and 5.6.3, Required – End-of-life processing requirements.

This criterion is applicable only in countries or regions for which the product is declared to conform to this Criteria Document.

Point value: 2

Geographic applicability: A manufacturer may declare this criterion differently in each country or region for which the product is declared to conform to this Criteria Document.

Verification requirements:

- a) evidence that customers are informed of the take-back service for deinstalled network equipment in product promotional materials, and the URL(s) for the manufacturer's public website that describes the product take-back service, including how to utilize the service.
- b) evidence that network equipment recovered is managed in conformance with verification requirements for Sections 5.6.1, Required - Provision of product take-back service, and 5.6.3, Required - End-of-life processing requirements.

References and details: None

5.6.3 Required – End-of-life processing requirements

The manufacturer shall demonstrate the following requirements are met for all end-of-life network equipment collected by the manufacturer (or their contractual agent) pursuant to 5.6.1, Required – Provision of product take-back service, by utilizing:

- 1) a government-approved program for end-of-life electronics processing, which includes network equipment and in which the manufacturer does not control the selection of initial service providers for network equipment in the jurisdiction where the network equipment were taken back; or
- 2) initial service providers that meet one of the following:
 - a) are certified by a certification body to a Qualified Electronics Recycling Standard (as specified below), such as:
 - the Responsible Recycling (R2) Standard for Electronics Recyclers;
 - the e-Stewards Standard for Responsible Recycling and Reuse of Electronic Equipment; and
 - EN 50625

Certification bodies shall be accredited by an IAF member accreditation body to certify to the specific Qualified Electronics Recycling Standard identified; or

- b) demonstrate legal compliance to a Qualified Electronics Recycling Standard, in countries or regions that require compliance with a Qualified Electronics Recycling Standard; or
- c) are certified to ISO 45001 or OHSAS 18001 and either ISO 14001 or EU EMAS⁶⁹ by a conformity assessment body that is accredited by an IAF member accreditation body to certify to the applicable management system Standards; and demonstrate conformance through annual third-party audits to a Qualified Electronics Recycling Standard. The audit shall be performed by a third-party conformity assessment body accredited by an IAF

⁶⁹ Certification to Recycling Industry Operating Standard™ (RIOS™) is equivalent; available at: <www.rioscertification.org>

member accreditation body to ISO/IEC 17021-1 or ISO 17065 and with competency to conduct an audit to the Qualified Electronics Recycling Standard.

For products declared in the US and Canada, manufacturers shall conform with a) or b), above.

For either option a) or b) above, the manufacturer may use an initial service provider located in a country other than where the end-of-life equipment is collected in compliance with national laws implementing applicable international agreements.

Qualified Electronics Recycling Standard: A Qualified Electronics Recycling Standard shall be publicly available and meet minimum technical requirements a) through f) below. A certification body or a registry service providing a registry of products declared to conform to this Criteria Document shall determine whether an electronics recycling standard is qualified.

The minimum technical requirements for a Qualified Electronics Recycling Standard are:

- a) the Standard is applicable within the country(s) / region(s) being declared to, and is applicable to the scope of equipment covered by this criterion;
- b) the Standard includes:
 - a definition for “materials of concern” (or analogous term identifying materials with hazardous characteristics as well as materials with special handling needs);
 - requirements for handling and disposition of those materials to protect human health and the environment; and
 - a requirement that initial service providers have a written management plan that addresses “materials of concern” and applicable legal requirements.
- c) the Standard requires that initial service providers shall document, maintain, review annually, and update as needed, an environmental, health and safety management system, and train their workers regarding the implementation of this system;
- d) the standard requires that material intended for reuse, repair, refurbishment, recycling, and disposal shall be managed in accordance with applicable trade and transporting laws of the exporting, transit, and importing countries, as determined by the competent authority of the countries involved;
- e) the standard requires that equipment / components going for reuse, repair, or refurbishment shall be tested or evaluated to determine if the product is suitable for reuse, refurbishment, or repair prior to export. In addition, the standard requires that transboundary movement for reuse, repair, or refurbishment must be in conformance with the laws of the importing, exporting, and transit countries, as determined by the competent authority of the countries involved. For any equipment going for reuse, key functions must be confirmed to be working properly prior to export;
- f) the standard requires that initial service providers shall control, document and track the material flow of all equipment, components, and materials covered by the standard, that pass through its facilities or its control; and

- g) the standard requires initial service providers to track all “materials of concern” to final disposition, and to ensure that the downstream take-back service providers are meeting the requirements of items b) through f).

Geographic applicability: This criterion shall be declared the same in all countries or regions for which the product is declared to conform to this Criteria Document. The approach used to conform to this criterion may vary by country or region.

Verification requirements:

For each of the country(s) / region(s) within which the manufacturer is declaring the product conformant, the following shall be documented:

- a) government-approved program(s) utilized by the manufacturer in the jurisdiction where the product was taken back with evidence that:
 - i. the scope of products covered by the government-approved program includes network equipment covered under the scope of this Criteria Document;
 - ii. the government-approved program accepts network equipment from all network equipment users, or the manufacturer offers take-back as per the requirements of this criterion for network equipment products or users not covered by the government-approved program, if permitted; and
 - iii. the manufacturer is participating in the government-approved program in that country / region.

- b) for each initial service provider that performs take-back services outside of a government-approved program in the jurisdictions where the product was taken back, in conformance with a Qualified Electronics Recycling Standard:
 - i. identification of the Qualified Electronics Recycling Standard(s) used;
 - ii. for initial service providers meeting verification element b), copy / evidence of a current certification, performed by a certification body that is accredited to certify to the Qualified Electronics Recycling Standard (s); and/or
 - iii. for initial service providers meeting verification element b), demonstration of legal compliance to a Qualified Electronics Recycling Standard; and/or
 - iv. for initial service providers meeting verification element b), documentation of the accreditation and competency of third-party conformity assessment body as specified in the bullet above, and findings (including all nonconformances) in the most recent third-party audit reports and other records confirming that all nonconformances have been closed and that the initial service provider conforms to the identified Qualified Electronics Recycling Standard

- c) When an agent is being used, the manufacturer must demonstrate that it has a contract with the agent and that the agent has a contract with the initial service providers that are providing the take-back services for the manufacturer.

References and details: None

5.6.4 Optional – Publicly available record of the reuse / recycling achievement

Manufacturer shall make publicly available on their website the annual reuse, recycling, and recovery achievements (as separate percentages of annual total weight returned as shown in Figure 1 of the take-back service for each country into which the product is declared to conform to this Criteria Document. This criterion applies only to network equipment taken back under Section 5.6.1. Network equipment recovered and processed under national or regional collection schemes (mandated programs) may be included if the data is made available to the manufacturer. If data is not available from a mandated program in which the manufacturer participates, and the manufacturer fulfills Section 5.6.1 solely through mandated programs, the manufacturer may declare “Not Applicable” to this criterion in the country or region.

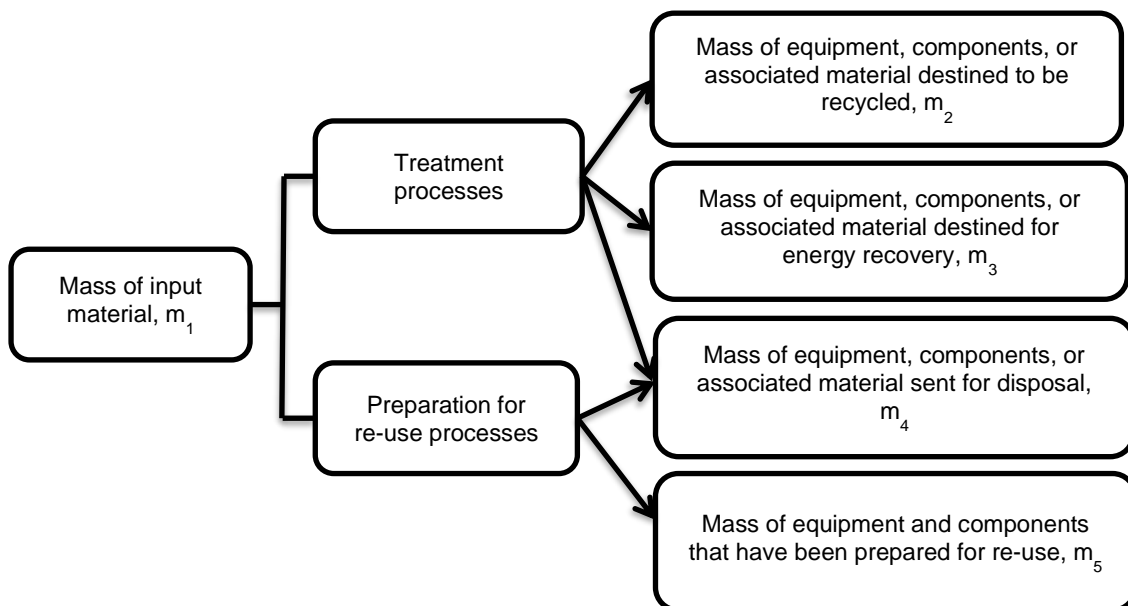
With reference to Figure 1:

Determination and calculation of the reuse, recycling, and recovery achievements at the reuse or treatment facility pursuant to Section 5.6.3, shall start with the receipt of the mass of all network equipment or network equipment components through the take-back service [m_1] and end with:

- [m_5] mass of equipment or components prepared for reuse;
- [m_2] mass of equipment, components, or associated materials intended for recycling that has been sent to the next treatment facility or final destination facility (e.g., smelter, extrusion plant, etc.);
- [m_3] mass of equipment, components, or associated materials sent to a waste to energy facility; and
- [m_4] mass of equipment, components, or associated materials sent to a thermal or landfill facility for disposal.

Figure 1

Flow chart showing separate parts of the reuse and treatment process



The total reuse achievement shall be calculated as:

$$\text{reuse achievement:} \quad \% \text{ rate} = \frac{m_5}{m_1}$$

The total recycling achievement shall be calculated as:

$$\text{recycling achievement:} \quad \% \text{ rate} = \frac{m_2}{m_1}$$

The total recovery achievement shall be calculated as:

$$\text{recovery achievement:} \quad \% \text{ rate} = \frac{m_2 + m_3}{m_1}$$

Point value: 2

Geographic applicability: A manufacturer may declare this criterion differently in each country or region for which the product is declared to conform to this Criteria Document.

Verification requirements:

- a) public URL(s) for manufacturer's website with annual reuse, recycling, and recovery achievements (as separate percentages of their annual total mass returned) of the take-back service for each country or region into which the product is declared to conform to this Criteria Document. At a minimum, the achievement must cover equipment collected under Section 5.6.1, but can include other network equipment; and
- b) statements of:
 - i. reuse from the initial service provider or reuse operator (percentage by weight to the mass of input equipment and, or components received for the preparation of reuse);
 - ii. recycling from the initial service provider or treatment operator (percentage by weight to the mass of end-of-life equipment and, or components received); and
 - iii. recovery from the initial service provider or treatment operator (percentage by weight to the mass of end-of-life equipment and, or components received).

References and details: None

6 Climate Change Mitigation

6.1 Internal power supply efficiency

6.1.1 Required - Energy efficiency of internal power supplies

Internal Power supply / supplies shipped with the product shall have been tested as in conformance with the requirements of the 80 Plus[®] program as specified below in Table 6.1.1 below. If the product does not have an internal power supply, if the internal power supply is direct current (DC), or if a DIN rail power supply is used, this criterion is Not Applicable.

Table 6.1.1

Single Output

Efficiency based on 80PLUS®	For Switches with PSUs Rated
80PLUS PLATINUM	>1000W
80PLUS GOLD	≥ 500W and ≤1000W
80PLUS SILVER	<500 W

Multi Output

Efficiency based on 80PLUS®	For Switches with PSUs Rated
80PLUS GOLD	≥1000W
80PLUS SILVER	≥ 500W and <1000W
80PLUS BRONZE	<500 W

Verification requirements:

- a) bill of material, or other comparable documentation, identifying the tested power supply is sold with the registered product.
- b) One of the following that demonstrates conformance with the 80 Plus® level specified:
 - valid listing on 80 Plus® website, or
 - test report from a laboratory that is accredited to ISO/IEC 17025, where the laboratory's scope of accreditation includes the standard or test method for which it is supplying data, or
 - test report from a laboratory in which the testing is witnessed or supervised by a certification body accredited to ISO/IEC 17065.

References and details: Generalized Internal Power Supply Efficiency Test Protocol, Rev. 6.7.1, available at: [https://www.plugloadsolutions.com/docs/collatrl/print/Generalized Internal Power Supply Efficiency Test Protocol R6.7.1.pdf](https://www.plugloadsolutions.com/docs/collatrl/print/Generalized%20Internal%20Power%20Supply%20Efficiency%20Test%20Protocol%20R6.7.1.pdf)

6.1.2 Optional - Energy efficiency of internal power supplies

Power supply / supplies shipped with the product shall have been tested as in conformance with the requirements of the 80 Plus[®] program as specified below in Table 6.1.2 below. If the product does not have an internal power supply, if the internal power supply is direct current (DC), or if a DIN rail power supply is used, this criterion is Not Applicable.

Table 6.1.2

Single Output

Efficiency based on 80PLUS®	For Switches with PSUs Rated
80PLUS TITANIUM	>1000 W
80PLUS PLATINUM	≥ 500W and ≤1000W
80PLUS GOLD	<500 W

Multi Output

Efficiency based on 80PLUS®	For Switches with PSUs Rated
80PLUS PLATINUM	>1000 W
80PLUS GOLD	≥ 500W and ≤1000W
80PLUS SILVER	<500 W

Point value: 1

Verification requirements:

- a) bill of material, or other comparable documentation, identifying the tested power supply is sold with the registered product.
- b) One of the following that demonstrates conformance with the 80 Plus® level specified:
 - valid listing on 80 Plus® website, or
 - test report from a laboratory that is accredited to ISO/IEC 17025, where the laboratory's scope of accreditation includes the standard or test method for which it is supplying data, or
 - test report from a laboratory in which the testing is witnessed or supervised by a certification body accredited to ISO/IEC 17065.

References and details: Generalized Internal Power Supply Efficiency Test Protocol, Rev. 6.7.1, available at:
[https://www.plugloadsolutions.com/docs/collatrl/print/Generalized Internal Power Supply Efficiency Test Protocol R6.7.1.pdf](https://www.plugloadsolutions.com/docs/collatrl/print/Generalized%20Internal%20Power%20Supply%20Efficiency%20Test%20Protocol%20R6.7.1.pdf)

6.2 External power supply efficiency

6.2.1 Required —Energy efficiency for external power supplies

The external power supply shipped with the product shall have an efficiency at least meeting the International Efficiency Marking Protocol for External Power Supplies Level VI average efficiency levels, for the applicable external power supply product class.

If the product does not ship with an external power supply, if the external power supply is direct current (DC), or if a DIN rail power supply is used this criterion is Not Applicable.

Verification requirements:

- a) bill of material, or other comparable documentation, identifying the tested power supply is sold with the registered product.
- b) One of the following that demonstrates conformance with the 80 Plus® level specified:
 - valid listing on 80 Plus® website, or
 - test report from a laboratory that is accredited to ISO/IEC 17025, where the laboratory's scope of accreditation includes the standard or test method for which it is supplying data, or
 - test report from a laboratory in which the testing is witnessed or supervised by a certification body accredited to ISO/IEC 17065.

References and details: U.S. Department of Energy External Power Supplies Energy Conservation Standard Final Rule, *Federal Register* 79 no. 27 (February 10, 2014).

6.2.2 Optional—Energy efficiency for external power supplies

The external power supply shipped with the product shall have an efficiency at least 1.0% higher than the International Efficiency Marking Protocol for External Power Supplies Level VI average efficiency levels, for the applicable external power supply product class. (*e.g., If the level VI minimum average efficiency in active mode requirement is 88.0%, it would need a minimum average efficiency in active mode of at least 89.0%.*) If the product does not ship with an external power supply, if the external power supply is direct current (DC), or if a DIN rail power supply is used, this criterion is Not Applicable.

Point value: 1

Verification requirements:

- a) bill of material, or other comparable documentation, identifying the tested power supply is sold with the registered product.
- b) One of the following that demonstrates conformance with the 80 Plus® level specified:
 - valid listing on 80 Plus® website, or
 - test report from a laboratory that is accredited to ISO/IEC 17025, where the laboratory's scope of accreditation includes the standard or test method for which it is supplying data, or
 - test report from a laboratory in which the testing is witnessed or supervised by a certification body accredited to ISO/IEC 17065.

References and details: U.S. DOE External Power Supplies Energy Conservation Standard Final Rule, *Federal Register* 79 no. 27 (February 10, 2014).

6.3 Energy Efficiency of Small Network Equipment

6.3.1 Required – Energy efficiency of Small Network Equipment

The product shall not exceed the electric power consumption limits for “Idle” and “On” states in the European Union Code of Conduct for Broadband Equipment applicable Tier for the year the product was first made available on the market.

Verification requirements:

- a) Documentation demonstrating the equipment and how it relates to the definitions in the Code of Conduct on Energy Consumption of Broadband Equipment (*e.g., number of ports and functions*).
- b) Documentation demonstrating the year the product was first made available on the market.
- c) Test report demonstrating measured power for idle and on state that are issued by a laboratory that is:
 - i. accredited by one of ILAC MRA signatories according to ISO/IEC 17025; and

- ii. holding accreditation scope that cover the standards relevant to the above measurement requirement.

References and details: EU Code of Conduct on Energy Consumption of Broadband Equipment Version 7.1 and Reporting Sheet Code of Conduct Broadband equipment.

6.3.2 Optional – Small Network Equipment load dependent power management

The electrical power consumption during active operation must be both functionally and load dependent and have automatic power management to reduce electrical power consumption or allow the user to individually enable or disable non-required functions or select individual energy saving settings using a software function or a switch.

Table 6.3.2

Requirement	Limit
LAN	<ul style="list-style-type: none"> • The electric power consumption of unused LAN ports, i.e., ports with no cable connected as well as ports with a non- active device connected shall be minimized automatically. • Router with Gigabit Ethernet ports shall detect connections to devices with Fast Ethernet ports and adapt the power consumption.

All copper-based physical network ports in product must support the Energy Efficiency Ethernet (EEE) defined by IEEE 802.3az.

Point value: 1

Verification Requirements:

- a) Documentation, such as specification, demonstrating that product meets the relevant requirements.

References and details: IEEE 802.3az Energy Efficiency of Small Network Equipment

6.4 Energy efficiency of Large Network Equipment

6.4.1 Required – Energy efficiency of large network equipment

The product shall conform with the most current version of the ENERGY STAR for Large Network Equipment program, as per the requirements in Table 6.4.1 below.

Table 6.4.1

Region or country	Requirement
U.S. and Canada	— product shall be ENERGY STAR certified

<p>ENERGY STAR international partner countries or regions</p>	<p>— product shall conform with the international partner country’s or region’s current ENERGY STAR Large Network Equipment Qualification Criteria</p> <p>Or</p> <p>— product shall be on the country’s or region’s ENERGY STAR qualified product listing</p>
<p>Countries or regions that are not ENERGY STAR international partners</p>	<p>— product shall conform with the current version of the U.S. ENERGY STAR Large Network Equipment Eligibility Criteria</p>

Verification requirements:

- a) identification of which of the above requirements in Table 6.4.1 to which the product conforms.
- b) documentation demonstrating that product meets the relevant requirements in Table 6.4.1
- c) for products that are not ENERGY STAR certified or listed on an international partner’s ENERGY STAR qualified product listing, test results from an ENERGY STAR accredited lab³ demonstrating that product conforms with the current version of the U.S. ENERGY STAR Large Network Equipment Eligibility Criteria.

References and details: [ENERGY STAR® Large Network Equipment specification](#)

6.5 Supply chain energy efficiency

6.5.1 Optional – Energy efficient supply chains

Manufacturer shall demonstrate that supplier facilities providing the design and, or manufacture of one or more listed components or services meet one of the following:

- a) self-declaration of an energy management system that meets the requirements of ISO 50001, or a nationally adopted version of the standard;
- b) third-party certification to ISO 50001 or a nationally adopted version of ISO 50001. A supplier manufacturing facility will be considered ISO 50001 certified if it is certified individually or if it is within the scope of an enterprise ISO 50001 certification. Certification(s) shall be obtained from a certification body accredited by an accreditation body that is a signatory to the International Accreditation Forum (IAF) Multilateral Recognition Arrangement (MLA) with the appropriate scope of accreditation.
- c) Third-party certification to one of the following:
 - the US DOE 50001 Superior Energy Performance™ (50001 SEP) program by an ANAB-accredited SEP verification body(ies); or
 - Korea Superior Energy Management System (Superior EnMS) Program); or

- a nationally equivalent program. An equivalent program shall meet the requirements of the US DOE 50001 SEP program.

Where a corporate certification is achieved by a supplier in accordance with a multisite certification, the certificate shall include all facilities claimed in the scope of facilities below.

The scope of facilities for this criterion includes suppliers of the following nine component or service categories for products within the scope of this Criteria Document:

- printed circuit board;
- printed circuit board assembly;
- integrated circuit;
- memory;
- microprocessors;
- battery;
- power supply;
- fans; and
- final assembly.

Optional points shall be awarded based on the number of credits achieved through the suppliers' facilities meeting a), b) or c) above. Supplier facilities receive credit as follows:

- a) Facilities meeting part a) receive $\frac{1}{2}$ credit
- b) Facilities meeting part b) receive 1 credit
- c) Facilities meeting part c) receive 2 credits

Optional points are awarded as follows:

- 1 optional point for 10 supplier facility credits; or
- 2 optional points for 20 supplier facility credits.

The number of facilities for which credits may be claimed are limited to:

- 2 suppliers per component or service category; and
- 3 facilities per supplier.

Point value: 1 or 2

Geographic applicability: This criterion shall be declared the same in all countries or regions for which the product is declared to conform to this Criteria Document. The approach used to conform to this criterion may vary by country or region.

Verification requirements:

- a) identification of the suppliers, components, and number of facilities or enterprises that meet the requirements of Part a), b) or c);
- b) for facilities claiming Part a), either copy of 50001 Ready program recognition certificate(s) at the facility level, or all of the following:
 - i. copy of the EnMS policy;
 - ii. document demonstrating top management commitment to the EnMS;
 - iii. description of context and scope of the EnMS;

- iv. energy review within the EnMS, scope and resulting significant energy uses, and at least 24 months of energy consumption data prior to the time product declaration;
- v. list of energy objectives, energy performance indicators (EnPIs), energy baseline(s) and action plans to achieve objectives;
- vi. demonstration of process to manage and implement annual internal ISO 50001 audits and summary of results of annual internal ISO 50001 audits;
- vii. documentation of annual management review and management decisions of effectiveness and suitability of the EnMS; and
- viii. evidence of continual improvement of the organization's energy performance through the results of the implemented action plans.

c) either one, or a combination of the following:

- for Part b), certificates, either at facility or enterprise level to ISO 50001 certification(s) or to certification(s) to a nationally adopted version of the Standard for all facilities claimed in scope. Certification(s) shall be obtained from a certification body accredited by an accreditation body that is a signatory to the IAF MLA with the appropriate scope of accreditation; And/or
- for Part c):
 - documentation of current US DOE 50001 SEP program certification, or certification(s) to a nationally equivalent 50001 SEP program; and
 - national program meets US DOE 50001 SEP program equivalency, if an equivalent 50001 SEP program is used.

References and details: None.

6.6 Manufacturing chemicals

6.6.1 Optional – Mitigation and inventory of process fluorinated greenhouse gas emissions resulting from semiconductor manufacturing

At least one supplier of central processing units (CPUs), dynamic random-access memory (DRAM), and, or accelerators used in the products declared to conform to these criteria shall have:

- developed a process F-GHG emissions inventory using one of the following methods:
 - the most recent IPCC Tier 2a, 2b, or Tier 3 methodology, or
 - methods included in the US EPA GHG Reporting Rule, Subpart I.

If the emissions inventory is not already publicly available, the supplier shall make the process F-GHG emissions inventory available to the manufacturer for the following categories of process F-GHGs: SF6, NF3, PFCs, and HFCs.

- a GHG emissions reduction goal, or maintains year-to-year GHG emissions reduction activities, and publicly reports progress toward this goal or on emission reduction activities, on an annual basis. The reduction goal and activities may include other GHG emission sources, but shall at least include direct process F-GHG emissions from the semiconductor manufacturing process. Process

F-GHG's are defined as SF₆, NF₃, PFCs and HFCs. Examples of F-GHGs include, but are not limited to, CF₄, C₂F₆, C₃F₈, C-C₄F₈, C₄F₆, C₄F₈O, CHF₃, CH₂F₂, CH₃F, NF₃, and SF₆.

This criterion applies to fabrication facilities associated with products covered by the criteria document. It is acceptable if only a portion of the supplier fabrication facilities is associated with the products covered under this Criteria Document.

Points shall be awarded according to Table 6.6.1.

Table 6.6.1

GHG emissions activity	Total points
F-GHG emissions inventory	1
F-GHG emissions inventory AND GHG emissions reduction goal or emission reduction activities	2

Point value: Maximum 2.

Geographic applicability: This criterion shall be declared the same in all countries or regions for which the product is declared to conform to this Criteria Document. The approach used to conform to this criterion may vary by country or region.

Verification requirements:

- a) For F-GHG emissions inventory:
 - i. documentation of process F-GHG emissions inventory and reporting using one of the following:
 - 1. latest IPCC Tier 2a, 2b, or Tier 3 methodology, or
 - 2. subpart I of the US EPA GHG Reporting Rule.

If the emissions inventory is not already publicly available, documentation that the supplier has made the process F-GHG emissions inventory available to the manufacturer for the following categories of process F-GHGs: SF₆, NF₃, PFCs, and HFCs.

- ii. unless specified already in the first verification above, reporting of:
 - 1. specification of the method used in the first verification above to estimate F-GHG emissions; and
 - 2. specification of the method used to estimate DREs of abatement equipment (e.g., facility-specific measurements or IPCC defaults).

- b) For GHG emission reduction goal or emission reduction activities:
 - i. supplier documentation that states emissions reduction goal or emission reduction activities and describes progress toward goal or progress made due

- to emission reduction activities, made publicly available for example on a website; and
- ii. if not already included in the previous verification, supplier letter that includes:
1. definition of baseline year for process F-GHG emissions reduction goal or emission reduction activities; and
 2. description of the method(s) implemented to reduce process F-GHG emissions. This may include any one or a combination of, but not limited to, the pollution prevention approaches outlined below, as applicable:
 - a. process recipe optimization;
 - b. greenhouse gas replacement;
 - c. point of use (POU) abatement; and
 - d. remote plasma clean.

References and details:

World Semiconductor Council Best Practice Guidance of PFC Emission Reduction, 2012.⁷⁰

Semiconductor Industry Association Post-2010 voluntary PFC emissions reduction goal.⁷¹

IPCC Fifth Assessment report - Appendix 8.A: Lifetimes, Radiative Efficiencies and Metric Values (Table 8.A.1)⁷²

6.7 Environmental impact of product transportation

6.7.1 Optional – Environmental impact of product transportation

Manufacturers shall annually conduct an assessment of greenhouse gas (GHG) emissions from supply chain transportation activities for products declared to conform to this Criteria Document, from the point of final product assembly to the customer, or transfer of product ownership.

The scope shall include transport for the applicable modes of freight movement for road, air, sea, inland waterways, and rail, for products declared to conform to this Criteria Document. The manufacturer may include additional products in the scope.

The manufacturer may choose to exclude from the assessment transportation segments where the customer controls the decision on the carrier choice and/or mode of transportation.

The assessment of supply chain GHG emissions shall include well-to-wheel GHG emissions from all modes of freight movement utilized (road, air, sea, inland waterways, ports, warehouses, terminals and rail), and shall be performed once per fiscal or calendar year using one or a combination of the following approaches:

- the Global Logistics Emissions Council (GLEC) Framework;
- the following mode-specific methodology as geographically applicable (if well-to-tank emissions are not included in a mode-specific methodology they shall be included by means of a scaling factor [such as that included in GLEC]):

⁷⁰ World Semiconductor Council <www.semiconductorcouncil.org>

⁷¹ Semiconductor Industry Association. <www.semiconductors.org>

⁷² IPCC 5th Assessment Report - https://www.ipcc.ch/site/assets/uploads/2018/02/WG1AR5_Chapter08_FINAL

- **road:** SmartWay or EN 16258;
- **air:** International Air Transportation Association (IATA) RP1678;
- **rail:** SmartWay or EcoTransIT;
- **sea:** Clean Cargo Working Group (CCWG) or International Maritime Organization (IMO);
- **inland waterways:** SmartWay or IMO.

— a methodology which includes a well-to-wheel performance-based assessment that uses fuel-based or activity-based metrics for each applicable mode (e.g., weight and/or volume of freight moved, and/or distance by mode). Data used shall include fuel consumption and published emission factors by fuel type.

A summary of results for absolute freight GHG emissions (e.g., annual tonnes of CO₂e) and normalized GHG emissions (e.g., grams of CO₂e per tonne-km) for each mode (road, air, rail, inland waterways and sea) shall be publicly disclosed and shall indicate what framework or mode-specific approaches were used and where third-party verification applies.

Manufacturers shall also develop a transport supply chain greenhouse gas emission reduction goal and publicly report progress towards meeting this goal annually.

Point value: 1

Geographic applicability: This criterion shall be declared the same in all countries or regions for which the product is declared to conform to this Criteria Document. The approach used to conform to this criterion may vary by country or region.

Verification requirements:

- a) demonstration of:
 - i. the location where the summary of results, the transport supply chain greenhouse gas reduction emission goal and progress report towards the goal are publicly posted (e.g., manufacturer URL(s), Corporate Sustainability Report (CSR) report, or program URL(s)); and
 - ii. if applicable, third-party verification in conformance with the applicable modes in the GLEC Framework or other mode-specific approaches described above. Document shall include credentials and contact information of third-party verifier.

References and details:

Well-to-wheel emissions is an accounting of the life cycle GHG emissions from transportation of products. Well-to-wheel analysis assesses the overall greenhouse gas impacts of a fuel, that include each stage of its production and use. GLEC defines this as an “approach to estimate the impact of the full fuel cycle including fuel production.”

Well-to-tank emissions is an accounting of the GHG emissions from fuel production, including extraction, cultivation, refining, transformation, transport, and distribution of fuels. This is the first stage of the life cycle GHG emissions, before the combustion “tank-to-wheel” or “operating phase.” GLEC defines “well-to-tank” as “upstream phase of fuel production only.”

7 Corporate Environment, Social and Governance (ESG) Performance

7.1 Environmental management system

7.1.1 Required – Environmental management system (EMS)

Manufacturer shall have formal, self-declared EMS for those parts of the company that have significant responsibility for the design and manufacture of all products declared to conform to this Criteria Document. The EMS shall meet the requirements of ISO 14001. Certification to either ISO 14001 or EMAS (European Union Eco-Management and Audit Scheme) meets this requirement.

Manufacturers who do not perform their own product design and who do not manufacture products in their own facilities shall claim “Not Applicable.”

Geographic applicability: This criterion shall be declared the same in all countries or regions for which the product is declared to conform to this Criteria Document. The approach used to conform to this criterion may vary by country or region.

Verification requirements:

- a) demonstration that the EMS meets the requirements of ISO 14001:
 - i. copy of ISO 14001 certification(s), or copy of EMAS certification(s); and
 - ii. for self-declared EMS, copy of EMS.
- b) list of all design and manufacturing operations of the company with significant responsibility for products declared to conform to this Criteria Document, and
- c) demonstration that the EMS is applicable to those operations listed in the b).

7.1.2 Optional – Environmental management system (EMS) certification

EMS specified in Section 7.1.1 shall be certified to either ISO 14001 or European Union EMAS by an accredited third-party certification body. Certification bodies shall be accredited by an International Accreditation Forum member accreditation body to certify to the specific Standard identified.

Manufacturers who do not perform their own product design and who do not manufacture products in their own facilities shall claim “Not Applicable.”

Point value: 1

Geographic applicability: This criterion shall be declared the same in all countries or regions for which the product is declared to conform to this Criteria Document. The approach used to conform to this criterion may vary by country or region.

Verification requirements:

- a) copy of ISO 14001 or European Union EMAS certificate or certificates covering company design and manufacturing operations in b); and

- b) list of all design and manufacturing operations of the company with significant responsibility for products declared to conform to this Criteria Document.

References and details: None

7.2 Supply chain reporting

7.2.1 Optional – Environmental and social responsibility reporting on nine suppliers

Manufacturer shall publicly disclose corporate environmental and social responsibility performance using the key performance indicators (or indicators) listed in Table 7.2.1.

The disclosure for this criterion shall include performance information for at least nine suppliers, and shall include three of the manufacturer's top six suppliers (by annual spend, fiscal or calendar) of each of the following two types of components, if applicable, for the product covered by this Criteria Document:

- processor(s) (CPU); and
- printed circuit board(s).

The suppliers included in the disclosure may change from year to year. If there are less than three suppliers for a component type named above, every supplier for that component type shall be included in the public disclosure.

Manufacturer may publicly disclose key performance indicators by supplier or in aggregate. Supplier names are not required in the public disclosure.

Reporting format and frequency:

- disclosures shall be publicly available on the manufacturer's website. It is acceptable to provide a link on the manufacturer's website to the disclosure on the supplier's website;
- data shall be reported consistent with the Topic-specific Standards in the GRI Sustainability Reporting Standards (GRI Standards) listed in Table 7.2.1. Manufacturers or suppliers may use a reporting framework or program other than the GRI Standards (e.g., CDP, Responsible Business Alliance [RBA], or Sustainability Accounting Standards Board [SASB]) if it can be demonstrated how the required topic-specific standards in Table 7.2.1 map to the alternative framework or program;
- publication of a full report or reports 'in accordance' with the GRI Standards is not required, but would meet the requirements of this criterion if the report(s) covers the indicators specified in this criterion; and
- performance against the indicators shall be reported and publicly disclosed at least annually.

Manufacturer may claim up to 2 points for this criterion. To claim 1 point, any six of the indicators listed in Table 7.2.1 shall be publicly disclosed for all nine suppliers. To claim 2 points, ten of the twelve GRI indicators listed in Table 7.2.1 shall be publicly disclosed for all nine suppliers.

Table 7.2.1

Key performance indicators	Consistent with topic-specific GRI standard disclosure
energy consumption outside of the organization	302-2
energy intensity	302-3
reduction of energy consumption	302-4
direct GHG emissions (Scope 1)	305-1
energy indirect GHG emissions (Scope 2)	305-2
materials used by weight or volume	301-1
total water withdrawal by source	303-1
water recycled and reused; or water discharge by quality and destination	303-3; or 306-1
waste by type and disposal method	306-2
freedom of association and collective bargaining	407-1
operations with risk for forced or compulsory labor	409-1
operations with risk for incidents of child labor	408-1

Point value: Maximum 2

Geographic applicability: This criterion shall be declared the same in all countries or regions for which the product is declared to conform to this Criteria Document. The approach used to conform to this criterion may vary by country or region.

Verification requirements:

- a) URL(s) for public disclosure on manufacturer’s website for the scope of suppliers covered by the criterion;
- b) if the manufacturer has less than three suppliers for any of the three listed components, a signed statement from manufacturer stating the number of suppliers of the component;
- c) if claiming 1 point, identification of which six indicators in Table 7.2.1 are addressed in the public disclosure for each of the nine suppliers. If claiming 2 points, identification of which ten indicators in Table 7.2.1 are addressed in the public disclosure for each of the nine suppliers;
- d) for each disclosure that uses a reporting framework or program other than GRI, demonstration of how the key performance indicators map to the Topic-specific GRI Standard disclosures in Table 7.2.1; and

- e) demonstration of at least one public disclosure for nine suppliers must be available at the time of first declaration to the criterion, and annually thereafter.

References and details: None

7.2.2 Optional – Environmental and social responsibility reporting on suppliers

Manufacturer shall publicly report on corporate environmental and social responsibility performance that includes the key performance indicators listed in Table 7.2.2, and which use the reporting format and frequency specified in Section 7.2.2.

The disclosure for this criterion shall include all suppliers who directly contract with the manufacturer and perform a manufacturing or assembly function for the manufacturer’s network equipment products. Public disclosure of supplier names is not required.

Public disclosure shall be made in accordance with Table 7.2.2.

Table 7.2.2

Consistent with topic-specific GRI Standards	Key performance indicators	Disclosure must include evaluation of supplier on these impacts:
414-1	new suppliers screened using social criteria	— disclosure must specify which social impacts were used for screening and evaluation for these indicators; and — labor practice criteria for screening and assessments must include compliance with laws on: — minimum wages; — working hours; and — compensation for overtime.
414-2	negative social impacts in supply chain and actions taken	
308-1	new suppliers that were screened using environmental criteria	— disclosure must specify which environmental impacts were used for screening and evaluation for these indicators.
308-2	negative environmental impacts in the supply chain and actions taken	

If a manufacturer does not contract for the manufacturing and assembly for the manufacturer’s network equipment products, “Not Applicable” may be declared.

Point value: 2

Geographic applicability: This criterion shall be declared the same in all countries or regions for which the product is declared to conform to this Criteria Document. The approach used to conform to this criterion may vary by country or region.

Verification requirements:

- a) URL(s) for public disclosure on manufacturer’s website in accordance with the requirements of the criterion;
- b) list of suppliers who perform manufacturing or assembly functions for the product declared to conform to this Criteria Document;

NOTE — This list is only provided for verification purposes and is not intended for public disclosure. The manufacturer may choose to identify suppliers in generic terms (such as Supplier A, B, C)

- c) for each disclosure that uses a reporting framework or program other than GRI, demonstration of how the key performance indicators map to Topic-specific GRI Standard disclosures in Table 7.2.2; and
- d) demonstration of at least one public disclosure for suppliers must be available at the time of first declaration to the criterion, and annually thereafter.

References and details: None

7.3 Responsible mineral sourcing

7.3.1 Required – Public disclosure of use of conflict materials in products (corporate)

Manufacturers shall:

- determine whether any of their products that they manufactured or contracted to have manufactured contain conflict minerals that are necessary to the functionality or production of those products and prepare disclosures on use and sources of these minerals in conformance with Rule 13p-1 under the US Securities Exchange Act of 1934; and
- make such disclosures publicly available on their websites. The URL(s) for the manufacturer’s public website disclosing this information shall be provided during product registration and certification, and made publicly available.

These requirements apply to all manufacturers with products conforming to this Criteria Document, regardless of whether they are Securities and Exchange Commission (SEC) registrants. Small business, as defined below are exempt from this criterion.

In instances where the manufacturer is not required to be a registrant with the US SEC, all elements of the disclosure under Rule 13p-1 are required, except the US administrative requirements (e.g., IRS employer identification number).

For the purposes of this criterion, an “exempt small business” is a company that:

- is not a subsidiary of or under common control with one or more other companies, and
- whose annual revenues are less than \$50 million USD in the most recent complete fiscal year for which audited financial statements are available, provided that the period for such audited financials concluded within the thirty-six months preceding product registration.

Geographic applicability: This criterion shall be declared the same in all countries or regions for which the product is declared to conform to this Criteria Document. The approach used to conform to this criterion may vary by country or region.

Verification requirements:

- a) public disclosure on the company website of conflict minerals found in its products in conformance with Rule 13p-1 under the US Securities Exchange Act of 1934.
- b) URL(s) of the conflict mineral public disclosure on the company website.
- c) for exempt small businesses, a statement that the organization is not a subsidiary of nor under common control of a larger company and a copy of its most recent (but not more than three years old) audited financial statements, indicating that annual earnings were below \$50 million USD.

References and details: None

7.3.2 Optional – Sourcing from validated conflict free smelters

Manufacturers shall conduct due diligence to determine all sources of conflict minerals used in the covered products and demonstrate that they are from either:

- recycled or scrap sources; or
- smelters and, or refiners that have been determined to be “conflict free”, consistent with the definitions provided for in Rule 13p-1 under the US Securities Exchange Act of 1934.

Due diligence shall conform to a nationally or internationally recognized due diligence framework, such as the OECD *Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High-Risk Areas* (OECD Guidance). A brief description of the due diligence inquiry and the determination shall be publicly disclosed.⁷³

If claiming “conflict-free”, independent private sector audit (IPSA) is required to verify manufacturer’s control systems and justification for determination, conducted in accordance with Rule 13p-1 under the US Securities Exchange Act of 1934.

NOTE — For this criterion, “recycled or scrap sources” are defined as recycled metals that are reclaimed from end-user or postconsumer products, or scrap processed metals created during product manufacturing. Recycled metal includes excess, obsolete, defective, and scrap metal materials which contain refined or processed metals that are appropriate to recycle in the

⁷³ For example on a manufacturer’s website or SEC’s EDGAR (Electronic Data Gathering, Analysis, and Retrieval system), etc.

production of tin, tantalum, tungsten and, or gold. Minerals partially processed, unprocessed or a byproduct from another ore are not recycled metals.⁷⁴

Point value: 1

Geographic applicability: This criterion shall be declared the same in all countries or regions for which the product is declared to conform to this Criteria Document. The approach used to conform to this criterion may vary by country or region.

Verification requirements:

- a) URL(s) to a public website that contains a description of due diligence inquiry and determination.
- b) if claiming “conflict free,” copy of the independent private sector audit report, as specified in the criterion, verifying the manufacturer’s determination of conflict-free sourcing.

References and details: None

7.3.3 Optional – Participation in in-region conflict-free sourcing program

Manufacturer shall participate in or source minerals from at least one of the in-region conflict free controlled chain-of-custody sourcing programs which are validating and, or sourcing minerals from certified conflict free sources in the Great Lakes region of Africa. In-region conflict free controlled chain-of-custody sourcing programs shall also meet the following criteria:

- multi-stakeholder participation (i.e., more than just one organization);
- is endorsed, recognized, funded, or contracted by the International Conference of the Great Lakes Region (ICGLR), European Union, OECD, United Nations, or US government agency / stakeholder (USAID, state department);
- increases the supply of conflict-free minerals (3TG or other conflict minerals as defined by countries that regulate importation of conflict minerals, e.g., EU Regulation 2017/821)⁷⁵ or reduces human rights abuses associated with mineral extraction;
- has a system of oversight and public reporting; and
- does not allow donation, participation, or activities by a manufacturer’s foundation to meet requirements.

Examples of programs that meet this requirement include Responsible Artisanal Gold Solutions Forum, International Tin Research Institute (ITRI), iTSCi (International Tin Supply Chain Initiative), Better Sourcing Program (BSP), Partnership Africa Canada’s Just Gold Program, Diamond Development Initiative, European Partnership for Responsible Minerals (EPRM), and Public Private Alliance for

⁷⁴ OECD Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High Risk Areas, p 12, FN 1, <https://www.oecd.org/daf/inv/mne/OECD-Due-Diligence-Guidance-Minerals-Edition3.pdf>

⁷⁵ Regulation (EU) 2017/821 of the European Parliament and of the Council; 17 May 2017, Annex 1, <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32017R0821>

Responsible Mineral Trade (PPA). “Participation in” may include, but is not limited to, providing in-kind personnel services or other resources to an in-region conflict-free sourcing program.

Point value: 2

Geographic applicability: This criterion shall be declared the same in all countries or regions for which the product is declared to conform to this Criteria Document. The approach used to conform to this criterion may vary by country or region.

Verification requirements:

- a) evidence of participation in at least one in-region conflict free sourcing program, as defined above (e.g., manufacturer listed on program website, or confirmation from the program); or
- b) documentation that the manufacturer sources conflict minerals for any of its products from certified conflict free sources in the Great Lakes Region of Africa, including:
 - i. name of sourcing program and evidence of manufacturer sourcing from program;
 - ii. name of conflict mineral sourced from sourcing program and the minimum amount sourced annually by the manufacturer; and
 - iii. component and product that the conflict-free mineral is used.

References and details: None

7.4 Compliance with occupational health and safety and social responsibility performance Standards

7.4.1 Required – Manufacturer conformance with occupational health and safety performance

Conformance to ISO 45001 *Occupational Health and Safety Management Systems*, ANSI/AIHA/ASSE Z10, *Occupational Health and Safety Management Systems*, or OHSAS 18001 shall be maintained for all manufacturer-owned operations with significant responsibility for the manufacture or assembly of products declared to conform to this criterion document. The manufacturer shall incorporate these standards into the manufacturer’s management system specified in Section 7.1.1, Environmental management system or maintain separate conformance to one of these occupational health and safety standards.

Geographic applicability: This criterion shall be declared the same in all countries or regions for which the product is declared to conform to this Criteria Document. The approach used to conform to this criterion may vary by country or region.

Verification requirements:

- a) list of all manufacturer-owned operations with significant responsibility for the manufacture or assembly of products declared to conform to this Criteria Document OR a signed statement from a company official that the company does not directly perform ANY manufacturing or assembly of the products declared to conform to this Criteria Document; and

- b) for self-declared, a copy of management system documentation applicable to operations in a) that demonstrate conformance with ISO 45001, ANSI/AIHA/ASSE Z10 or OHSAS 18001; or
- c) for certified facilities, copy of certification or certifications to ISO 45001, ANSI/AIHA/ASSE Z10 or OHSAS 18001 applicable to operations in a).

7.4.2 Optional – Supply chain conformance to occupational health and safety performance standards

Manufacturer shall ensure that three of their top six suppliers (by annual spend, fiscal or calendar) for each of these two main components, if applicable to the product declared to conform to this Criteria Document, (processor[s] [CPU]; and printed circuit board[s]) produce these components in supplier facilities that conform to or are certified to ISO 45001, ANSI/AIHA/ASSE Z10 or OHSAS 18001 if the facility is owned or operated by the supplier. Certification(s) shall be obtained from a certification body accredited by an accreditation body that is a signatory to the International Accreditation Forum (IAF) Multilateral Recognition Arrangement (MLA) with the appropriate scope of accreditation.

If there are less than three suppliers for a component type named above, every supplier for that component type needs to provide data.

NOTE — For the purpose of this criterion “facility” is defined as a manufacturing site that is majority owned or operated by one of the suppliers within the scope of this criterion.

Point value: 2

Geographic applicability: This criterion shall be declared the same in all countries or regions for which the product is declared to conform to this Criteria Document. The approach used to conform to this criterion may vary by country or region.

Verification requirements:

- a) either demonstration of conformance or copy of current certificate or URL(s) verifying current certification to ISO 45001, ANSI/AIHA/ASSE Z10 or OHSAS 18001 for facilities owned or operated by three of their top six suppliers that produce the following two components, if applicable, for the product declared to the Standard:
 - i. principle semiconductor device(s); and
 - ii. printed circuit board(s).
- b) if the manufacturer has fewer than three suppliers of components listed in a), a signed statement from a company official stating the number of suppliers the company has for the product declared to the criterion.

References and details: None

7.4.3 Optional – Certification to social responsibility performance standard

Manufacturer shall ensure that all supplier owned or operated facilities of three of its six top suppliers (by annual spend, fiscal or calendar) that manufacture each of two main components (processor[s] [CPU]; and printed circuit board[s]), if applicable, for the product are:

— certified by accredited certification bodies to Social Accountability (SA) 8000. Certification bodies shall be accredited by an authorized accreditation body to certify to the SA8000. The certification shall be no older than three years (2 points).

Optional points shall only be awarded for SA8000 certification if all facilities designated above are certified to SA8000. If there are fewer than three suppliers for a component type named above, every supplier for that component shall conform to this criterion; or

- audited to the EICC/RBA Code of Conduct using the Validated Audit Process (VAP) (1 point).

Optional point shall only be awarded for VAP audits if a certificate has been issued by the VAP Operations Management Team to verify that for each facility:

- initial validated audit reports contained no major or priority non-conformance findings. If the facility was determined to be Low Risk⁷⁶ as defined by the EICC/RBA VAP, the initial report shall be no older than four years. If the facility was determined to be Medium or High Risk⁷⁷ as defined by the EICC/RBA VAP, the initial report shall be no older than two years; or
- closure audit report confirms that all major and priority nonconformance corrective actions resulting from previous VAP audits were remedied within time frame specified by the EICC/RBA (i.e., RBA VAP Gold Recognition Certificate). The initial audit report shall be no older than two years; or
- closure audit report confirms that all non-conformance corrective actions resulting from previous VAP audits were remedied within the time frame specified by the EICC/RBA (i.e., RBA VAP Platinum Recognition Certificate). The initial audit report shall be no older than four years.

Optional point shall be awarded for EICC/RBA VAP audits if all facilities designated above meet the VAP audit requirements or facilities meet a combination of VAP audits and SA8000 certification.

If there are fewer than three suppliers for a component type named above, every supplier for that component shall conform to this criterion.

NOTE — For the purpose of this criterion “facility” is defined as a manufacturing site that is majority owned or operated by one of the suppliers within the scope of this criterion.

Point value: 1 or 2

Geographic applicability: This criterion shall be declared the same in all countries or regions for which the product is declared to conform to this Criteria Document. The approach used to conform to this criterion may vary by country or region.

Verification requirements:

- a) demonstration of certification to SA8000 or EICC/RBA VAP audits for all supplier owned or operated facilities of three of its six top suppliers that manufacture the three components listed above, if applicable, for the product declared to conform to this criterion, including either:

⁷⁶ Currently defined by EICC/RBA as ≥ 180 of 200 points

⁷⁷ Currently defined by EICC/RBA as < 180 of 200 points.

- i. certificate to SA8000 issued within three years prior to product declaration or product verification for all supplier owned or operated facilities of three largest suppliers that manufacture the three components; or
 - ii. certificate issued by the EICC/RBA VAP Operations Management Team for all supplier owned or operated facilities of three of its six top suppliers that manufacture the three components listed above for the product declared to conform to this criterion. Initial audit reports must be issued within the timeframes specified below and each certificate must verify that:
 1. the initial validated audit report contained no major or priority non-conformance findings. If the facility was determined to be Low Risk, the initial report must be issued within four years of product declaration or product verification. If the facility was determined to be Medium or High Risk, the initial report must be issued within two years of product declaration or product verification; or
 2. the closure audit report confirms that all major and priority non-conformance corrective actions were remedied within the time frame specified by the EICC/RBA (i.e., RBA VAP Gold Recognition Certificate). The initial audit report must be issued within two years of product declaration or product verification; or
 3. the closure audit report confirms that all nonconformance corrective actions were remedied within the time frame specified by the EICC/RBA (i.e., RBA VAP Platinum Recognition Certificate). The initial audit report must be issued within four years of product declaration or product verification.
- b) if the manufacturer has fewer than three suppliers of components listed in a), a signed statement from a company official stating the number of suppliers the company has for the product declared to the criterion.

References and details: None

7.5 Product life cycle assessment

7.5.1 Optional – Conduct life cycle assessment

The manufacturer shall conduct a life cycle assessment (LCA) of the product declared to this Criteria Document in accordance with ISO 14040/14044 or the *European Union Product Environmental Footprint Guide*.

The LCA shall include all stages (see Normative Annex 2) of the product life cycle, from extraction of raw materials through end-of-life (i.e., cradle-to-grave), and shall cover, at a minimum, the following impact assessment categories using either U.S. EPA TRACI 2.1, or University of Leiden (CML) 2001 (Nov 09), or European ILCD 2011, or Japan's "LIME2" impact assessment methodologies:

- global warming potential (GWP 100 years);
- acidification potential (AP);
- photochemical ozone creation potential (POCP, or "Smog");
- eutrophication potential (EP);
- ozone depletion potential (ODP);
- abiotic depletion potential (ADP) – or fossil fuels depletion when using TRACI.

To qualify under this criterion, the LCA must have been reviewed in accordance with ISO 14044 Section 6.1 by an independent third-party external to the manufacturer and must have been

conducted no more than three years prior to product registration or certification. The LCA may be conducted on a family or class of products that includes the declared product, however, because this is a product criterion, each product for which this criterion is claimed must meet the requirements. This can be accomplished by either performing one LCA for one product, or by grouping products into product families where one LCA report applies to each product in the family. If the LCA covers a product family, it must be clearly delineated in the report that the individual product in the family is covered by the LCA report. An LCA for one product does not automatically extend to all products in that family.

A new LCA will be required if:

- the previously submitted LCA is more than five years old; or
- changes have been made to the product manufacturing or design and a sensitivity analysis indicates that those changes have resulted in significant differences (a significant difference is when there have been changes or updates in the product that resulted in a change in environmental performance of the product entailing either an increase or decrease of 20% or more on any one of the impact assessment categories listed above).

Point value: 3

Geographic applicability: This criterion shall be declared the same in all countries or regions for which the product is declared to conform to this Criteria Document. The approach used to conform to this criterion may vary by country or region.

Verification requirements:

- a) copy of LCA, URL(s) to LCA, or URL(s) to environmental product declaration (EPD) Type III label applicable to the product declared to conform to the Standard.
- b) documentation of independent third-party review of LCA in accordance with ISO 14044 Section 6.1.

References and details: None

7.5.2 Optional - Public disclosure of LCA results

The LCA produced in Section 7.5.1 shall be made publicly available on the manufacturer's website using one of the following documents:

- third-party report of the LCA as defined in Section 5.2 of ISO 14044; or
- environmental product declaration (EPD) Type III label in accordance with ISO 14025; or
- submitting the LCA or life cycle inventory data for use in a national database (such as the US LCI Database, the European LCA Platform Database, or the LCA Society of Japan Database, or other public disclosure system).

This criterion may be satisfied by the manufacturer providing a link on its website to another publicly available website. The URL(s) for the manufacturer's public website disclosing this information shall be provided during product registration and certification, and made publicly available.

Point value: 1

Geographic applicability: This criterion shall be declared the same in all countries or regions and is applicable only in countries or regions for which the product is declared to conform to this Criteria Document.

Verification requirements:

- a) URL(s) to manufacturer's public website that contains either:
 - i. third-party report of LCA as defined in Section 5.2 of ISO 14044, or
 - ii. environmental product declaration (EPD) Type III label in accordance with ISO 14025;
- b) documentation of LCA or inventory data submitted to a national database.

References and details: None

Normative Annex 1

Table of criteria and optional points

All of the criteria in this table are applicable to both Small Network Equipment (SNE) and Large Network Equipment (LNE) unless otherwise noted. Criteria applicable only to LNE include 6.4.1 (required) and 5.2.3 (optional). Criteria applicable only to SNE include 6.3.1 (required) and 5.1.2, 5.2.4, 5.2.5, 6.3.2 (all optional).

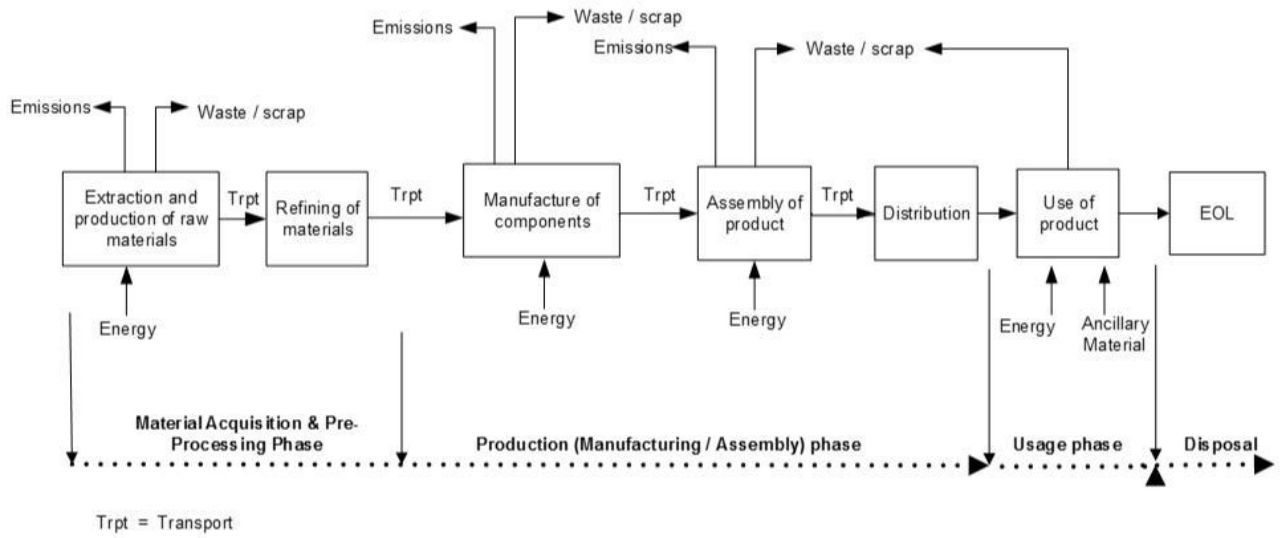
Criterion #	Title	Max Optional Points
4	Chemical Substances	
4.1	Reduction of substances of concern	
4.1.1	Required - Conformance with provisions of European Union RoHS Directive	
4.1.2	Required - Conformance with substance restriction requirements of the European Union Battery Directive	
4.1.3	Required - Reduction of Bromine and Chlorine content of plastic parts > 25 grams	
4.1.4	Optional - Further reduction of Bromine and Chlorine content of plastic parts > 25 grams	2
4.1.5	Required - Conformance with supply chain communication provisions of European Union REACH Regulation	
4.1.6	Optional - Reduction of substances on the European Union REACH Regulation Annex XIV (authorization list)	1
4.2	Inventory and assessment of substances	
4.2.1	Optional – Record of declarable substances	1
4.2.2	Optional – Disclosure of declarable substances	1
4.2.3	Optional – Requesting full substance inventory	1
4.2.4	Optional – Acquiring substance inventory	2
4.2.5	Optional – Substance hazard assessment	2
4.2.6	Optional – Making safer substance use hazard assessment publicly available	1
4.3	Reduction of substances of concern in packaging	
4.3.1	Required – Elimination of added heavy metals in packaging	
4.3.2	Required – Restriction of use of elemental chlorine as a bleaching agent in paper-based packaging materials	
4.3.3	Optional – Restriction on the use of chlorine compounds in processing packaging materials	1
5	Sustainable Use of Resources	
5.1	Product recycled content	
5.1.1	Required – Declaration of postconsumer recycled plastic content	
5.1.2	Optional – Minimum postconsumer recycled content in external enclosures for SNE	1
5.1.3	Optional – Postconsumer recycled content of rare earth elements in hard drive(s) in product	2
5.2	Resource efficiency of product packaging	
5.2.1	Required – Enhancing recyclability of packaging materials	

5.2.2	Required – Recycled fiber in corrugated packaging	
5.2.3	Optional – Higher recycled fiber content in corrugated packaging for LNE	1
5.2.4	Optional – Bulk packaging for SNE	1
5.2.5	Optional – Recycled content of paper-based packaging for SNE	1
5.3	Design for repair, reuse and recycling	
5.3.1	Required – Design for repair, reuse and recycling	
5.3.2	Required – Design for plastics recycling	
5.3.3	Optional – Further design for plastics recycling	1
5.4	Information and tools for reuse and recycling	
5.4.1	Required – Information and reporting in preparation for reuse and recycling	
5.4.2	Optional – Further information and reporting in preparation for reuse and recycling	1
5.4.3	Optional – Product marked to identify components and materials requiring selective treatment	1
5.4.4	Optional – Functionality testing software tools	1
5.5	Product longevity	
5.5.1	Required – Product service and, or replacement components availability	
5.5.2	Required – Secure data deletion	
5.6	End-of-life management (corporate)	
5.6.1	Required – Provision of product take-back service	
5.6.2	Optional – Manufacturer take-back service for deinstalled network equipment	2
5.6.3	Required – End-of-life processing requirements	
5.6.4	Optional – Publicly available record of the reuse / recycling achievement	2
6	Climate Change Mitigation	
6.1	Internal power supply efficiency	
6.1.1	Required – Energy efficiency of internal power supplies	
6.1.2	Optional – Energy efficiency of internal power supplies	1
6.2	External power supply efficiency	
6.2.1	Required – Energy efficiency of external power supplies	
6.2.2	Optional – Energy efficiency of external power supplies	1
6.3	Energy efficiency of small network equipment	
6.3.1	Required – Energy efficiency of small network equipment	
6.3.2	Optional – Small network equipment load dependent power management	1
6.4	Energy efficiency of large network equipment	
6.4.1	Required – Energy efficiency of large network equipment	
6.5	Supply chain energy efficiency	
6.5.1	Optional – Energy efficient supply chains	2
6.6	Manufacturing chemicals	
6.6.1	Optional – Mitigation and inventory of process fluorinated greenhouse gas emissions resulting from semiconductor manufacturing	2
6.7	Environmental Impact of Product Transportation	
6.7	Optional – Environmental Impact of Product Transportation	1
7	Corporate Environment, Social and Governance (ESG) Performance	
7.1	Environmental management system	
7.1.1	Required – Environmental management system (EMS)	

7.1.2	Optional – Environmental management system (EMS) certification	1
7.2	Supply chain reporting	
7.2.1	Optional – Environmental and social responsibility reporting on nine suppliers	2
7.2.2	Optional – Environmental and social responsibility reporting on suppliers	2
7.3	Responsible mineral sourcing	
7.3.1	Required – Public disclosure of use of conflict materials in products	
7.3.2	Optional – Sourcing from validated conflict free smelters	1
7.3.3	Optional – Participation in in-region conflict-free sourcing program	2
7.4	Compliance with occupational health and safety and social responsibility performance standards	
7.4.1	Required – Manufacturer conformance with occupational health and safety performance	
7.4.2	Optional – Supply chain conformance to occupational health and safety performance standards	2
7.4.3	Optional – Certification to social responsibility performance standard	2
7.5	Product life cycle assessment	
7.5.1	Optional – Conduct life cycle assessment	3
7.5.2	Optional – Public disclosure of LCA results	1
Total number of required criteria:		23
Total number of optional criteria:		35
Total number of optional points (maximum possible):		50

Normative Annex 2

Figure 2. Life-cycle assessment example flow, section 7.5.1 system boundaries



Informative Annex 1

While not explicitly cited in the criteria section of this document, the following references are provided as non-normative useful guides for the application of this document.

- DIN EN 15343: 2008-02, Plastics - Recycled Plastics - Plastics recycling traceability and assessment of conformity and recycled content⁷⁸
- European Chemicals Agency, *Guidance on requirements for substances in articles*⁷⁹
- Solutions for Hope⁸⁰
- Subsport Substitution Support Portal (SUBSPORT)⁸¹
- UL 746C, Standard for Polymeric Materials - Use in Electrical Equipment Evaluations⁸²
- US EPA *Protocol for Measuring Destruction or Removal Efficiency (DRE) of Fluorinated Greenhouse Gas Abatement Equipment in Electronics Manufacturing* (US EPA DRE Protocol)⁸³

⁷⁸ European Standards. Krimicka 134, 318 13 Pilsen, Czech Republic. <www.en-standard.eu>

⁷⁹ European Chemicals Agency. PO Box 400, 00121 Helsinki, Finland. <www.echa.europa.eu>

⁸⁰ Resolve. 1255 23rd Street NW, Suite 275, Washington, DC 20037. www.resolve.ngo/site-cfti

⁸¹ Substitution Support Portal. Bundesanstalt für Arbeitsschutz und Arbeitsmedizin (BAuA), Fabricestraße 8, 01099 Dresden, Germany. <www.subsportplus.eu>

⁸² UL LLC. 33 Pflingsten Road, Northbrook, IL 60062. www.ul.com,
<https://standardscatalog.ul.com/ProductDetail.aspx?productId=UL746c>

⁸³ US EPA, <https://www.epa.gov/f-gas-partnership-programs/epas-protocol-measuring-destruction-or-removal-efficiency>