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**Access, Terminals, Transmission and Multiplexing (ATTM);  
Broadband Deployment and Lifecycle Resource Management;  
Part 5: Customer network infrastructures;  
Sub-part 1: Homes (single-tenant)**

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# Contents

Intellectual Property Rights .....	4
Foreword.....	4
Modal verbs terminology.....	4
Introduction .....	4
1 Scope .....	6
2 References .....	6
2.1 Normative references .....	6
2.2 Informative references.....	6
3 Definition of terms, symbols and abbreviations.....	9
3.1 Terms.....	9
3.2 Symbols.....	9
3.3 Abbreviations .....	9
4 Customer networks in homes (single-tenant).....	10
4.1 Overview of home network infrastructures .....	10
4.1.1 General.....	10
4.1.2 Network convergence .....	11
4.2 Infrastructure standardization activities.....	12
4.2.1 Generic cabling designs in accordance with CENELEC EN 50173-4.....	12
4.2.1.1 Infrastructure layers .....	12
4.2.1.2 CCCB infrastructure.....	13
4.2.1.3 ICT and BCT infrastructure .....	14
4.2.1.4 Cabling .....	14
4.2.2 Cabling installation in accordance with CENELEC EN 50174 standards.....	14
4.3 Network access infrastructure .....	15
4.3.0 Energy Efficiency in network access cabling and equipment.....	15
4.3.1 Cabling designs in accordance with CENELEC EN 50090 and CENELEC EN 50491 series.....	15
5 Energy efficiency .....	17
5.1 General .....	17
5.2 Energy efficiency of information technology infrastructures.....	17
5.3 The use of information technology to reduce total energy consumption.....	17
5.3.1 Infrastructure.....	17
5.3.2 Applications.....	18
5.3.3 Green issues.....	18
5.4 The POF cabling case: ETSI TS 105 175-1-1 .....	18
5.4.0 Generalities .....	18
5.4.1 ETSI TS 105 175-1-1.....	18
5.4.2 Typical power consumption values .....	18
5.4.3 Low Power Idle mode.....	19
5.4.4 Idle mode - Wake up functionality .....	19
<b>Annex A (informative): Services within the home.....</b>	<b>20</b>
History .....	22

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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 5, sub-part 1 of a multi-part deliverable. Full details of the entire series can be found in part 1 [i.36].

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# Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**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 maximize the energy efficiency of all the 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 5 sub-part 1 of a multi-part deliverable which has been produced by ETSI Technical Committee Access, Terminals, Transmission and Multiplexing (ATTM) 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 documents will contain information that has been jointly evolved to present developments in installations and transmission implementation and describing their progress towards energy efficiency in Next Generation Networks (NGN).

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Full standard:  
<https://standards.iteh.ai/catalog/standards/sist/7d1e280a-c0c5-48e9-8da5-bc7d7dec962/etsi-ts-105-174-5-1-v1.4.1-2020-01>

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# 1 Scope

The present document details measures which may be taken to improve the energy efficiency within homes (single-tenant) by virtue of broadband deployment. Clauses 2 and 3 contain references, definitions of terms 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.

Within the present document:

- clause 4 describes the nature of customer premises networks in homes (single tenant), defines the interfaces to those networks and identifies the standardization bodies working on the design and installation of those networks;
- clause 5 describes the strategies that may be employed within homes (single tenant) to both increase the energy efficiency of installed information technology equipment and to use the facilities offered by information technology services to reduce overall energy consumption.

This will enable the proper implementation of services, applications and content on an energy efficient infrastructure, though it is not the goal of this multi-part deliverable to provide detailed standardized solutions for home broadband network architecture.

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## 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.

Referenced documents which are not found to be publicly available in the expected location might be found at <https://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.

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

Not applicable.

### 2.2 Informative 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.

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] European Commission: "DG-JRC Code of Conduct on Energy Consumption of Broadband Equipment".
- [i.2] CENELEC EN 50090 series: "Home and Building Electronic Systems (HBES)".
- [i.3] CENELEC EN 50173-1: "Information technology - Generic cabling systems - Part 1: General requirements".
- [i.4] CENELEC EN 50173-4: "Information technology - Generic cabling - Part 4: Homes".

- [i.5] CENELEC EN 50174-1: "Information technology - Cabling installation - Part 1: Installation specification and quality assurance".
- [i.6] CENELEC EN 50174-2: "Information technology - Cabling installation - Part 2: Installation planning and practices inside buildings".
- [i.7] CENELEC EN 50090-2-1: "Home and Building Electronic Systems (HBES) - Part 2-1: System overview - Architecture".
- [i.8] CENELEC EN 50090-2-2: "Home and Building Electronic Systems (HBES) - Part 2-2: System overview - General technical requirements".
- [i.9] CENELEC EN 50090-2-3: "Home and Building Electronic Systems (HBES) - Part 2-2: System overview - General functional safety requirements for products intended to be integrated in HBES".
- [i.10] CENELEC EN 50090-3-1: "Home and Building Electronic Systems (HBES) - Part 3-1: Aspects of application - Introduction to the application structure".
- [i.11] CENELEC EN 50090-3-2: "Home and Building Electronic Systems (HBES) - Part 3-2: Aspects of application - User process for HBES Class 1".
- [i.12] CENELEC EN 50090-3-3: "Home and Building Electronic Systems (HBES) - Part 3-3: Aspects of application - HBES Interworking model and common HBES data types".
- [i.13] CENELEC EN 50090-4-1: "Home and Building Electronic Systems (HBES) - Part 4-1: Media independent layers - Application layer for HBES Class 1".
- [i.14] CENELEC EN 50090-4-2: "Home and Building Electronic Systems (HBES) - Part 4-2: Media independent layers - Transport layer, network layer and general parts of data link layer for HBES Class 1".
- [i.15] CENELEC EN 50090-4-3: "Home and Building Electronic Systems (HBES) - Part 4-3: Media independent layers - Communication over IP".
- [i.16] CENELEC EN 50090-5-1: "Home and Building Electronic Systems (HBES) - Part 5-1: Media and media dependent layers - Power line for HBES Class 1".
- [i.17] CENELEC EN 50090-5-2: "Home and Building Electronic Systems (HBES) - Part 5-2: Media and media dependent layers - Network based on HBES Class 1, Twisted Pair".
- [i.18] CENELEC EN 50090-5-3: "Home and Building Electronic Systems (HBES) - Part 5-3: Media and media dependent layers - Radio frequency".
- [i.19] CENELEC prTS 50090-6-4: "Home and Building Electronic Systems (HBES) - Part 6-4: Interfaces - Residential gateway model for a home and building electronic system".
- [i.20] CENELEC EN 50090-7-1: "Home and Building Electronic Systems (HBES) - Part 7-1: System management - Management procedures".
- [i.21] CENELEC EN 50090-8: "Home and Building Electronic Systems (HBES) - Part 8: Conformity assessment of products".
- [i.22] CENELEC EN 50090-9-1: "Home and Building Electronic Systems (HBES) - Part 9-1: Installation requirements - Generic cabling for HBES Class 1 Twisted Pair".
- [i.23] CENELEC TR 50090-9-2: "Home and Building Electronic Systems (HBES) - Part 9-2: Installation requirements - Inspection and testing of HBES installation".
- [i.24] CENELEC EN 50491-2: "General requirements for Home and Building Electronic Systems (HBES) and Building Automation and Control Systems (BACS) -- Part 2: Environmental conditions".
- [i.25] CENELEC EN 50491-3: "General requirements for Home and Building Electronic Systems (HBES) and Building Automation and Control Systems (BACS) -- Part 3: Electrical safety requirements".

- [i.26] CENELEC EN 50491-5-1: "General requirements for Home and Building Electronic Systems (HBES) and Building Automation and Control Systems (BACS) -- Part 5-1: EMC requirements, conditions and test set-up".
- [i.27] CENELEC EN 50491-5-2: "General requirements for Home and Building Electronic Systems (HBES) and Building Automation and Control Systems (BACS) -- Part 5-2: EMC requirements for HBES/BACS used in residential, commercial and light industry environment".
- [i.28] CENELEC EN 50491-5-3: "General requirements for Home and Building Electronic Systems (HBES) and Building Automation and Control Systems (BACS) -- Part 5-3: EMC requirements for HBES/BACS used in industry environment".
- [i.29] CENELEC EN 50491-6: "General requirements for Home and Building Electronic Systems (HBES) and Building Automation and Control Systems (BACS) -- Part 6: Design, planning and installation".
- [i.30] ETSI TS 102 973: "Access Terminals, Transmission and Multiplexing (ATTM); Network Termination (NT) in Next Generation Network architectures".
- [i.31] IEEE 802.3af™: "IEEE Standard for Information Technology - Telecommunications and Information Exchange Between Systems - Local and Metropolitan Area Networks - Specific Requirements - Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications - Data Terminal Equipment (DTE) Power Via Media Dependent Interface (MDI)".
- [i.32] IEEE 802.3at™: "Standard for Information Technology Telecommunications and Information Exchange Between Systems Local and Metropolitan Area Networks Specific Requirements Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications Amendment: Data Terminal Equipment (DTE) Power Via the Media Dependent Interface (MDI) Enhancements".
- [i.33] IEEE 802.3az™: "IEEE Standard for Information Technology - Telecommunications and Information Exchange Between Systems - Local and Metropolitan Area Networks - Specific Requirements Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications - Amendment: Media Access Control Parameters, Physical Layers and Management Parameters for Energy-Efficient Ethernet".
- [i.34] ISO/IEC 15018: "Information technology - Generic cabling for homes".
- [i.35] Commission Regulation (EC) No 1275/2008 of 17 December 2008, implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to "ecodesign requirements for standby and off mode electric power consumption of electrical and electronic household and office equipment".
- [i.36] ETSI TS 105 174-1: "Access, Terminals, Transmission and Multiplexing (ATTM); Broadband Deployment and Energy Management; Part 1: Overview, common and generic aspects".
- [i.37] CENELEC EN 60603-7 series: "Connectors for electronic equipment -- Part 7: Detail specification for 8-way".
- [i.38] CENELEC EN 50491-4 (in development): "General requirements for Home and Building Electronic Systems (HBES) and Building Automation and Control Systems (BACS); Part 4: Functional safety requirements".
- [i.39] ETSI TR 105 174-4: "Access, Terminals, Transmission and Multiplexing (ATTM); Broadband Deployment - Energy Efficiency and Key Performance Indicators; Part 4: Access networks".
- [i.40] ETSI TS 105 175-1 (V2.0.0): "Access, Terminals, Transmission and Multiplexing (ATTM); Plastic Optical Fibre System Specifications for 100 Mbit/s and 1 Gbit/s".
- [i.41] ETSI TS 105 175-1-1: "Access, Terminals, Transmission and Multiplexing (ATTM); Plastic Optical Fibres; Part 1: Plastic Optical Fibre System Specifications for 100 Mbit/s and 1 Gbit/s; Sub-part 1: Application requirements for physical layer specifications for high-speed operations over Plastic Optical Fibres".



- [i.42] ETSI TS 105 175-1-2: "Access, Terminals, Transmission and Multiplexing (ATTM); Plastic Optical Fibres; Part 1: Plastic Optical Fibre System Specifications for 100 Mbit/s and 1 Gbit/s; Sub-part 2: 1 Gbit/s and 100 Mbit/s physical layer for Plastic Optical Fibres".
- [i.43] CENELEC EN 50173 series: "Information technology - Generic cabling systems".

## 3 Definition of terms, symbols and abbreviations

### 3.1 Terms

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

**application:** system, with its associated transmission method that is supported by telecommunications cabling (this corresponds to a Layer One application in the OSI 7-layer model)

**Broadcast Communication Technology (BCT) application:** system, with its associated transmission method using the HF band (3 MHz to 30 MHz), the VHF band (30 MHz to 300 MHz) and the UHF band (300 MHz to 3 000 MHz) dedicated to the transmission of sound radio, TV and two-way data services, as well as for in-home inter-networking

NOTE: See CENELEC EN 50173-1 [i.3] modified.

**BCT service:** transmission of sound radio, TV and two-way data

NOTE: See CENELEC EN 50173-1 [i.3] modified.

**Control, Command and Communications in Building (CCCB) application:** system, with its associated transmission method dedicated to providing appliance control and building control

NOTE: See CENELEC EN 50173-1 [i.3] modified.

**CCCB services:** appliance control and building control

NOTE: See CENELEC EN 50173-1 [i.3] modified.

**Information Communication Technology (ICT) applications:** system, with its associated transmission method for the communication of information

**ICT services:** creation, communication dissemination, storage and management of information

**network convergence:** ability of a network, by virtue of the applications it supports, to deliver multiple ICT, BCT and CCCB services

### 3.2 Symbols

Void.

### 3.3 Abbreviations

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

ACP	Area Connection Point
BACS	Building Automation and Control Systems
BCT	Broadcast Communications Technology
BO	Broadcast Outlet
CAT	CATegory
CATV	CABle Television
CCCB	Command Control and Communications in Buildings
CGIC	ETSI CLC Co-ordination Group on Installations and Cabling
CO	Control Outlet
DC	Dedicated Control

DSL	Digital Subscriber Line
DTE	Data Terminal Equipment
EC	European Commission
EEE	Energy Efficient Ethernet
EMC	Electro-Magnetic Compatibility
ENTI	External Network Termination Interface
EU	European Union
FTTH	Fibre To The Home
HBES	Home and Building Electronic Systems
HD	Home Distributor
HDMI	High Definition Media Interface
HD/SHD	Home Distributor / Secondary Home distributor
ICT	Information and Communication Technology
IEC	International Electrotechnical Commission
LAN	Local Area Network
LPI	Low Power Idle
MATO	Multi-Application Telecommunications Outlet
MDI	Media-Dependent Interface
NGN	Next Generation Network
OF	Optical Fiber
OIE	Operator Independent Equipment
OSE	Operator Specific Equipment
PC	Personal Computer
PDA	Personal Digital Assistant
PoE	Power over Ethernet
POF	Plastic Optical Fibre
RJ	Registered Jack
SHD	Secondary Home Distributor
SI	Step Index
SI-POF	Step Index Plastic Optical Fibre
TO	Telecommunications Outlet
TR	Technical Report
TV	TeleVision

## 4 Customer networks in homes (single-tenant)

### 4.1 Overview of home network infrastructures

#### 4.1.1 General

Homes, both as single-tenant and multi-tenant premises, are unique with respect to cabling infrastructures for the following reasons:

- they represent the largest constituency for broadband services;
- there are limited or non-existent cabling infrastructures within the home for the distribution of external network telecommunications services or internally generated information technology services;
- residents are either willing to physically move within the home, or install service-specific wireless systems to access the primary telecommunications equipment;
- residents tend to situate their living space(s) according to the availability of the BCT service;
- the ongoing development of BCT services and the consequent requirements of the local cabling (HDMI, etc.) restrict distribution of those services within the home since a significant percentage of installations have been changed by the user and which restrict the capability of the infrastructure to support upgraded services.