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**Access, Terminals, Transmission and Multiplexing (ATTM);
Broadband Deployment and Lifecycle Resource Management;
Part 8: Management of end of life of ICT equipment
(ICT waste/end of life)**

Reference

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Foreword

This draft European Standard (EN) has been produced by ETSI Technical Committee Access, Terminals, Transmission and Multiplexing (ATTM), and is now submitted for the combined Public Enquiry and Vote phase of the ETSI standards EN Approval Procedure.

The present document is part 8 of a multi-part deliverable covering lifecycle resource management of broadband deployment as identified below:

Part 1: "Overview, common and generic aspects";

Part 2: "ICT sites";

Part 5: "Customer network infrastructures; Sub-part 1 Homes (single-tenant)";

Part 8: "Management of end of life of ICT equipment (ICT waste/end of life)".

Other documents are planned for development to extend this multi-part deliverable. These are listed in annex A and are mentioned in the present document.

Proposed national transposition dates	
Date of latest announcement of this EN (doa):	3 months after ETSI publication
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	6 months after doa
Date of withdrawal of any conflicting National Standard (dow):	6 months after doa

Modal verbs terminology

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Introduction

The increasing interaction between the different elements of the Information Communication Technology (ICT) sector (hardware, middleware, software and services) supports the concept of convergence in which:

- multi-service packages can be delivered over a common infrastructure;
- a variety of infrastructures is able to deliver these packages;
- a single multi-service-package may be delivered over different infrastructures.

As a result of this convergence, the development of new services, applications and content has resulted in:

- an increased demand for bandwidth, reliability, quality and performance, with a consequent increase in the demand for power which has implications for cost and, in some cases, availability;
- an associated continuous evolution of ICT equipment.

It is therefore important to consider the environmental viability of all network elements necessary to deliver the required services in terms of the management of their operational aspects i.e. energy management (including energy efficiency) and the management of the End-of-Life (EoL) of the ICT equipment.

NOTE: The term "environmental viability" is used while recognizing that well established treatments of "sustainability" feature three separate viability objectives (environmental, economic and social). For the purposes of this multi-part deliverable, only operational aspects of environmental viability are considered. A wider approach to environmental viability takes other factors into account including the use of raw materials and avoidance of hazardous substances in the construction of infrastructure or ICT equipment- these factors are not considered.

New technologies and infrastructure strategies are expected to enable operators to decrease the energy consumption, for a given level of service, of their existing and future infrastructures thus decreasing their costs. This requires a common understanding among market participants that only standards can produce.

This multi-part deliverable specifies the general engineering of various broadband infrastructures to enable the most effective energy management (and management of other resources) and the appropriate measures for EoL treatment of ICT equipment. Certain of the standards may specify requirements for interoperability.

The present document has been developed against the following background:

- Waste of Electrical and Electronic Equipment (WEEE) such as the ICT equipment used within broadband deployment systems and mobile networks has joined computers, televisions, refrigerators and mobile telephones as one of the fastest growing waste streams in the European Union (EU) and is expected to grow to more than 12 million tonnes by 2020.
- Further to the 1997 Kyoto Protocol, the European Commission (EC) has issued, and will issue, Directives and Regulations in order to improve e-waste processing of whole industry sectors and producers and users of ICT equipment are obliged to monitor waste processing of that equipment.

Independent of national regulation and legislation concerning WEEE, the present document specifies requirements for processes in relation to management of EoL for ICT equipment used within infrastructures of broadband deployment.

The objective of the present document is to specify requirements and recommendations for the ICT sector to contribute actively to the WEEE collection objectives as defined in the WEEE Directive.

1 Scope

The present document is part 8 of a multi-part deliverable which specifies requirements for processes in relation to management of end-of-life of ICT equipment.

The present document specifies requirements and recommendations for the ICT sector to contribute actively to the WEEE collection objectives as defined in the WEEE Directive.

Interpretation of regulation and legislation concerning the topic are outside the outside the scope of the present document and are covered by other standards and regulations. However, information given in the present document may be of assistance in meeting these standards and regulations.

2 References

2.1 Normative references

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

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

Not applicable.

2.2 Informative references

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

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

[i.1] Directive 2012/19/EU of the European Parliament and of the Council of 4 July 2012 on waste electrical and electronic equipment (WEEE) Text with EEA relevance.

NOTE Referred to as the "WEEE Directive".

[i.2] Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment Text with EEA relevance.

NOTE: Referred to as the "RoHS Directive".

[i.3] Directive 2006/66/EC of the European Parliament and of the Council of 6 September 2006 on batteries and accumulators and waste batteries and accumulators and repealing Directive 91/157/EEC (Text with EEA relevance).

[i.4] ETSI EN 305 174-1: "Access, Terminals, Transmission and Multiplexing (ATTM); Broadband Deployment and Lifecycle Resource Management; Part 1: Overview, common and generic aspects".

- [i.5] Recommendation ITU-T I.113: "Vocabulary of terms for broadband aspects of ISDN".
- [i.6] Regulation (EC) 1013/2006 of the European Parliament and of the Council of 14 June 2006 on shipments of waste.
- [i.7] Regulation (EC) 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC (Text with EEA relevance).
- [i.8] Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal.
- [i.9] Mandate M/462: "Standardisation mandate addressed to CEN, CENELEC and ETSI in the field of ICT to enable efficient energy use in fixed and mobile information and communication networks".
- [i.10] ETSI EN 305 174-3: "Access, Terminals, Transmission and Multiplexing (ATTM); Broadband Deployment and Lifecycle Resource Management; Part 3: Core, regional metropolitan networks".
- [i.11] ETSI EN 305 174-4-1: "Access, Terminals, Transmission and Multiplexing (ATTM); Broadband Deployment and Lifecycle Resource Management; Part 4-1: Fixed access networks (excluding cable)".
- [i.12] ETSI EN 305 174-4-2: "Access, Terminals, Transmission and Multiplexing (ATTM); Broadband Deployment and Lifecycle Resource Management; Part 4-2: Mobile access networks".
- [i.13] ETSI EN 305 174-5-2: "Access, Terminals, Transmission and Multiplexing (ATTM); Broadband Deployment and Lifecycle Resource Management; Part 5-2: Office premises (single-tenant)".
- [i.14] ETSI EN 305 174-5-4: "Access, Terminals, Transmission and Multiplexing (ATTM); Broadband Deployment and Lifecycle Resource Management; Part 5-4: Multi-tenant premises (residential and commercial)".
- [i.15] ETSI EN 305 174-6: "Access, Terminals, Transmission and Multiplexing (ATTM); Broadband Deployment and Lifecycle Resource Management; Part 6: Cable Access Networks".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions apply:

access network: functional elements (that is equipment and infrastructure) that enable communication between an operator site (OS) and a customer network

Base Station (BS): network telecommunications equipment which serves one or more cells within a coverage area of a mobile network

base station site: network distribution node (NDN) which accommodates a base station

broadband: telecommunications service capable of providing more than 2 048 kbit/s (Recommendation ITU-T I.113 [i.5]) full-rate capacity in at least one direction

NOTE: ISDN is not considered to be a broadband technology and is not addressed in the present document.

cable access network: access network provided by cable operators comprising optical fibre and metallic cabling providing direct connection to customer premises

collection (of WEEE): gathering of waste, including the preliminary sorting and preliminary storage of waste for the purposes of transport to a waste treatment facility

core network: functional elements (that is equipment and infrastructure) that enable communication between operator sites (OSs) or equivalent ICT sites

disposal (of WEEE): any operation which is not recovery even where the operation has as a secondary consequence the reclamation of substances, materials or products or energy

Electrical and Electronic Equipment (EEE): equipment which is dependent on electric currents or electromagnetic fields in order to work properly and equipment for the generation, transfer and measurement of such currents and fields and designed for use with a voltage rating not exceeding 1 000 volts for alternating current and 1 500 volts for direct current

End-of-Life (EoL): established point in a product life cycle after a period of primary use and at which a decision is required with regard to reuse, recycling or disposal

Fibre Node (FN): device which performs a media conversion between an optical fibre cable link and a coaxial cable link in a cable access network

fixed access network: access network provided by telecommunications operators comprising optical fibre and metallic cabling providing direct connection to customer premises

fraction (of WEEE): separate output material generated by WEEE treatment

ICT equipment: equipment providing data storage, processing and transport services

NOTE: A combination of Information Technology Equipment and Network Telecommunications Equipment

ICT site: site containing structures or group of structures dedicated to the accommodation, interconnection and operation of ICT equipment together with all the facilities and infrastructures for power distribution and environmental control together with the necessary levels of resilience and security required to provide the desired service availability

Information Technology Equipment (ITE): equipment providing data storage, processing and transport services for subsequent distribution by network telecommunications equipment (NTE)

mobile access network: telecommunications network in which the access to the network (connection between user equipment and network) is implemented over the air interface

Network Data Centre (NDC): data centre embedded within the core network

NOTE: A network data centre of a cable access network may be termed a master head-end

Network Distribution Node (NDN): grouping of NTE equipment within the boundaries of an access network providing distribution of service from an operator site (OS)

NOTE: Where all the Network Telecommunications Equipment (NTE) at a given location is under common governance, any supporting infrastructure for power distribution and environmental control together with the necessary levels of resilience and security required to provide the desired service availability is included as part of the NDN.

Network Interface Unit (NIU): principal device within customer premises allowing user access to the services provided by the cable access network

Network Telecommunications Equipment (NTE): equipment between the boundaries of, and dedicated to providing connection to, core and/or access networks

Network Termination Point (NTP): physical point(s) at which a subscriber is provided with access to the operator network (this may be co-located with an external network test interface)

Operator Site (OS): premises accommodating network telecommunications equipment (NTE) providing direct connection to the core and access networks and which may also accommodate information technology equipment (ITE)

NOTE 1: An operator site that is only connected to the core network is considered as a network data centre.

NOTE 2: An operator site of a cable access network may be termed a local head-end.

recovery (of WEEE): any operation the principal result of which is waste serving a useful purpose in replacing other substances, materials or products that have been used for a particular purpose, or waste being prepared to be used for this purpose

recycling (of WEEE): any recovery operation by which waste materials are reprocessed into substances, materials or products for their original purpose or for other purposes

NOTE: E.g.: recovery of electronic cards, processing of plastics or metals contained in WEEE collected by ICT users are recycling operations.

reuse (of WEEE): any operation by which products or components that are not waste are used again for the same purpose for which they were conceived

Terminal Equipment (TE): principal device within customer premises allowing user access to the services provided by the fixed access network

treatment (of WEEE): means recovery or disposal operations, including preparation prior to recovery or disposal

User Equipment (UE): device allowing user access to the services provided by the mobile access network

valorisation: extraction of monetary or economic value

Waste Electrical and Electronic Equipment (WEEE): electrical or electronic equipment which is waste within the meaning of Article 3(1) of Directive 2008/98/EC, including all components, sub-assemblies and consumables which are part of the product at the time of discarding

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

ADSL	Asynchronous Digital Subscriber Line
BS	Base Station
CE	Conformité Européenne (meaning European Conformity for CE Marking)
EC	European Commission
EEE	Electrical and Electronic Equipment
EFTA	European Free Trade Association
EoL	End-of-Life
EPR	Extended Producer Responsibility
EU	European Union
FN	Fibre Node
ICT	Information Communications Technology
IP	Internet Protocol
IT	Information Technology
ITE	Information Technology Equipment
NDC	Network Data Centre
NDN	Network Distribution Node
NIU	Network Interface Unit
NTE	Network Telecommunications Equipment
OECD	Organisation for Economic Cooperation and Development
OS	Operator Site
PABX	Private Automated Branch eXchange
PC	Personal Computer
PSTN	Private Subscriber Telephone Network
R	Repeater
REACH	Registration, Evaluation, Authorization and restriction of CHemicals
RoHS	Restriction of Hazardous Substances
SSD	Solid State Drive
SVHC	Substances of Very High Concern (in the context of REACH)
TE	Terminal Equipment
UE	User Equipment
WEEE	Waste Electrical and Electronic Equipment

4 Waste electrical and electronic equipment (WEEE)

4.1 General

The treatment of obsolete ICT equipment is an important aspect of overall environmental viability of broadband deployment because:

- the production of electronics devices requires the use of scarce and expensive resources;
- waste ICT equipment is a complex mixture of materials and components that, because of their hazardous content, can cause major environmental and health problems if not properly managed.

The improvement of collection, treatment and recycling of electronics at the End-of-Life (EoL) improves the environmental management of WEEE, contributes to a circular economy and enhances resource management.

4.2 European Union actions on e-waste

The two main European Union (EU) actions which established the European regulatory framework for the separate collection and treatment of electrical and electronic equipment waste in each Member State are:

- Directive 2012/19/EU [i.1], referred to as the "WEEE Directive";
- Directive 2011/65/EU [i.2], referred to as the "RoHS Directive".

These are complemented by Regulation (EC) 1907/2006 (REACH) [i.7], which regulates the use of most concerning and hazardous substances (for all industries) and Regulation (EC) 1013/2006 [i.6] regarding trans-boundary movements of e-waste.

The RoHS Directive [i.2] lists substances whose use in the manufacturing of equipment is banned or strictly controlled. The current Directive includes:

- progressive harmonization with REACH Substances of Very High Concern (SVHC) candidate list;
- scientific research results about substances;
- inclusion of RoHS compliancy in CE Marking and labelling.

The "new" WEEE Directive 2012/19/EU [i.1] entered into force on 13 August 2012 and became effective on February 2014 in EU State members. The WEEE Directive specifically requires:

- EEE eco-design in order to facilitate WEEE reuse and treatment;
- separate collection of WEEE;
- systematic treatment of specific components (such as capacitors containing polychlorinated biphenyls, printed circuit boards) and of substances classified as dangerous (such as mercury, chlorofluorocarbons) to prevent pollution;
- reuse, recycling and recovery of collected WEEE with high recycling and recovery targets, with the reuse of whole devices being identified as the priority.

Under the WEEE Directive [i.1], all EEE devices, whether household or professional, are classified into one of a number of categories. ICT equipment falls under the designation "IT and Telecommunication Equipment" and, depending on its physical size or other attribute may lie within one or more WEEE categories.

The ten current categories of equipment are:

- 1) Large household appliances.
- 2) Small household appliances.
- 3) IT and telecommunications.

- 4) Consumer equipment.
- 5) Lighting equipment.
- 6) Electrical and electronic tools.
- 7) Toys, leisure and sports equipment.
- 8) Medical devices.
- 9) Monitoring and control instruments.
- 10) Automatic dispensers.

These ten categories apply until 14 August 2018. From 15 August 2018 EEE shall be reported under any of the six new categories:

- 1) Temperature exchange equipment.
- 2) Screens, monitors and equipment containing screens (having a surface area greater than 0,01 m²).
- 3) Lamps.
- 4) Large equipment (any external dimensions greater than 0,05 m); including, but not limited to, Household appliances; IT and telecommunication equipment; consumer equipment; luminaires; equipment reproducing sound or images, musical equipment; electrical and electronic tools; toys, leisure and sports equipment; medical devices; monitoring and control instruments; automatic dispensers; equipment for the generation of electric currents. This category does not include equipment included in categories 1 to 3.
- 5) Small equipment (any external dimensions less than 0,05 m); including but not limited to Household appliances; consumer equipment; luminaires; equipment reproducing sound or images, musical equipment; electrical and electronic tools; toys, leisure and sports equipment; medical devices; monitoring and control instruments; automatic dispensers; equipment for the generation of electric currents. This category does not include equipment included in categories 1 to 3 and 6.
- 6) Small IT and telecommunication equipment (no external dimension more than 0,5 m).

NOTE: A separate EU Directive 2006/66/CE [i.3] addresses waste batteries and accumulators.

4.3 Trans-boundary movements of waste

Under EC 1013/2006 [i.6], the EU has established a system for the supervision and control of shipments of waste within its borders and with the countries of the European Free Trade Association (EFTA), the Organization for Economic Cooperation and Development (OECD) and third countries which are party to the Basel Convention [i.8]. It aims to strengthen, simplify and specify the procedures for controlling waste shipments to improve environmental protection. The Regulation addresses most types of waste, excluding those that are subject to separate control regimes and applies to shipments of waste:

- between Member States, within the EU or with transit through third countries;
- imported into the EU from third countries;
- exported from the EU to third countries;
- in transit through the EU, on the way from and to third countries.

4.4 Extended Producer Responsibility Principle (EPR)

Originally formulated by the OECD, the fundamental principle of Extended Producer Responsibility (EPR) is to involve the manufacturer in support of its product impacts on the environment, including the end-of-life, and do act to reduce these impacts and therefore in the public interest. WEEE, batteries, paper are under the EPR Principle in the main European countries. The European WEEE Directive [i.1] relies on this principle.

The EEE producer is the entity which puts the equipment on the market of a Member State. According to that definition, there are five types of producers and producers as listed in Table 1 are responsible for organizing and financing the collection and treatment of WEEE. In some countries (France, UK, Spain, Poland, etc.) the producer can delegate this responsibility to a State Agreed Structure termed Eco-organisms.

In some cases, ICT sector users are producer towards WEEE Directive without being manufacturers themselves of the equipment they are using or selling.

Table 1: Types of EEE producer

Type of EEE Producer	Description
Manufacturer	Sells under its own brand products manufactured in member state
Importer	Imports EEE in a Member State from a country outside the EU (or from a third country)
Introducer	Imports EEE in a Member State from another Member State
Reseller under its own brand	Resells EEE under its own brand
Distant seller of household equipment	Direct seller of household EEE from abroad by post or Internet communication

4.5 European Union ICT WEEE

4.5.1 General

The improvement of collection, recycling and treatment of EEE at the End-of-Life (EoL) improves the environmental management of WEEE, contributes to a circular economy and enhances resource management.

4.5.2 Collection and recycling of WEEE

The collection and recycling of WEEE presents a unique and complex set of challenges. These factors include:

- the heterogeneity of EEE in terms of dimensions, materials, weight, and functionality/application (e.g. refrigerators, tablets, process control devices in production companies);
- the continuous introduction of new products and new applications of EEE that all have different compositions and characteristics;
- the presence of hazardous components and substances in some EEE (e.g. substances that damage the ozone layer, mercury, and other heavy metals) that should be processed correctly;
- the possibility of recovering valuable resources such as metals and plastics, but also a number of rare natural resources that are of critical importance due to their limited availability and strategic application (e.g. ruthenium, indium, platinum, and rare earth elements), and of which, EEE contains a significant share of the world's supply;
- the large number and diversity of actors and industry sectors involved throughout the life cycle of EEE, from design to reprocessing, and their respective roles, interests and responsibilities;
- developments in the recycling of WEEE and the addition of a specialized WEEE sector that can recycle these devices.

4.5.3 Treatment of WEEE

The treatment of WEEE and in particular of obsolete ICT equipment is an important aspect of overall environmental viability of broadband deployment because:

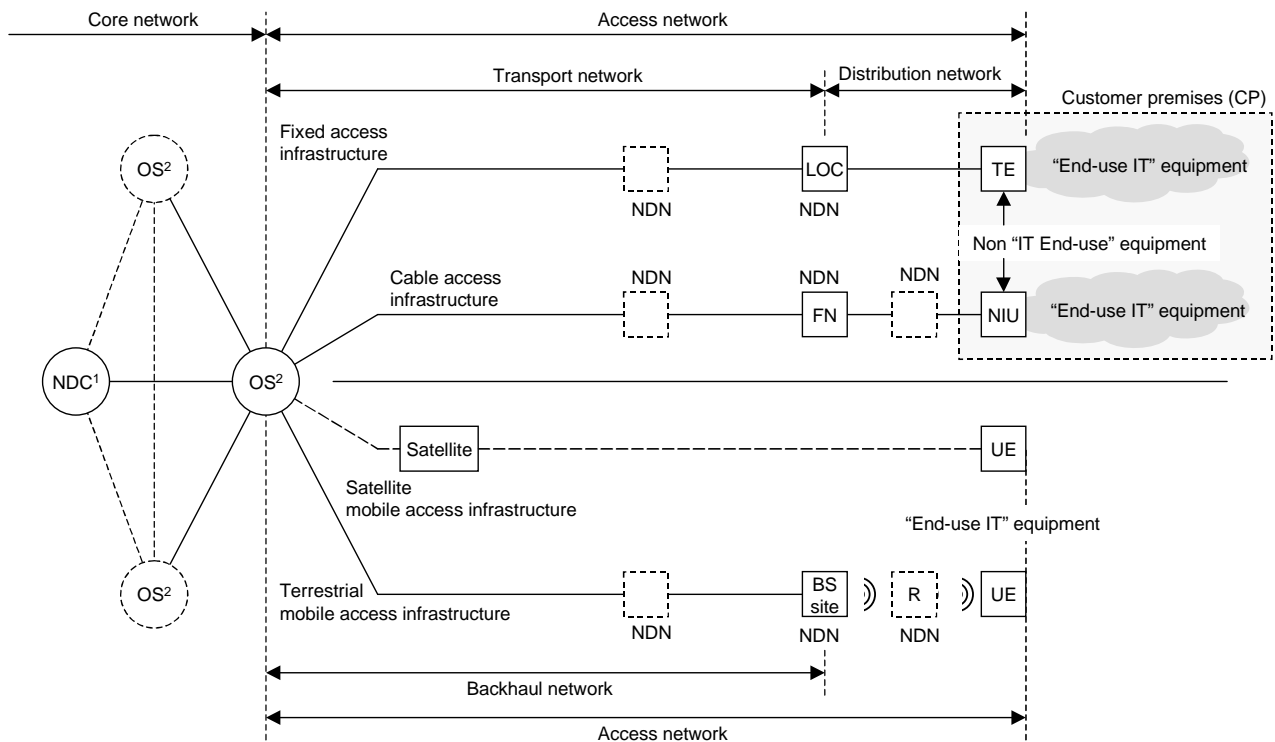
- the production of EEE requires the use of scarce and expensive resources;
- waste ICT equipment is a complex mixture of materials and components that, because of their hazardous content, can cause major environmental and health problems if not properly managed.

5 ICT WEEE

5.1 General

The network schematic used in the present document is shown in Figure 1. This has been updated since the original schematic included in the initial response to the Mandate M/462 [i.9]. The original schematic and details of the changes are detailed in ETSI EN 305 174-1 [i.4].

Table 2 describes the type of equipment (both ICT equipment and other supporting equipment) that are used within the elements of Figure 1 are subject to the requirements for processing as WEEE described in clause 6 of the present document.



¹ For cable access networks this is termed "Master head-end/OS"
² For cable access networks this is termed "Local head-end/OS"

Figure 1: Schematic of fixed and mobile communication networks

Table 2: WEEE in the elements of broadband deployment

ICT Categories	Equipment	Examples	
ICT sites	Network telecommunications equipment (NTE)		
	Information technology equipment (ITE)	Server Switch Routers Arrays	Libraries Hard disk drives (HDD) Solid state drives (SSD)
	Power supply equipment		
	Environmental control equipment		
	Security systems		
	Lighting		
	Overhead function	Fixed PC and laptops of employees Monitors Printers	Accessories Fixed and mobile telephones Other peripherals
Network distribution node (NDN)	NTE		
	ITE		
	Power supply equipment		
	Environmental control equipment		
	Security systems		
	Lighting		
	Overhead function		
Core networks	See ICT sites and NDN		
Fixed access networks	See ICT sites and NDN		
Mobile access networks	See ICT sites and NDN		
Cable access networks	See ICT sites and NDN		
Customer premises	Terminal equipment		
	Network interface units		

6 Requirements for processing of WEEE within broadband deployment

6.1 General

6.1.1 Application of national legislation

The requirements of the present document support the collection and treatment of WEEE and are not intended to conflict with any legal obligations that may exist under national implementations of European Directives or European regulations.

6.1.2 Collection of WEEE

The treatment of professional WEEE from the ICT sector is complex and differs from the treatment of household WEEE, except for small equipment, it is more difficult to determine the technological design evolution and the composition of the EEE and requires dedicated treatment processes.

The collection and treatment of WEEE presents a unique and complex set of challenges.

The methods of collection of WEEE and the selection of treatment procedures (see clause 6.3) shall take into account the factors listed in clause 4.5.2 and the following:

- the long service/usage life of professional EEE, especially in the ICT sector;
- the important opportunity market for used EEE and especially for export.

In general, specific training is required for the operators when large equipment, including hazardous substances, is collected and processed for the first time. To anticipate the challenges associated with the processing of these, agreed structures are needed to work with manufacturers to carry out:

- a mapping of the risks of the specific treatment of WEEE;
- an inventory of the strategic materials present in EEE, which could be subject to recovery and valorisation.

6.1.3 Treatment

There are five identified forms of treatment of WEEE. They are listed below in order of preference:

- 1) Reuse of complete WEEE.
- 2) Reuse of the components comprising the WEEE.
- 3) Recycling of materials within the WEEE.
- 4) Energy recovery.
- 5) Disposal - without any energy recovery.

Operators shall have a process that supports the selection of new EEE and the treatment of WEEE in accordance with this order of preference.

The treatment process of WEEE typically includes the following steps:

- **Step 1:** Dismantling (separation of different components) and depollution (extraction of substances polluting).
- **Step 2:** Grinding of equipment into small pieces.
- **Step 3:** Electromagnetic separation of the ferrous elements by means of magnets.
- **Step 4:** Optical sorting which makes it possible to separate the electronic boards, which are subsequently upgraded via another recycling method for recovering the strategic metals contained in these fractions.
- **Step 5:** Separation of non-ferrous metallic elements (including copper) by Foucault currents.
- **Step 6:** Separation of plastics by floatation or optical sorting (other residues such as paper fall to the bottom of the tank while the plastic remains on the surface).
- **Step 7:** Recovery of precious metals and rare earths through specific industrial process, involving metal smelting companies after specific treatments (including grinding and concentration of materials, usage of pyrometallurgy and hydrometallurgy processes).

6.2 Management of WEEE within ICT sites, core and access networks

6.2.1 Requirements

6.2.1.1 Supply Chain

Operators of broadband deployment infrastructures shall:

- a) have processes in place to ensure suppliers of new EEE are compliant with RoHS [i.2] and REACH [i.7];
- b) specify, when possible, the respective contractual responsibilities of the parties regarding WEEE treatment and determine which party holds the Extender Producer Responsibility.

6.2.1.2 Internal organization

Operators of broadband deployment infrastructures shall, for all WEEE collected, have processes in place to:

- a) identify the type of WEEE concerned: e.g. old servers and storage equipment, private automated branch exchange (PABX) equipment, old personal computers, other WEEE;
- b) measure WEEE flows using actual or make an estimation of the weight of WEEE categories before treatment;
- c) encourage reuse (refurbishment and second life) of equipment (with erasure of personal data) taking into account:
 - 1) local re-use of equipment: e.g. when migrating radio access technology, exchanged equipment is re-used in other site or by affiliates of the operator;
 - 2) service priority: the service may be more important than the device that delivers it (e.g. Internet access) and terminal equipment (TE), network interface unit (NIU) and user equipment (UE) can be refurbished and re-use and may need:
 - software updates;
 - changing of shell if it slightly damaged;
 - 3) for Business-to-Business (B2B) customers: develop offer where devices are rented to the customers.

6.2.1.3 Extended Producer Responsibility

Operators of broadband deployment infrastructures shall, for all WEEE collected, have processes in place to:

- a) determine the EPR status taking into account the difficulty for old equipment;

NOTE: Before August 2005 under WEEE legislation the user/owner of WEEE is designated as the Producer.

- b) ensure proper declaration by EPR holder to public environment authorities Registry for:
 - new equipment placed on the market;
 - reporting of WEEE collected.

6.2.1.4 Training

Operators of broadband deployment infrastructures shall develop specific training programs on aspects of WEEE for the following employees involved in corporate and social responsibility issues:

- a) project managers on network transformation that implies decommissioning of old equipment;
- b) data centre managers.

6.2.1.5 WEEE in companies network transformation

Operators of broadband deployment infrastructures shall have processes in place to:

- a) identify where decommissioning of WEEE includes complex operations in buildings and generates extra costs;
- b) identify situations where large network transformation processes imply the generation of WEEE such as:
 - refurbishment and renewal of ICT sites;
 - virtualization, renewal of fixed, cable or mobile access networks;
 - IP technology migration processes resulting in the decommissioning (progressive decommissioning of public switched telephone network (PSTN), asynchronous transfer mode (ATM)/asynchronous digital subscriber line (ADSL) equipment, etc.;
 - decommissioning of old equipment in case of network upgrades;

- evolutions of transmission network, etc. (optical fibre or microwave deployment);
- renewal/upgrades of companies information technology networks and infrastructures (internal telephony/Internet networks, etc.);
- implementation of network functions virtualization (NFV)/software-defined networks - implying concentration of equipment for multi-functionality and multi-access (network slicing).

6.2.1.6 Collection Scheme and partners

Operators of broadband deployment infrastructures shall, for all WEEE collected, have processes in place to identify relevant and traceable collection, transport and treatment solutions and:

- a) provide documentation addressing traceability after collection (e.g. bill of materials, transport certificates, etc.);
- b) ensure transportation to authorized treatment facilities unless the appliances are reused as a whole ensuring that, where trans-boundary WEEE shipment is planned, that transport and treatment solution are compliant with Regulation (EC) 1013/2006 [i.6] and the Basel Convention [i.8] and that the exporter can prove that the recovery, reuse and/or recycling operation takes place under conditions that are equivalent to the EU legislation;
- c) monitor targets, producers, or third parties acting on their behalf, are keeping records on the mass of WEEE and the equipment components, materials or substances entering and leaving the treatment(recovery and/or recycling) facility;
- d) in treatment facilities:
 - check that the company has all the relevant authorization for waste treatment;
 - check that employees have all the relevant certification or have undergone training in order to manage all risks in relation to health, safety, environment, exposure of substances to humans and environment;
- e) administer proactively the collection, transport and treatment solutions employed across all relevant groups:
 - perform regular audits of contract with and process employed by waste treatment partners;
 - ensure auditable and reliable reporting.

6.2.1.7 Subscriber equipment

Operators of broadband deployment infrastructures shall implement "take back" solutions to collect equipment (e.g. such as mobile telephones, tablets, switches, Internet routers, screens, transmission equipment) when they are no longer used following equipment or service upgrades, end of service subscriptions.

Solutions are not limited to the equipment rented from the operator and may include equipment purchased the equipment from the operator.

6.2.1.8 Rare resources and valorisation

Operators of broadband deployment infrastructures shall maintain information about materials resources recovery opportunities in some WEEE: precious metals (e.g. in printed circuit boards, rare earths etc.).

6.2.1.9 Second-hand and re-use of equipment

Operators of broadband deployment infrastructures shall:

- a) monitor brokers and mitigate any risk of lack of traceability in case of resale of second hand equipment;
- b) require treatment partners to provide precise tests and procedures to identify properly working equipment;
- c) obtain relevant authorizations in relation to any trans-boundary movements of waste;

- d) ensure with collection and treatment partners that WEEE or second-hand EEE is not discarded without control in emerging countries.

6.2.2 Recommendations

Operators of broadband deployment infrastructures should have processes in place to:

- a) estimate the potential recovery value of the WEEE (especially regarding rare resources) with the following recommendations:
- take into account the global financial balance (including revenues from recovery but also for instance costs from transportation, de-pollution of hazardous and less valuable parts);
 - take into account that value can come from gold, silver, platinum, palladium or rare-earths, in WEEE.

NOTE: Regarding rare earths elements, the following have been identified as the most critical for the European industry:

- indium (In),
 - germanium (Ge),
 - gallium (Ga),
 - neodymium (Nd),
 - dysprosium (Dy) with a very low recycling rate and high dependence on imports limits.
- b) address Eco-conception for ICT EEE by developing new tools and make it possible to integrate recyclability issues upstream, in the products' design phase.

EXAMPLE: By disclosing the essential characteristics of their equipment producers can undergo to a complete product assessment in reference to circular economy: recyclability rate, outlets for recycled plastics, potential presence of rare metals, de-pollution etc.

6.2.3 Management of WEEE within customer premises

With specific reference to customer premises equipment, operators shall have a traceable process that allows collection and transport of WEEE collected in customer premises.

6.3 Calculation of recycling and valorisation rates

The following formulas are used to calculate recycling and recovery rates:

$$WEEE_{\text{treated}} = WEEE_{\text{prepared for reuse}} + WEEE_{\text{reused by parts}} + WEEE_{\text{recycled}} + WEEE_{\text{recovered energy}} + WEEE_{\text{destroyed}}$$

$$\text{Reuse and recycling rate} = \frac{WEEE_{\text{prepared for reuse}} + WEEE_{\text{reused by parts}} + WEEE_{\text{recycled}}}{WEEE_{\text{processed}}}$$

$$\text{Valorisation/recovery rate} = \frac{WEEE_{\text{prepared for reuse}} + WEEE_{\text{reused by parts}} + WEEE_{\text{recycled}} + WEEE_{\text{recovered energy}}}{WEEE_{\text{processed}}}$$

The calculation of the targets is calculated, for each category, by dividing the weight of the WEEE that enters the recovery or recycling/preparing for re-use facility, after proper treatment in accordance with Article 8(2) of WEEE 2012/19/EU Directive [i.1] with regard to recovery or recycling, by the weight of all separately collected WEEE for each category, expressed as a percentage.

Annex A (informative): Future structure of this multi-part deliverable

The present document forms part of series of standards which are listed under Phase 2 of Mandate M/462 [i.9].

In addition to the parts listed in the foreword, the series is intended to include the following:

- ETSI EN 305 174-3: "Core, regional metropolitan networks" [i.10]
- ETSI EN 305 174-4-1: "Fixed access networks (excluding cable)" [i.11]
- ETSI EN 305 174-4-2: "Mobile access networks" [i.12].
- ETSI EN 305 174-5-2: "Office premises (single-tenant)" [i.13].
- ETSI EN 305 174-5-4: "Multi-tenant premises (residential and commercial)" [i.14].
- ETSI EN 305 174-6: "Cable Access Networks" [i.15.]

Annex B (informative): Bibliography

- Directive 2002/96/EC of the European Parliament and of the Council of 27 January 2003 on waste electrical and electronic equipment (WEEE) - Joint declaration of the European Parliament, the Council and the Commission relating to Article 9.
- Directive 2002/95/EC of the European Parliament and of the Council of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.
- Council Directive 91/157/EEC of 18 March 1991 on batteries and accumulators containing certain dangerous substances.

History

Document history			
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