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Environmental Engineering (EE); Monitoring and control interface for infrastructure equipment (Power, Cooling and environment systems used in telecommunication networks); Part 11: Battery system with integrated control and monitoring information model

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Foreword

This final draft ETSI Standard (ES) has been produced by ETSI Technical Committee Environmental Engineering (EE), and is now submitted for the ETSI standards Membership Approval Procedure.

The present document is part 11 of a multi-part deliverable covering Monitoring and control interface for infrastructure equipment (Power, Cooling and environment systems used in telecommunication networks), as identified below:

Part 1: "Generic Interface";

Part 2: "DC power system control and monitoring information model";

Part 3: "AC UPS power system control and monitoring information model";

Part 4: "AC distribution power system control and monitoring information model";

Part 5: "AC diesel back-up generator system control and monitoring information model";

Part 6: "Air Conditioning System control and monitoring information model";

Part 7: "Other utilities system control and monitoring information model";

Part 8: "Remote Power Feeding System control and monitoring information model".

Part 9: "Alternative Power Systems";

Part 10: "AC inverter power system control and monitoring information model";

Part 11: "Battery system with integrated control and monitoring information model";

Part 12: "Telecom/ICT equipment control and monitoring information model".

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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1 Scope

The present document applies to Battery Systems with integral control and monitoring for telecommunication and datacom (ICT) equipment. It applies to battery system with a dedicated monitoring and control unit.

The present document defines:

- Monitored and controlled battery system architectures.
- The minimum set of exchanged information required at the interface, described in "natural language" in text tables.
- The XML files with tags and variables corresponding to the data in the tables of the annexes.

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] ETSI ES 202 336-1: "Environmental Engineering (EE); Monitoring and Control Interface for Infrastructure Equipment (Power, Cooling and Building Environment Systems used in Telecommunication Networks) Part 1: Generic Interface".

[2] ETSI EN 300 132-3-1: "Environmental Engineering (EE); Power supply interface at the input to telecommunications and datacom (ICT) equipment; Part 3: Operated by rectified current source, alternating current source or direct current source up to 400 V; Sub-part 1: Direct current source up to 400 V".

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] IEEE 802.1 to 11: "IEEE Standard for Local and Metropolitan Area Networks: Overview and Architecture".

[i.2] ISO/IEC 10164 (all parts): "Information technology - Open Systems Interconnection".

[i.3] ISO/IEC 8879:"Information processing - Text and office systems - Standard Generalized Markup Language (SGML)".

[i.4] ETSI EN 300 132-2: "Environmental Engineering (EE); Power supply interface at the input to telecommunications and datacom (ICT) equipment; Part 2: Operated by -48 V direct current (dc)".

3 Definitions, symbols and abbreviations

3.1 Definitions

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

NOTE: Terms referring to energy interface, equipment and distribution are described in power distribution standards EN 300 132-2 [i.4], EN 300 132-3-1 [2].

alarm: any information signalling abnormal state, i.e. different to specified normal state of hardware, software, environment condition (temperature, humidity, etc.)

NOTE: The alarm signal should be understood by itself by an operator and should always have at least one severity qualification or codification (colour, level, etc.).

EXAMPLE: Rectifier failure, battery low voltage, etc.

alarm loop: electrical loop which open or closed state correspond to alarm start (set) or end (clear) state

alarm message: text parts of the alarm structure

alarm structure: organized set of information fields in an alarm data frame (time stamp, set/clear, text, etc.)

battery cell: basic electrochemical element (e.g. a 3.6 Vnominal cell for single lithium ion cell)

battery cell string: number of series and parallel interconnected cells to make a standard building block

Battery Management System (BMS): electronic components of an Integrated Battery Unit (IBU) that provides safety protection, detection and balancing, communicating status and alarms, and data acquisition and history for one IBU

client post: any device (laptop, PDA, console, etc.) connected to servers via the operation system networks to perform maintenance or supervision operations

Control form Style Sheet (CSS): simple mechanism for adding style (e.g. fonts, colours, spacing) to Web documents

EXAMPLE: Tutorials, books, mailing lists for users, etc.

Data Gathering Unit (DGU): functional unit used for several functions:

- collect serial, digital and analogue data from several equipment;
- option to send (output) serial or digital commands;
- forward/receive information to/from the Local/Remote Management Application via agreed protocols;
- mediation between interfaces and protocols.

NOTE: This function may be integrated as part of specific equipment.

Dynamic Host Control Protocol (DHCP): protocol used for self configuration of TCP/IP parameters of a workstation assigning IP address and a subnetwork mask

NOTE: DHCP may also configure DNS.

Dynamic Name Server (DNS): associates a single domain name to an IP address

dynamic synoptic: dynamic display of geographical maps, networks, installations and equipment

ethernet: LAN protocol

NOTE: Equivalent to IEEE 802.1 to 11 [i.1].

event: any information signalling a change of state which is not an alarm: e.g. battery test, change of state of battery charge

NOTE: The event signal should be understood by itself by an operator and should always have at least one severity qualification or codification (colour, level, etc.). It should be transmitted in a formatted structure with text message and other fields like for alarm, e.g. an event can be coded as an alarm with severity "0".

eXtensible Mark-up Language (XML): application profile or restricted form of SGML

NOTE: By construction, XML documents are conforming SGML the Standard Generalized Markup Language (ISO/IEC 8879 [i.3]). documents.XML is designed to describe data and focus on what data is. XML should be discerned from the well known Hypertext Transfer Mark-up Language (HTML) which was designed to display data and to focus on how data looks.

eXtensible Style sheet Language (XSL): language for expressing style sheets

NOTE: It consists of two parts, a language for transforming XML documents, and an XML vocabulary for specifying formatting semantics. An XSL style sheet specifies the presentation of a class of XML documents by describing how an instance of the class is transformed into an XML document that uses the formatting vocabulary.

infrastructure equipment: power, cooling and building environment systems used in telecommunications centres and Access Networks locations

EXAMPLE: Cabinets, shelters, underground locations, etc.

Integrated Battery System (IBS): energy storage system providing power to the telecom load composed of one or several Integrated Battery Units (IBU's) connected to the DC bus and managed by an integrated control and monitoring usually called Master Battery Management Module (MBMM)

Integrated Battery Unit (IBU): energy storage system providing power to the telecom load comprised of a battery cell string integrated with a Battery Management System (BMS)

NOTE: The standard nominal IBU voltage is typically 24V or 48V comprised of one or more battery cell strings.

intranet: internal company network generally using Ethernet protocol and extended IP addresses

logbook: chronological file that contains alarm and event messages may be paper or electronic

Management Information Base (MIB): dynamic data base that gathers all objects and should evolve to include automatic and manual configuration tools with self coherence tests

Master Battery Management Module (MBMM): electronic unit (optionally used depending on application) that manages and controls several connected Integrated Battery Units (IBU's) and provides safety control, communicating status and alarms, and data acquisition and history for the Integrated Battery System (IBS)

menu: list of possible input command choices that may be presented in different ways on a display

NOTE: Selection is normally made by a keyboard, a pointing device, a mouse or directly by finger on a sensitive screen.

object: class description of items that accept a set of properties or functions

NOTE: Generic objects can include more specific items and inherit from their properties. If correctly structured, object programming can allow the system to evolve, i.e. be more future-proof. The code should intrinsically be open and structured.

Hypertext Preprocessor (PHP): powerful tool for making dynamic and interactive Web pages

pop-up: information or command screen that appears when a menu choice is selected

NOTE: For example this may be a pop-up menu when the pointer is on a title button.

REpresentational State Transfer (REST): way to build an application for distributed system as www

Simple Object Access Protocol (SOAP): way to communicate between applications running on different operating systems, with different technologies and programming languages

NOTE 1: SOAP communicates over HTTP, because HTTP is supported by all Internet browsers and servers, SOAP traffic is not blocked by firewalls and proxy servers

NOTE 2: See http://www.w3c.org.

Systems Management Function (SMF): object properties or classes with projection on CMIS application context communication

NOTE: Set of ISO system management functions according to ISO/IEC 10164 [i.2].

warning: low severity alarm

World Wide Web Consortium (W3C): consortium founded in October 1994 to develop common interoperable protocols and promote World Wide Web

NOTE: See http://www.w3c.org.

Windows: virtual area on the display that corresponds to a specific application

web: common name for the Internet or Intranet

XCU: CU enabled to communicate using XML interface as defined in the present document

XHTML: stricter and cleaner version of HTML consisting in all the elements in HTML 4.01 combined with the syntax of XML and readable by all XML browser

NOTE: See http://www.w3c.org.

XML Schema Definition (XSD): new more detailed XML description compared to the previous one, the DTD

3.2 Symbols

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

I_{Batt}	Total battery current (DC)
I_{IBn}	Integrated Battery Unit or System (IBU or IBS) current (DC) where *n* is the unit or system number
I_{Load}	Total output load current (DC)
I_{Rect}	Total rectifier output current (DC)

3.3 Abbreviations

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

AC	Alternating Current
BMS	Battery Management System
CAN	Controller Area Network
CSS	Control form Style Sheet
CU	Control Unit
DC	Direct Current
DGU	Data Gathering Unit
DHCP	Dynamic Host Control Protocol
DNS	Dynamic Name Server
DTD	Document Type Definition
HTML	Hypertext Transfer Make-up Language
HTTP	HyperText Transfer Protocol
IBS	Integrated Battery System
IBU	Integrated Battery Unit
ICT	Information and Communication Technology
IP	Internet Protocol

LAN	Local Array Network
MBMM	Master Battery Management Module
MIB	Management Information Base
PHP	Hypertext Preprocessor
REST	REpresentational State Transfer
RMA	Remote Management Application
SMF	Systems Management Function
SOAP	Simple Object Access Protocol
SoC	State of Charge of the IBU or IBS
SoH	State of Health of the IBU or IBS
TCP	Transmission Control Protocol for IP
UPS	Uninterrupted Power Supply
W3C	World Wide Web Consortium
XCU	XML enabled CU
XML	eXtensible Markup Language
XSD	XML Schema Definition
XSL	eXtensible Style sheet Language

4 Integrated Battery Unit (IBU) and Integrated Battery System (IBS) control and monitoring presentation

In telecommunication or datacom (ICT) site, batteries are used to get an uninterruptible power supply. They are storing energy which is used to power equipment in the event of source or power supply failure. Battery systems provide typical standby of 10 min to 48 hours on grid connected sites. For off grid telecom site, the battery autonomy can last several days.

In most existing installation, there is no specific control/monitoring provided as part of the battery system. It is provided by the power system. With some new battery technologies, control and monitoring is incorporated in the battery system.

An Integrated Battery System (IBS) can comprise several Integrated Battery Units (IBU).

Both an IBU and an IBS store energy and deliver their stored energy like a legacy battery unit or battery system. The difference is that an IBU or IBS includes electronics combined with a battery string including several cells. In an IBU, the integrated electronics is referred to as the Battery Management System (BMS). In an IBS, an electronic unit may be optionally added to a system of connected IBU and this is referred to as the Master Battery Management Module (MBMM).

For battery technology where it is not required to monitor and control each cells individually, there can be a single electronics in the IBS, IBU being only equipped with sensors.

Integrated in an IBU, the BMS includes the primary functions of safety protection, voltage limit detection and charge balancing, communicating status and alarms, and data acquisition and history. An IBU may include features like a resettable breaker or a replaceable fuse, internal heater depending on technology, electronic contactor and current regulation. Each IBU can communicate directly with an external management application by utilizing the appropriate transmission protocol (e.g. CAN bus) or/and a dry contact alarm signal. Figures 1 and 2 show a functional schematic view of a typical IBU.

In an IBS, the IBU can be arranged in series or in parallel. For example, an IBS with eight multiple 48V IBU in series can be connected to a DC power system used to supply interface A3.

NOTE 1: There can be in some battery systems a double protection with fuse and circuit breaker in series, in case of very high fault current and risk of damage to the circuit breaker that prevent it to open. The fuse is then in this case a back-up protective device.

NOTE 2: The IBU communication bus is commonly a data bus e.g. CAN bus.