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TECHNICAL SPECIFICATION

**Access, Terminals, Transmission and Multiplexing (ATTM);
Broadband Deployment and Energy Management;
Part 1: Overview, common and generic aspects**

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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Access, Terminals, Transmission and Multiplexing (ATTM).

The present document is part 1, of a multi-part deliverable covering efficient energy management and broadband deployment, as identified below:

TS 105 174-1:   **"Overview, common and generic aspects";**

TS 105 174-2:   "Operator sites and data centres";

TS 105 174-3:   "Core, regional metropolitan networks";

TS 105 174-4:   "Access networks":

  TS 105 174-4-1: "Fixed access networks (excluding cable)";

  TS 105 174-4-2: "Mobile access networks";

TS 105 174-5:   "Customer network infrastructures":

  TS 105 174-5-1: "Homes (single-tenant)";

  TS 105 174-5-2: "Office premises (single-tenant)";

  TS 105 174-5-3: "Industrial premises (single-tenant)";

  TS 105 174-5-4: "Multi-tenant premises (residential and commercial)";

TR 105 174-6:   "Cable Access Networks".

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**may not**", "**need**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the ETSI Drafting Rules (Verbal forms for the expression of provisions).

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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. It is therefore important to optimize the energy management (including energy efficiency) of all network elements necessary to deliver the required services.

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.

The present document is part 1 of a multi-part deliverable which has been produced by ETSI Technical Committees Access, Terminals, Transmission and Multiplexing (ATTM) and Cable in close collaboration with CENELEC via the Co-ordination Group on Installations and Cabling (CGIC). It offers a contribution to the required standardization process by establishing an initial basis for work on ICT networks and transmission engineering, with active collaboration from a number of other ETSI and CENELEC Technical Bodies. When complete, the multi-part deliverable will contain information that has been jointly evolved to present developments in installations and transmission implementation, and describing their contribution to energy management in next generation networks (NGN).

It is intended that all the documents mentioned in the foreword and more fully described in clause 8 will be produced as soon as the workload allows. The multi-part deliverable will contain a high level analysis of broadband deployment and multi-service implementation, explaining the various optical fibre access network infrastructure architectures (FTTx) required to deliver efficient broadband services to customer premises and the associated difficulties, for example, the impact on implementation created by legislation and regulation of the operator environment.

1 Scope

The present document gives an overview of this multi-part deliverable covering energy management and broadband deployment. Clause 2 and clause 3 contain references, definitions and abbreviations which relate to this part; similar information will be included in the corresponding clauses of the other parts, thus ensuring that each document can be used on a "stand-alone" basis.

Clause 6 describes the network sub-systems applicable to broadband deployment and their interconnections.

Clause 7 considers the measures which may be taken to optimize energy management of the end-to-end network and introduces the concept of key performance indicators (KPI) to enable consistent monitoring of energy management for each of the network sub-systems described in clause 5.

Clause 8 contains details of the subsequent parts and sub-parts of this multi-part deliverable which, for each of the network sub-systems described in clause 5:

- identify the standardization bodies working on the design and installation of the cabling within and between the network sub-systems and the relevant interfaces;

- provide a more strategic analysis of energy consumption trends, in a range of different broadband deployment scenarios;

- outline further work needed to ensure the improvement of energy efficiency in communication networks.

This will enable the proper implementation of services, applications and content using an energy efficient infrastructure, though it is not the goal of this multi-part deliverable to provide detailed standardized solutions for the power distribution systems or physical design of data centres.

2 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 reference document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at http://docbox.etsi.org/Reference.

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

2.1 Normative references

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

[1] Void.

[2] CENELEC EN 50173-2: "Information technology - Generic cabling systems - Part 2: Office premises".

[3] CENELEC EN 50173-3: "Information technology - Generic cabling systems - Part 3: Industrial premises".

[4] CENELEC EN 50173-4: "Information technology - Generic cabling systems - Part 4: Homes".

[5] CENELEC EN 50173-5: "Information technology - Generic cabling systems - Part 5: Data centres".

[6] CENELEC TR 50173-99-2: "Information technology - Implementation of BCT applications using cabling in accordance with EN 50173-4".

[7]   CENELEC EN 50174-1: "Information technology - Cabling installation - Part 1: Installation specification and quality assurance".

[8]   CENELEC EN 50174-2: "Information technology - Cabling installation - Part 2: Installation planning and practices inside buildings".

[9]   CENELEC EN 50174-3: "Information technology - Cabling installation - Part 3: Installation planning and practices outside buildings".

[10]   CENELEC EN 60728 series: "Cable networks for television signals, sound signals and interactive services".

[11]   Void.

[12]   Void.

[13]   Recommendation ITU-T I.113: "Vocabulary of terms for broadband aspects of ISDN".

[14]   CENELEC EN 50600 series: "Information technology - Data centre facilities and infrastructures".

[15]   ETSI ES 205 200-1: "Access, Terminals, Transmission and Multiplexing (ATTM); Energy management; Global KPIs; Operational infrastructures; Part 1: General requirements".

[16]   ETSI ES 205 200-2-1: "Access, Terminals, Transmission and Multiplexing (ATTM); Energy management; Global KPIs; Operational infrastructures; Part 2: Specific requirements; Sub-part 1: Data centres".

[17]   ETSI GS OEU 001: "Operational energy Efficiency for Users (OEU); Technical Global KPIs for Data Centres".

[18]   ETSI GS OEU 008: "Operational energy Efficiency for Users (OEU); Global KPI for Information and Communication Technology Nodes".

2.2   Informative references

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 1999/5/EC of the European Parliament and of the Council of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity (R&TTE Directive).

[i.2]   Directive 2002/22/EC of the European Parliament and of the Council of 7 March 2002 on universal service and users' rights relating to electronic communications networks and services (Universal Service Directive).

[i.3]   ETSI TS 102 973: "Access Terminals, Transmission and Multiplexing (ATTM); Network Termination (NT) in Next Generation Network architectures".

[i.4]   ETSI EG 201 730 (all parts): "Terminals' access to Public Telecommunications Networks; Application of the Directive 1999/5/EC (R&TTE), article 4.2; Guidelines for the publication of interface specifications".

[i.5]   ETSI EG 202 306: "Transmission and Multiplexing (TM); Access networks for residential customers".

[i.6]   ETSI TS 105 174-2: "Access, Terminals, Transmission and Multiplexing (ATTM); Broadband Deployment and Energy Management; Part 2: Operator sites and data centres".

[i.7]   Void.

[i.8]   ETSI TS 105 174-3: "Access, Terminals, Transmission and Multiplexing (ATTM); Broadband Deployment and Energy Management; Part 3: Core, regional metropolitan networks".

[i.9]   ETSI TS 105 174-4-1: "Access, Terminals, Transmission and Multiplexing (ATTM); Broadband Deployment and Energy Management; Part 4: Access Networks; Sub-part 1: Fixed access networks (excluding cable)".

[i.10]   ETSI TS 105 174-4-2: "Access, Terminals, Transmission and Multiplexing (ATTM); Broadband Deployment and Energy Management; Part 4: Access Networks; Sub-part 2: Mobile access networks".

[i.11]   ETSI TS 105 174-5-1: "Access, Terminals, Transmission and Multiplexing (ATTM); Broadband Deployment and Energy Management; Part 5: Customer network infrastructures; Sub-part 1: Homes (single-tenant)".

[i.12]   ETSI TS 105 174-5-2: "Access, Terminals, Transmission and Multiplexing (ATTM); Broadband Deployment and Energy Management; Part 5: Customer network infrastructures; Sub-part 2: Office premises (single-tenant)".

[i.13]   ETSI TS 105 174-5-3: "Access, Terminals, Transmission and Multiplexing (ATTM); Broadband Deployment and Energy Management; Part 5: Customer network infrastructures; Sub-part 3: Industrial premises (single-tenant)".

[i.14]   ETSI TS 105 174-5-4: "Access, Terminals, Transmission and Multiplexing (ATTM); Broadband Deployment and Energy Management; Part 5: Customer network infrastructures; Sub-part 4: Multi-tenant premises (residential and commercial)".

[i.15]   ETSI TR 105 174-6: "CABLE; Broadband Deployment and Energy Management; Part 6: Cable Access Networks".

[i.16]   European Commission: "DG-JRC Code of Conduct on Data Centres Energy Efficiency".

[i.17]   European Commission: "DG-JRC Code of Conduct on Energy Consumption of Broadband Equipment".

[i.18]   CENELEC EN 61784 series: "Industrial communication networks - Profiles".

[i.19]   CENELEC EN 61918: "Industrial communication networks - Installation of communication networks in industrial premises".

[i.20]   ETSI ES 205 200-2-2: "Access, Terminals, Transmission and Multiplexing (ATTM); Energy management; Global KPIs; Operational infrastructures: Fixed (excluding cable) access networks".

[i.21]   ETSI ES 205 200-2-3: "Access, Terminals, Transmission and Multiplexing (ATTM); Energy management; Global KPIs; Operational infrastructures; Part 2: Specific requirements; Sub-part 3: Mobile access networks".

3   Definitions and abbreviations

3.1   Definitions

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

access network: functional elements (that is equipment and infrastructure) that enable communication between the core network and a customer network

core network: functional elements (that is equipment and infrastructure) that enable communication between operator sites and/or network data centres

customer network: functional elements (that is equipment and infrastructure) that enable communication between an NTP or ENTI, as appropriate, and one or more attached terminal equipments

distribution infrastructure: sub-part of the access network comprising the functional elements that enable communication between the last cabinet and a customer network

External Network Test Interface (ENTI): point in or near the customer premises (inside or outside the customer network) accessible to the network operator for testing purposes

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)

NOTE: The schematic of figure 1 helps understanding many of the definitions related with relevant points and areas of the installation.

operator site: premises accommodating network telecommunications equipment providing direct connection to the core and access networks and which may also accommodate information technology equipment

transport infrastructure: sub-part of the access network comprising the functional elements that enable communication between the core network and the last cabinet and a customer network

3.2 Abbreviations

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

ATTM	Access, Terminals, Transmission and Multiplexing
BEF	Building Entrance Facility
CENELEC	European Committee for Electrotechnical Standardization
CGIC	Co-ordination Group on Installations and Cabling
CLC	European Electrotechnical Standardisation Committee (CENELEC / Comité Européen de Normalisation ELECtrotechnique)
CP	Customer Premises
DC	(Network) Data Centre
DG-JRC	European Commission Direction General Joint Research Centre
ENTI	External Network Test Interface
FTTB	Fibre To The Building
FTTC	Fibre To The Cabinet
FTTH	Fibre To The Home
FTTx	Fibre To The (various)

NOTE: See FTTB, FTTC and FTTH.

HEF	Home Entrance Facility
HFC	Hybrid Fibre Coaxial
HV	High Voltage
ICT	Information Communications Technology
ISDN	Integrated Service Digital Network
KPI	Key Performance Indicator
LC	Last Cabinet

NOTE: Before the customer premises in the access network.

NGN	Next Generation Networks
NTP	Network Termination Point
OS	Operator Site
POTS	Plain Old Telephone Service
TxRx	Transceiver equipment

4 Generalities

In order to monitor the implementation and operation of energy management of deployed broadband, certain documents will also focus on the possible consequences of standardization of installations, cabling techniques and equipment. In particular, the study will investigate possibilities and suggest solutions for development of processes for optimization in installation techniques and energy consumption. Operational monitoring of energy management will be done by means of Objective and Global Key Performance Indicators (KPIs). These KPIs are defined in ES 205 200 Series [15], [16], [i.20] and [i.21] and supported by several Position Papers (e.g. GS OEU 001 [17] and GS OEU 008 [18]) from Industrial Specification Group Operational energy Efficiency for Users (ISG OEU).

5   Broadband deployment

Broadband access equipment is defined by its incorporation of a transmission technology capable of providing more than 2 048 kbit/s (Recommendation ITU-T I.113 [13]) full-rate capacity in at least one direction. On this basis, ISDN is not considered to be a broadband technology and is not addressed in the present document.

6   Network sub-systems of broadband deployment

6.1   General

This clause will identify and explain the elements of the network sub-systems employed in broadband deployment.

6.2   Network sub-systems

Figure 1 is a technology agnostic diagram depicting a segment of a broadband network showing the interconnection of network data centres, operator sites and customer premises installations. In principle, every operator network can contain any number of each of these elements and may be connected to any number of other operator networks.
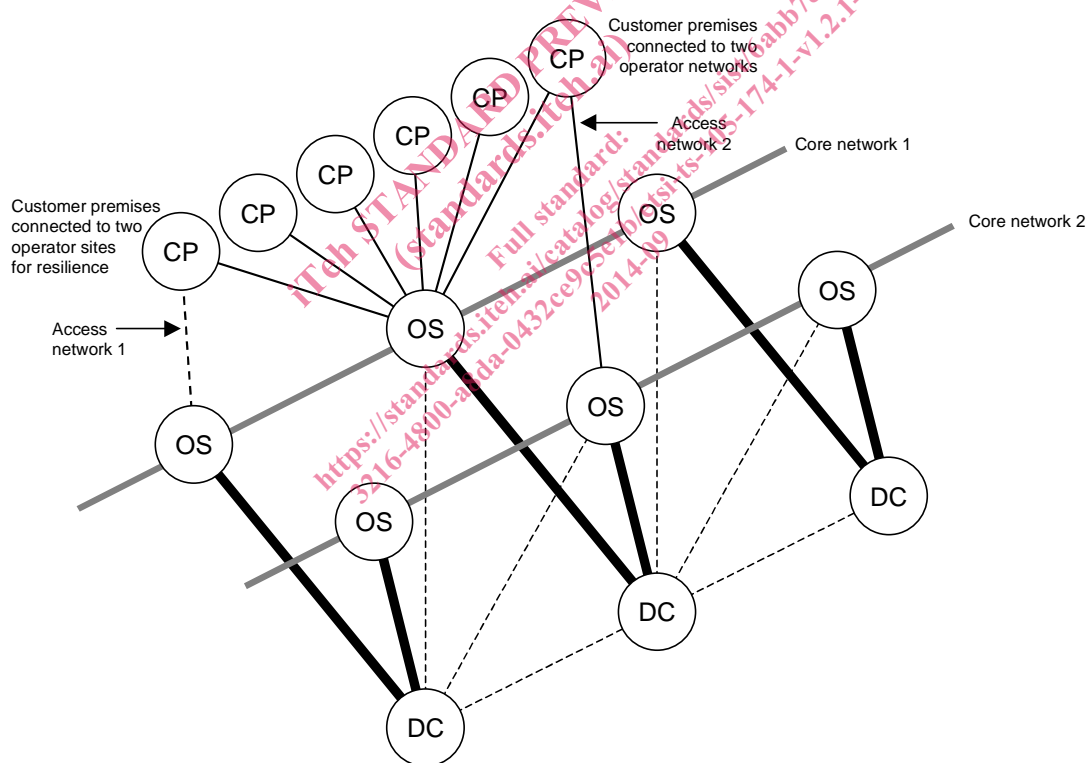

Figure 1: Network sub-systems of broadband deployment

6.2.1   Data centre

A network data centre is the network sub-system that supports one or more operator core networks. Its functions include the storage, processing and dissemination of data as required to fulfil customer expectations, the hosting of the necessary applications, content hosting, etc. In this context, data centres do not include sites containing only servers and their related hardware that are used required solely for administrative functions such as customer management functions, billing, etc.