ETSI ES 202 336-9 V1.1.1 (2012-09)

Environmental Engineering (EE);
Monitoring and Control Interface for Infrastructure Equipment (Power, Cooling and Building Environment Systems used in Telecommunication Networks);
Part 9: Alternative Power Systems

Reference
DES/EE-02037-9

Keywords
control, interface, power

ETSI

650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° 7803/88

Important notice

Individual copies of the present document can be downloaded from:
http://www.etsi.org

The present document may be made available in more than one electronic version or in print. In any case of existing or perceived difference in contents between such versions, the reference version is the Portable Document Format (PDF). In case of dispute, the reference shall be the printing on ETSI printers of the PDF version kept on a specific network drive within ETSI Secretariat.

Users of the present document should be aware that the document may be subject to revision or change of status. Information on the current status of this and other ETSI documents is available at
http://portal.etsi.org/tb/status/status.asp

If you find errors in the present document, please send your comment to one of the following services:
http://portal.etsi.org/chaircor/ETSI_support.asp

Copyright Notification

Contents

Intellectual Property Rights

IPRs essential or potentially essential to the present document may have been declared to ETSI. The information pertaining to these essential IPRs, if any, is publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: *"Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards"*, which is available from the ETSI Secretariat. Latest updates are available on the ETSI Web server (http://ipr.etsi.org).

Pursuant to the ETSI IPR Policy, no investigation, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETSI SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

Foreword

This ETSI Standard (ES) has been produced by ETSI Technical Committee Environmental Engineering (EE).

The present document is part 9 of a multi-part deliverable. Full details of the entire series can be found in part 1 [1].

1 Scope

The present document applies to monitoring and control of alternative power supply systems for telecommunication equipment. The alternative power systems may include solar power system, wind power system, fuel cell system, external heat engine generator system, etc.

This multi-part deliverable defines:

- The monitored and controlled alternative power supply 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.

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 referenced 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 300 132-2: "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] 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".

[4] ETSI ES 202 336-2: "Environmental Engineering (EE); Monitoring and control interface for infrastructure equipment (Power, Cooling and environment systems used in telecommunication networks); Part 2: DC power system control and monitoring information model".

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] ETSI EN 302 099: "Environmental Engineering (EE); Powering of equipment in access network".

[i.2] ETSI TR 102 532: "Environmental Engineering (EE) The use of alternative energy sources in telecommunication installations".

[i.3] ETSI ES 202 336-11: "Environmental engineering (EE) Monitoring and Control Interface for infrastructure equipment (Power, Cooling and Building Environment Systems used in Telecommunication Networks). Part 11: Battery systems control and monitoring information model".

[i.4] IEEE 802.1 to 802.11: "IEEE Standard for Local & Metropolitan Area Network".

[i.5] ISO/IEC 8879: "Information processing - Text and office systems - Standard Generalized Markup Language (SGML)".

3 Definitions 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 [2], EN 300 132-3-1 [3] for ac and dc interface and EN 302 099 [i.1] for access network equipment powering.

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

battery: complete arrangement of battery cells or blocks in one string or more in parallel

battery cell: basic electrochemical element (e.g. a 2 V nominal cell for a high capacity lead acid battery)

battery string: number of serially interconnected battery blocks or cells

Control Unit (CU): integrated unit in an equipment to monitor and control this equipment through sensors and actuators

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

- collect serial, digital, and analog 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 Name Server (DNS): associates a single domain name to an IP address

Ethernet: LAN protocol

NOTE: Equivalent to IEEE 802.1 to 11 [i.4].

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.5]) documents. XML is designed to describe data and focus on what data is. XML is discerned from the well known Hypertext Transfer Mark-up Language (HTML) which was designed to display data and to focus on how data looks.

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

NOTE: Examples of the infrastructure equipment are cabinets, shelters, underground locations, etc.

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

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.

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.

warning: low severity alarm

web: common name for the Internet or Intranet

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.

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

3.2 Abbreviations

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

AC	Alternative Current
CU	Control Unit of an equipment
DC	Direct Current
DGU	Data Gathering Unit
DNS	Dynamic Name Server
HTML	Hypertext Transfer Make-up Language
HTTP	HyperText Transfer Protocol
IP	Internet Protocol
LAN	Local Array Network
LVD	Low Voltage Disconnection
MPPT	Maximum Power Point Tracking
PV	Photovoltaic
SPD	Surging Protection Device
TCP	Transmission Control Protocol for IP
W3C	World Wide Web Consortium
XCU	XML enabled CU
XML	eXtensible Mark-up Language

4 Alternative power system

The alternative power system subset described in ES 202 336-1 [1] transforms alternative energy source into DC voltage on interface A defined in EN 300 132-2 [2] or EN 300 132-3-1 [3] for telecom center or defined for local or remote power supply of access network equipment in EN 302 099 [i.1].

The alternative power systems may includes solar-power system, wind-power system, fuel cell system external heat engine generator system, etc., referenced in TR 102 532 [i.2]. One single control unit XCU can monitor and control several power cabinets through field bus. Field bus is outside the scope of the present document.

4.1 solar power system

This clause defines solar power systems. One example is depicted in figure 1.

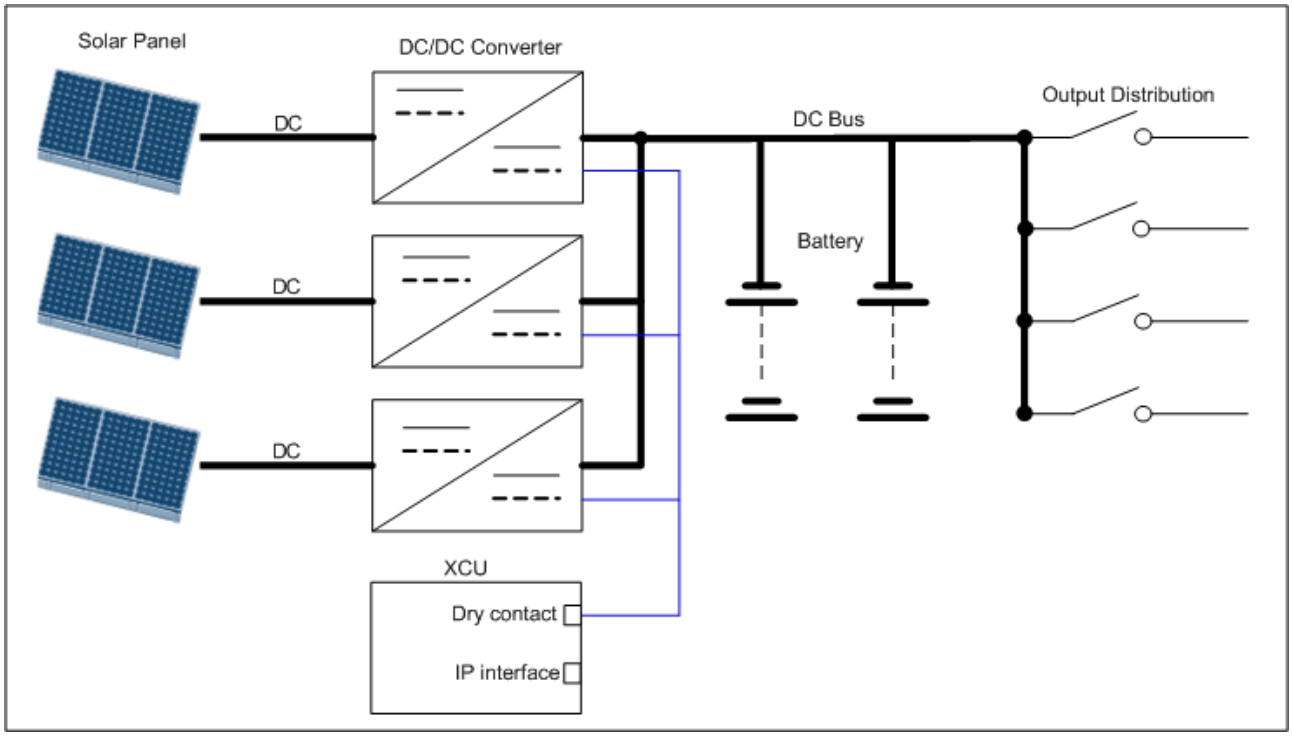

Figure 1: Example of solar power system with storage battery

The main elements of solar power systems are:

- One or more solar converters that convert DC voltage to DC voltage and control the battery charge in voltage and current. These DC/DC can have a Maximum Power Point Tracking function (MPPT).
- One or more storage battery strings.
- Protection and distribution (DC bus, circuit breaker, …) to power different loads and discriminate faults.
- A system monitoring and control unit (XCU) to monitor voltage, current, power, temperature etc, send alarms and provide system control functionality.

Several measurements are possible: converter states (normal/abnormal operation), converter input and output voltages and currents, temperature (battery, ambient), load currents, protective devices states, etc.

In option solar energy measurement can be proposed.

Several controls are possible to adjust converter voltage and current, to optimize the load between converters for energy saving and higher reliability.

For element of DC power systems that are used in alternative power systems, the information table model of DC system control monitoring ES 202 336-2 [4] shall be used.

For battery systems, the information table model ES 202 336-11 [i.3] under preparation should be used.

Table A.1 corresponds to mandatory data that shall be provided for a minimal solar power system.

Table B.1 corresponds to non mandatory data that shall be provided for a common solar power system, and Table B.5 includes data that should be provided in addition to mandatory one.

Annex C standardizes XML coding structures for these data.

4.2 wind power system

This clause defines wind power systems . One example is depicted in figure 2.

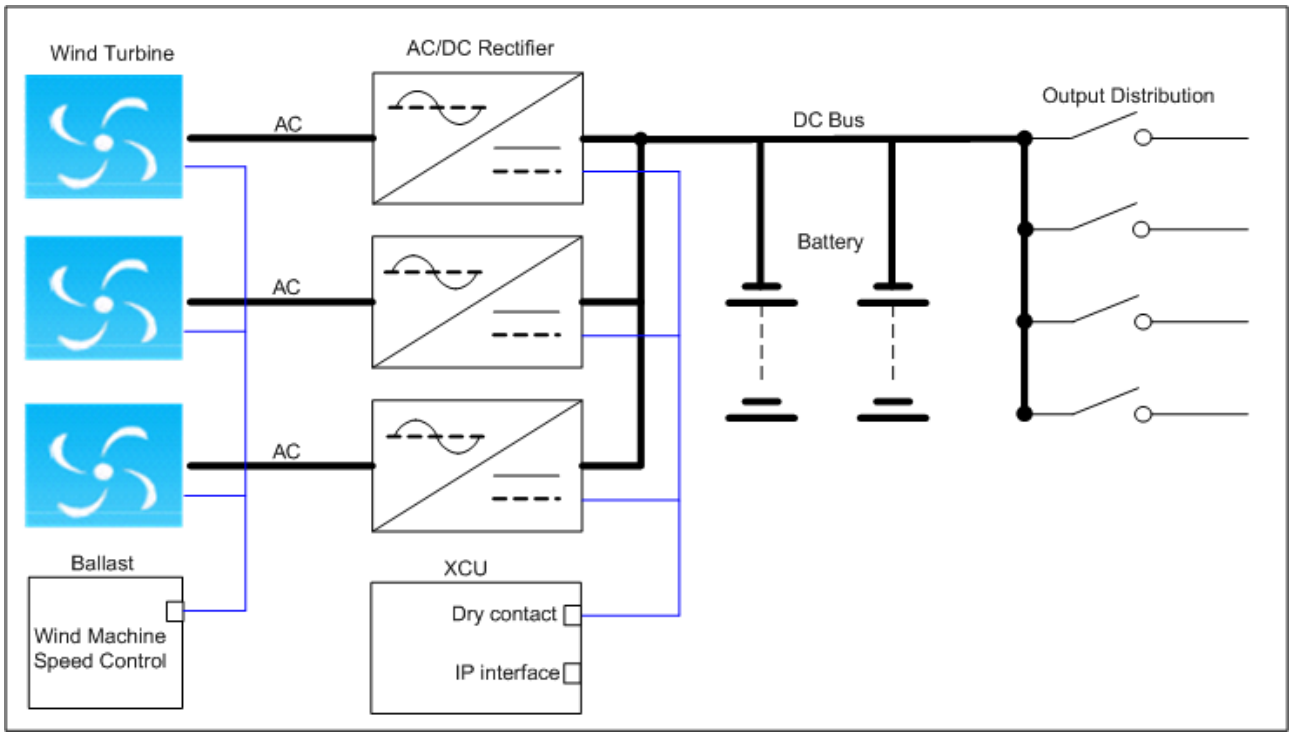

Figure 2: Example of a modular wind power system with storage battery

The main elements of wind power systems are:

- One or more wind rectifiers that convert AC voltage to DC voltage, or control the battery charge in voltage and current. These AC/DC can have a function to track the maximum possible power at a given wind speed.
- Wind machine control (speed limitation including ballast load or mechanical brake, turbine orientation, pitch control, etc.).
- One or more storage battery strings.
- Protection and distribution (DC bus, circuit breaker, …) to power different loads and discriminate faults.
- A system monitoring and control unit (XCU) to monitor voltage, current, power, temperature etc, send alarms and provide system control functionality.
- Warning light at top of mast for large system.

Several measurements are possible: rectifiers states (normal/abnormal operation), rectifiers input and output voltages and currents, temperature (battery, ambient), load currents, protective devices states.

In option wind measurement can be proposed.

Several controls are possible to adjust rectifier voltage and current, to optimize the load between rectifiers for energy saving and higher reliability.

NOTE: The AC input form wind turbine to wind AC/DC rectifier varies both in frequency and voltage much more than AC grid.

For element of DC power systems that are used in alternative power systems, the information table model of DC system control monitoring ES 202 336-2 [4] shall be used.

For battery systems, the information table model ES 202 336-11 [i.3] under preparation should be used.

Table A.2 corresponds to mandatory data that shall be provided for a minimal wind power system.

Table B.2 corresponds to non mandatory data that shall be provided for a common wind power system, and table B.6 includes data that should be provided in addition to mandatory one.

Annex C standardizes XML coding structures for these data.

4.3 fuel cell system

This clause defines the fuel cell systems . One example is depicted in figure 3.

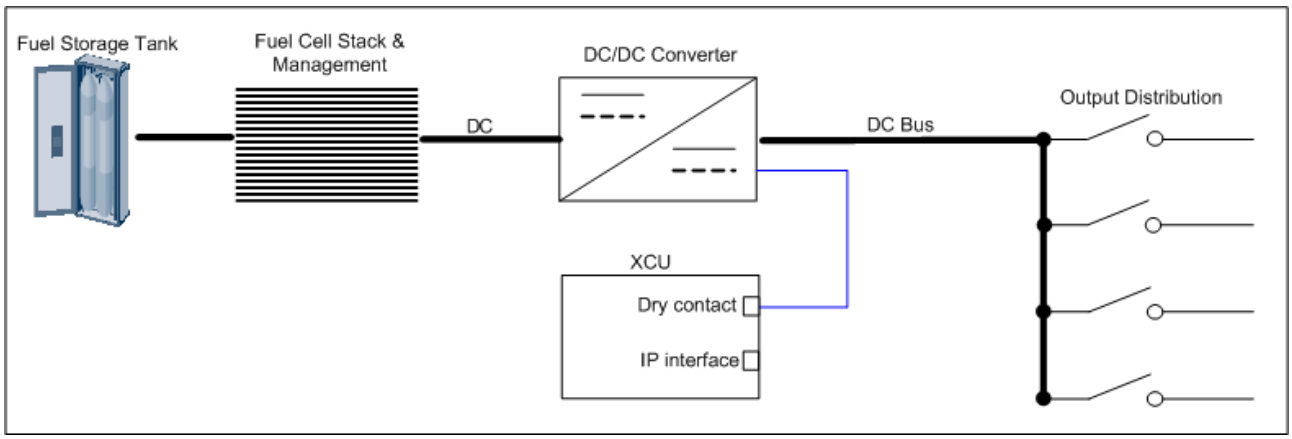

Figure 3: Example or fuel cell system

The main elements of fuel cell systems are:

- Fuel cell stack and management (including a heater to avoid internal water temperature falling below 0 °C, fans, filters, compressors, automatic valves, control unit that can be common with the XCU, etc.).
- A fuel storage made with bottle of Hydrogen, or hydride storage, or methanol + reformer, etc.
- One or more converters that convert fuel cell DC voltage to required DC voltage.
- Protection and distribution (DC bus, circuit breaker, …) to power different loads and discriminate faults.
- A system monitoring and control unit (XCU) to monitor voltage, current, power, temperature, fuel level etc., send alarms and provide system control functionality.
- Several measurements are possible: converter states, converter voltage and current, temperature, user load currents, etc.

Several controls are possible to adjust converter voltage and current, to optimize the load between converters for energy saving and higher reliability.

For element of DC power systems that are used in alternative power systems, the information table model of DC system control monitoring ES 202 336-2 [4] shall be used.

For battery systems, the information table model ES 202 336-11 [i.3] under preparation should be used.

Table A.3 corresponds to mandatory data that shall be provided for a minimal fuel cell system.

Table B.3 corresponds to non mandatory data that shall be provided for a common fuel cell system, and table B.7 includes data that should be provided in addition to mandatory one.

Annex C standardizes XML coding structures for these data.

4.4 External heat engine generator power system

This clause defines the external heat engine generator power systems. One example is depicted in figure 4.

NOTE: The external heat engine generator is a system based on a motor using heat from external combustion burner or solar concentrator e.g. Robert Stirling or John Ericsson machine.

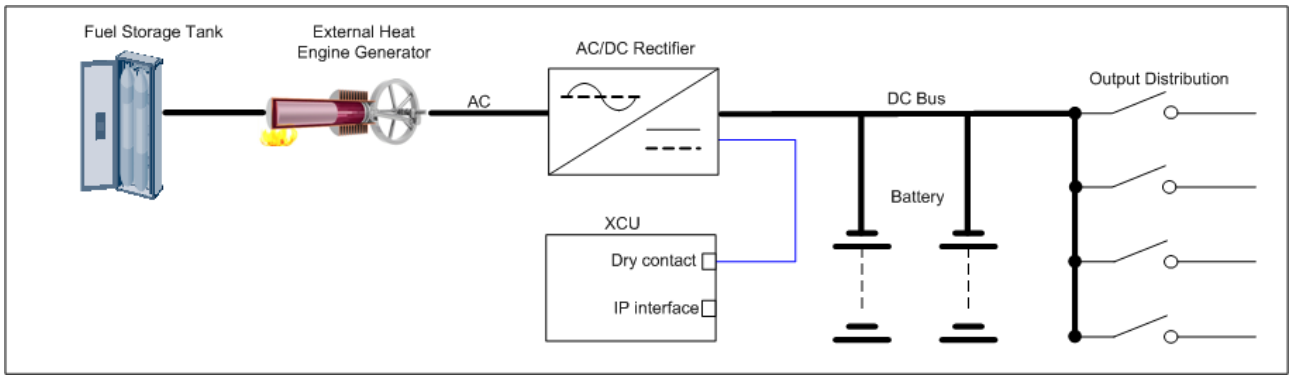

Figure 4: Example of external heat engine generator power system

The main elements of external heat engine generator systems are:

- Engine (speed control, temperature, safety circuitry).
- Alternator and power circuit (voltage, frequency, current).
- Fuel tank and supply to the engine.
- Water and air cooling circuit (fluid temperature, levels, circulation pumps, air, louvers, fans control).
- Oil circuit (pressure, levels, preheating).
- Starting devices system (battery voltage, starting speed, battery charger).
- Electrical auxiliary circuit (auxiliary protection devices, power contactors).
- A system monitoring and control unit (XCU) to monitor the generator, extend alarms and provide system control functionality.

For element of DC power systems that are used in alternative power systems, the information table model of DC system control monitoring ES 202 336-2 [4] shall be used.

For battery systems, the information table model ES 202 336-11 [i.3] under preparation should be used.

Table A.4 corresponds to mandatory data that shall be provided for a minimal external heat engine generator system.

Table B.4 corresponds to non mandatory data that shall be provided for a common external heat engine generator system, and table B.8 includes data that should be provided in addition to mandatory one.

Annex C standardizes XML coding structures for these data.

Annex A (normative): Summary of mandatory monitoring / supervision information and functions

This annex gathers the information needed on the remote monitoring application for different types of power systems. It specifies the mandatory requirements that shall be provided in all cases.

NOTE 1: These tables do not specify the power equipment by itself. These tables refer to subsets or devices that are not necessarily present in each equipment configuration. As a matter of fact, one alarm and its class apply only in case of the presence of this subset or device.

When an optional alarm that requires a parameter set is present, the corresponding parameter set is mandatory in the control section in order to allow remote adjustment under appropriate login procedure.

According to their types (Description, Alarm, Data, etc.), as defined in ES 202 336-1 [1] the information shall be provided by the Control Unit (XCU).

NOTE 2: If there is no XCU this data can be provided by the Data Gathering Unit (DGU).

When a CU has a field data bus connected to the DGU, at least, the DGU shall store data (record measurements, log files).The XCU which has the XML interface over Ethernet TCP/IP, shall store these data.

A.1 Table for solar power system

Table A.1

Type	Monitored information	Explanation
description	Device description	
alarm	One solar converter failure at least	
	Partial network failure (high error rate, XCU-DGU link fault, etc)	
event	None	
data	None	
data record	None	
config	None	
control	All XCU alarm/event/test/command parameters (time-out, counter, thresholds, …) if any	
	XCU program download with default to previous release	
	Default values resetting (safe value for XCU)	
NOTE: The identifiers used in the Type column of the following tables are described in ES 202 336-1 [1].		

A.2 Table for wind power system

Table A.2

Type	Monitored information	Explanation
description	Device description	
	One wind rectifier failure at least	
	Partial network failure (high error rate, XCU-DGU link fault, etc)	
event	None	
data	None	
data record	None	
config	None	
control	All XCU alarm/event/test/command parameters (time-out, counter, thresholds, …) if any	
	XCU program download with default to previous release	
	Default values resetting (safe value for XCU)	
NOTE: The identifiers used in the Type column of the following tables are described in ES 202 336-1 [1].		

A.3 Table for fuel cell power system

Table A.3

Type	Monitored information	Explanation
description	Device description	
	One fuel cell failure at least	
	Partial network failure (high error rate, XCU-DGU link fault, etc.)	
event	None	
data	None	
data record	None	
config	None	
control	All XCU alarm/event/test/command parameters (time-out, counter, thresholds, etc.) if any	
	XCU program download with default to previous release	
	Default values resetting (safe value for XCU)	
NOTE: The identifiers used in the Type column of the following tables are described in ES 202 336-1 [1].		

A.4 Table for external heat engine generator power system

Table A.4

Type	Monitored information	Explanation
description	Device description	
alarm	One external heat engine generator failure at least	
	Partial network failure (high error rate, XCU-DGU link fault, etc)	
event	None	
data	None	
data record	None	
config	None	
control	All XCU alarm/event/test/command parameters (time-out, counter, thresholds, …) if any	
	XCU program download with default to previous release	
	Default values resetting (safe value for XCU)	
NOTE: The identifiers used in the Type column of the following tables are described in ES 202 336-1 [1].		

Annex B (informative): Summary of non-mandatory monitoring / supervision information and functions

According to their types (Description, Alarm, Data, etc.), as defined in the present document the information should be provided by the Control Unit (XCU) or by the Data Gathering Unit (DGU) .

The non mandatory information of a table TBn (n being the N° of the table) are provided in addition to the mandatory information defined in annex B in table B.n.

B.1 Table for solar power system

Table B.1

Type	Monitored information	Explanation
description	additive information	
alarm	DC bus output low voltage	
	DC bus output high voltage	
	DC bus voltage sense failure	
	Load breaker open	
	One solar converter failure	
	Greater than one solar converter failure	
event	Alarm set/clear	
data	DC bus voltage	
	DC total load current	
	DC total energy consumption	This value can be measured using a kWh meter or calculated by the alternative power system controller using values of voltage and current monitored in the rectifiers
	DC total power	This value can be calculated by the alternative power system controller from DC output voltage and current measurements
	Solar converters total output current	
	Solar converters output power max. (one day)	
	Solar converters total output power (one day)	This value can be calculated by the alternative power system controller from solar converters output voltage and current measurements
	Solar power capacity management (ratio) = Used/Installed power	
data record	none	
config	DC bus output voltage low	
	DC bus output voltage high	
control	Disconnect the LVD	
	Reconnect the LVD	
	Clear all events	
	Clear the specified level events	

B.2 Table for wind power system

Table B.2

Type	Monitored information	Explanation
description	additive information	
alarm	DC bus output low voltage	
	DC bus output high voltage	
	DC bus voltage sense failure	
	Load breaker open	
	One wind rectifier failure	
	Greater than one wind rectifier failure	
	One wind rectifier failure	
event	Alarm set/clear	
data	DC bus voltage	
	DC total load current	
	DC total energy consumption	This value can be measured using a kWh meter or calculated by the alternative power system controller using values of voltage and current monitored in the rectifiers
	DC total power	This value can be calculated by the alternative power system controller from DC output voltage and current measurements
	Wind power rectifiers total output current	
	Wind power rectifiers output power max. (one day)	
	Wind power rectifiers total output power (one day)	This value can be calculated by the alternative power system controller from wind-power rectifiers output voltage and current measurements
	Wind power capacity management (ratio) = Used/Installed power	
	Wind speed	
	Max wind speed (one day)	
data record	none	
config	DC bus output voltage low	
	DC bus output voltage high	
control	Disconnect the LVD	
	Reconnect the LVD	
	Clear all events	
	Clear the specified level events	

B.3 Table for fuel cell power system

Table B.3

Type	Monitored information	Explanation
description	additive information	
alarm	DC bus output low voltage	
	DC bus output high voltage	
	DC bus voltage sense failure	
	Load breaker open	
	One fuel cell failure	
	Greater than one fuel cell failure	
event	Alarm set/clear	
data	DC bus voltage	
	DC total load current	
	DC total energy consumption	This value can be measured using a kWh meter or calculated by the alternative power system controller using values of voltage and current monitored in the rectifiers
	DC total power	This value can be calculated by the alternative power system controller from DC output voltage and current measurements
	Fuel cells total output current	
	Fuel cells total output power (one day)	This value can be calculated by the alternative power system controller from fuel cells output voltage and current measurements
	Fuel cells Power capacity management (ratio) = Used/Installed power	
data record	none	
config	DC bus output voltage low	
	DC bus output voltage high	
control	Disconnect the LVD	
	Reconnect the LVD	
	Clear all events	
	Clear the specified level events	

B.4 Table for external heat engine generator power system

Table B.4

Type	Monitored information	Explanation
description	additive information	
alarm	DC bus output low voltage	
	DC bus output high voltage	
	DC bus voltage sense failure	
	Load breaker open	
	One external heat engine generator converter failure	
	Greater than one external heat engine generator converter failure	
event	Alarm set/clear	
data	DC bus voltage	
	DC total load current	
	DC total energy consumption	This value can be measured using a kWh meter or calculated by the alternative power system controller using values of voltage and current monitored in the converter
	DC total power	This value can be calculated by the alternative power system controller from DC output voltage and current measurements
	External heat engine generator total output current	
	External heat engine generator converters output power max. (one day)	
	External heat engine generator converters total output power (one day)	This value can be calculated by the alternative power system controller from converters output voltage and current measurements
	External heat engine generator capacity management (ratio) = Used/Installed power	
data record	none	
config	DC bus output voltage low	
	DC bus output voltage high	
control	Disconnect the LVD	
	Reconnect the LVD	
	Clear all events	
	Clear the specified level events	

B.5 Table for solar converter

Table B.5

Type	Monitored information	Explanation
description	Converter reference	
	Converter serial number	
alarm	Communication interrupt	
	Converter failure	
	Converter protection	
	Fan failure	
	Over temperature	
	PV array lost	
	At least one PV array failure	
event	Alarm Set/Clear	
Data	Output power	
	Output voltage	
	Output current	
	PV array output voltage	
	PV array output current	
	PV array output current max. (one day)	
	Converter temperature	
data record	None	
config	Temperature high	
control	None	

B.6 Table for wind power rectifier

Table B.6

Type	Monitored information	Explanation
description	Rectifier Reference	
	Rectifier Serial Number	
alarm	Communication interrupt	
	Rectifier failure	
	Fan failure	
	Over temperature	
	Wind turbine failure	
	Wind turbine over speed	
	Surge Protective Device (SPD) failure	
event	Alarm Set/Clear	
data	Output power	
	Output voltage	
	Output current	
	Rectifier temperature	
	Phase A input voltage	
	Phase B input voltage	
	Phase C input voltage	
	Phase A input current	
	Phase B input current	
	Phase C input current	
	Wind turbine speed	
data record	None	
config	Temperature high	
	Wind turbine speed max.	
control	None	

B.7 Table for fuel cell

Table B.7

Type	Monitored information	Explanation
description	Fuel cell reference	
alarm	Communication interrupt	
	Fuel cell failure	
	Fan failure	
	Fuel cell over temperature	
	Inlet pressure low	
	Inlet pressure high	
	Air filter jamming	
	Power output insufficient	
	Fuel leakage	
	Fuel cell temperature sense fail	
	Fuel cell inlet pressure sense fail	
event	Alarm Set/Clear	
data	Output power	
	Output voltage	
	Output current	
	Output power max.	
	Output current max.	
	Inner temperature	
	Inlet pressure	
data record	None	
config	Fuel cell temperature high	
	Rated power output	
	Inlet pressure high	
	Inlet pressure low	
control	none	

B.8 Table for external heat engine generator rectifier

Table B.8

Type	Monitored information	Explanation
description	Converter reference	
	Converter serial number	
alarm	Communication interrupt	
	Converter failure	
	Converter protection	
	Fan failure	
	Over temperature	
event	Alarm Set/Clear	
Data	Output power	
	Output voltage	
	Output current	
data record	None	
config	Temperature high	
control	None	

Annex C (normative): Mandatory XML structure and elements

C.1 Structure of a XML document for a solar power system

In the site DGU XML data structure as described in ES 202 336-1 [1], a solar power system equipment is always a child of a site energy system.

The XML structure shall be as follows.

NOTE: It indicates precisely the generic mandatory XML structure and where to put the information if it exists (where it starts and stops).

Every equipment and element, should be considered as a folder in the XML structure.

It is not needed to repeat what is in ES 202 336-1 [1] (site id, …) but just focusing on alternative power system.

```
<site id="23" status ="normal">
        ....
    <energy_system id="1" status="normal">
        <description_table>
        …
        </description_table>
        …
        < solar_power_system id="1" status="normal">
            <description_table>
            …
            </description_table>
            <alarm_table>
            …
            </alarm_table>
            <event_table>
            …
            </event_table>
            <data_table>
            …
            </data_table>
            <data_record_table>
            …
            </data_record_table>
            <config_table>
            …
            </config_table>
            <control_table>
            …
            </control_table>
            <solar_converter id="1" status="normal">
            …
            </solar _converter>
            ….
        </ solar _power_system >
        …
    </energy_system>
    …
</site>
```

A solar power system XCU will only generate the XML document "solar_power_system.xml". This file can be downloaded by the DGU of the site and embedded in the "site.xml" document. In this case, the structure of the document is as follows:

```
< solar_power_system id="1" status="normal">
    <description_table>
    …
    </description_table>
    <alarm_table>
    …
    </alarm_table>
    <event_table>
    …
    </event_table>
    <data_table>
    …
    </data_table>
    <data_record_table>
    …
    </data_record_table>
    <config_table>
    …
    </config_table>
    <control_table>
    …
    </control_table>
    <solar_converter id="1" status="normal">
    …
    </solar_converter >
    …
</ solar_power_system >
```

C.2 Structure of a XML document for a wind power system

In the site DGU XML data structure as described in ES 202 336-1 [1], a wind power system equipment is always a child of a site energy system.

The XML structure shall be as follows.

NOTE: It indicates precisely the generic mandatory XML structure and where to put the information if it exists (where it starts and stops).

Every equipment and element, should be considered as a folder in the XML structure.

It is not needed to repeat what is in ES 202 336-1 [1] (site id, …) just focusing on wind power system.

```
<site id="23" status ="normal">
          ....
    <energy_system id="1" status="normal">
        <description_table>
        …
        </description_table>
        …
        < wind _power_system id="1" status="normal">
            <description_table>
            …
            </description_table>
            <alarm_table>
            …
            </alarm_table>
            <event_table>
            …
            </event_table>
            <data_table>
            …
            </data_table>
            <data_record_table>
            …
            </data_record_table>
            <config_table>
            …
            </config_table>
            <control_table>
            …
            </control_table>
            <wind_rectifier id="1" status="normal">
            …
            </ wind_rectifier >
            ….
        </ wind _power_system >
        …
    </energy_system>
    …
</site>
```

A wind power system XCU will only generate the XML document "wind_power_system.xml". This file can be downloaded by the DGU of the site and embedded in the "site.xml" document. In this case, the structure of the document is as follows:

```
<wind_power_system id="1" status="normal">
    <description_table>
    …
    </description_table>
    <alarm_table>
    …
    </alarm_table>
    <event_table>
    …
    </event_table>
    <data_table>
    …
    </data_table>
    <data_record_table>
    …
    </data_record_table>
    <config_table>
    …
    </config_table>
    <control_table>
    …
    </control_table>
    <wind_power_rectifier id="1" status="normal">
    …
    </ wind_power_rectifier >
    …
</ wind _power_system >
```

C.3 Structure of a XML document for a fuel cell power system

In the site DGU XML data structure as described in ES 202 336-1 [1], an alternative -power system equipment is always a child of a site energy system.

The XML structure shall be as follows.

NOTE: It indicates precisely the generic mandatory XML structure and where to put the information if it exists (where it starts and stops).

Every equipment and element, should be considered as a folder in the XML structure.

It is not needed to repeat what is in ES 202 336-1 [1] (site id, …) just focusing on alternative power system.

```
<site id="23" status ="normal">
          ....
    <energy_system id="1" status="normal">
        <description_table>
        …
        </description_table>
        …
        < fuel_cell_system id="1" status="normal">
            <description_table>
            …
            </description_table>
            <alarm_table>
            …
            </alarm_table>
            <event_table>
            …
            </event_table>
            <data_table>
            …
            </data_table>
            <data_record_table>
            …
            </data_record_table>
            <config_table>
            …
            </config_table>
            <control_table>
            …
            </control_table>
            ….
        </ fuel_cell_system >
        …
    </energy_system>
    …
</site>
```

A fuel cell system XCU will only generate the XML document "fuel_cell_system.xml". This file can be downloaded by the DGU of the site and embedded in the "site.xml" document. In this case, the structure of the document is as follows:

```
<fuel_cell_system id="1" status="normal">
    <description_table>
    …
    </description_table>
    <alarm_table>
    …
    </alarm_table>
    <event_table>
    …
    </event_table>
    <data_table>
    …
    </data_table>
    <data_record_table>
    …
    </data_record_table>
    <config_table>
    …
    </config_table>
    <control_table>
    …
    </control_table>
    <fuel_cell id="1" status="normal">
    …
    </fuel_cell >
    …
</ fuel_cell_system >
```

C.4 Structure of a XML document for an external heat engine generator power system

In the site DGU XML data structure as described in ES 202 336-1 [1], a external heat engine generator power system equipment is always a child of a site energy system.

The XML structure shall be as follows.

NOTE: It indicates precisely the generic mandatory XML structure and where to put the information if it exists (where it starts and stops).

Every equipment and element, should be considered as a folder in the XML structure.

It is not needed to repeat what is in part 1 (site id, …) just focusing on alternative power system.

```
<site id="23" status ="normal">
          ....
    <energy_system id="1" status="normal">
        <description_table>
        …
        </description_table>
        …
        < external heat engine generator_power_system id="1" status="normal">
            <description_table>
            …
            </description_table>
            <alarm_table>
            …
            </alarm_table>
            <event_table>
            …
            </event_table>
            <data_table>
            …
            </data_table>
            <data_record_table>
            …
            </data_record_table>
            <config_table>
            …
            </config_table>
            <control_table>
            …
            </control_table>
            < external heat engine generator _converter id="1" status="normal">
            …
            </ external heat engine generator _converter>
            ….
        </ external heat engine generator _power_system >
        …
    </energy_system>
    …
</site>
```

An external heat engine generator power system XCU will only generate the XML document "external heat engine generator _power_system.xml". This file can be downloaded by the DGU of the site and embedded in the "site.xml" document. In this case, the structure of the document is as follows:

```
< external heat engine generator _power_system id="1" status="normal">
    <description_table>
    …
    </description_table>
    <alarm_table>
    …
    </alarm_table>
    <event_table>
    …
    </event_table>
    <data_table>
    …
    </data_table>
    <data_record_table>
    …
    </data_record_table>
    <config_table>
    …
    </config_table>
    <control_table>
    …
    </control_table>
    < external heat engine generator _converter id="1" status="normal">
    …
    </ external heat engine generator _converter >
    …
</ external heat engine generator _power_system >
```

C.5 The specific XML elements of a solar power system

New tag for tag element that is not in ES 202 336-1 [1].

Child Element	Description	Datatype
< solar-converter >	For detailed information about each solar converter	xs:complexType

C.6 The specific XML elements of a wind power system

New tag for tag element that is not in ES 202 336-1 [1].

Child Element	Description	Datatype
< wind-power-rectifier>	For detailed information about each wind-power rectifier	xs:complexType

C.7 The specific XML elements of a fuel cell power system

New tag for tag element that is not in ES 202 336-1 [1].

Child Element	Description	Datatype
< fuel-cell >	For detailed information about fuel cell	xs:complexType

C.8 The specific XML elements of an external heat engine generator power system

New tag for tag element that is not in ES 202 336-1 [1].

Child Element	Description	Datatype
< external heat engine generator-converter >	For detailed information about each external heat engine generator converter	xs:complexType

Annex D (informative): Examples of XML elements for a solar power system

D.1 The <description> elements of a solar power system

Here follows some examples of description elements.

This means that the annex A data are mandatory, but not the XML coding, and the existence of the data in the XML file should be checked.

Name	Group	Description
Manufacturer Name	Manufacturer	The name of the manufacturer
Product Name	Manufacturer	The commercial name of the product
Short Description	Manufacturer	A short description of the product written by the manufacturer
Reference	Manufacturer	The internal manufacturer reference of the equipment/system e.g. ordering code
Serial Number	Manufacturer	The serial number of the system/equipment

EXAMPLE:

```
<description_table>
    <description id="1" name ="Manufacturer Name" group="Manufacturer">Best Manufacturer</description>
        …
    <description id="4" name ="Serial Number" group="Manufacturer">45623-5F-EG</description>
        …
    <description id="10" name ="Reference" group="User">SEP1245-DC</description>
</description_table>
```

D.2 The <alarm> elements of a solar power system

EXAMPLE:

```
<alarm_table>
  <alarm id="1" active="false" name=" DC bus output low voltage " severity_type="major" severity_level="6"/>
  <alarm id="2" active="false" name=" DC bus output high voltage " severity_type="major" severity_level="6"/>
  <alarm id="3" active="false" name=" DC bus voltage sense failure " severity_type="major" severity_level="6"/>
  <alarm id="4" active="false" name=" Load breaker open " severity_type="major" severity_level="6"/>
  <alarm id="5" active="false" name="One solar converter failure" severity_type="major" severity_level="4"/>
  <alarm id="6" active="false" name="Greater than one solar converter failure" severity_type="major"
severity_level="6"/>
</alarm_table>
```

D.3 The <event> elements of a solar power system

Here follows some examples of event elements.

```
<event_table>
    ...
  <event id="7" datetime="2010-02-11T21:50:43" severity_type="minor" severity_level="4">Alarm Set : Load breaker
open </event>
  <event id="8" datetime="2010-02-11T21:50:58" severity_type="minor" severity_level="4">Alarm Clear : Load
breaker open </event>
          ...
</event_table>
```

D.4 The <data> elements of a solar power system

EXAMPLE:

```
<data_table>
  <data id="1" name="DC bus voltage" group="General" unit="volt">53.5</data>
  <data id="2" name="DC total load current" group="General" unit="ampere">20.0</data>
  <data id="3" name="DC total energy consumption" group="General" unit="KWh">53.5</data>
  <data id="4" name="DC total power" group="General" unit="watt">20.0</data>

  <data id="5" name="solar converter total output current" group="SolarConverters" unit="ampere">15.88</data>
  <data id="6" name="solar converter total output power"  group=" SolarConverters " unit="watt">15.88</data>
  <data id="7" name="solar converter total output power Max"  group=" SolarConverters " unit="watt">15.88</data>
  <data id="8" name="Solar Power capacity management (ratio)" group=" SolarConverters " unit=" ">0.00</data>
</data_table>
```

D.5 The <data_record> elements of a solar power system

The structure of the data record is really manufacturer dependent and is free.

D.6 The <config> elements of a solar power system

EXAMPLE:

```
<config_table>
  <config id="1" name="DC Bus Voltage Low" group="Bus Voltage Config">48.00</config>
  <config id="2" name="DC Bus Voltage High" group="Bus Voltage Config">58.50</config>
</config_table>
```

D.7 The <control> elements of a solar power system

Here follows some examples of control elements. Writing a '1' to the "innertext" of these elements start the control function.

```
<control_table>
  <control id="1" name="Disconnect the LVD" group="LVD"/>
  <control id="2" name="Reconnect  the LVD" group="LVD"/>
  <control id="3" name="Clear all events" group="Events"/>
  <control id="4" name="Clear the specified level events " group="Events"/>
</control_table>
```

Annex E (informative): Examples of XML elements for a wind power system

E.1 The <description> elements of a wind power system

Here follows some examples of description elements.

This means that the annex A data are mandatory, but not the XML coding, and the existence of the data in the XML file has to be checked.

Name	Group	Description
Manufacturer Name	Manufacturer	The name of the manufacturer
Product Name	Manufacturer	The commercial name of the product
Short Description	Manufacturer	A short description of the product written by the manufacturer
Reference	Manufacturer	The internal manufacturer reference of the equipment/system e.g. ordering code
Serial Number	Manufacturer	The serial number of the system/equipment

EXAMPLE:

```
<description_table>
    <description id="1" name ="Manufacturer Name" group="Manufacturer">Best Manufacturer</description>
        …
    <description id="4" name ="Serial Number" group="Manufacturer">45623-5F-EG</description>
        …
    <description id="10" name ="Reference" group="User">SEP1245-DC</description>
</description_table>
```

E.2 The <alarm> elements of a wind power system

EXAMPLE:

```
<alarm_table>
  <alarm id="1" active="false" name=" DC bus output low voltage " severity_type="major" severity_level="6"/>
  <alarm id="2" active="false" name=" DC bus output high voltage " severity_type="major" severity_level="6"/>
  <alarm id="3" active="false" name=" DC bus voltage sense failure " severity_type="major" severity_level="6"/>
  <alarm id="4" active="false" name=" Load breaker open " severity_type="major" severity_level="6"/>
  <alarm id="7" active="false" name="One wind power rectifier failure" severity_type="major" severity_level="4"/>
  <alarm id="8" active="false" name="Greater than one wind power rectifier failure" severity_type="major"
severity_level="6"/>
</alarm_table>
```

E.3 The <event> elements of a wind power system

Here follows some examples of event elements.

```
<event_table>
    ...
  <event id="7" datetime="2010-02-11T21:50:43" severity_type="minor" severity_level="4">Alarm Set : Load breaker open </event>
  <event id="8" datetime="2010-02-11T21:50:58" severity_type="minor" severity_level="4">Alarm Clear : Load breaker open </event>
          ...
</event_table>
```

E.4 The <data> elements of a wind power system

EXAMPLE:

```
<data_table>
  <data id="1" name="DC bus voltage" group="General" unit="volt">53.5</data>
  <data id="2" name="DC total load current" group="General" unit="ampere">20.0</data>
  <data id="3" name="DC total energy consumption" group="General" unit="KWh">53.5</data>
  <data id="4" name="DC total power" group="General" unit="watt">20.0</data>

  <data id="5" name="Wind power rectifiers total output current" group="WindRectifiers" unit="ampere">15.0</data>
  <data id="6" name="Wind power rectifiers total output power"  group="WindRectifiers" unit="watt">802.5</data>
  <data id="7" name="Wind power rectifiers output power Max" group="WindRectifiers" unit="watt">850</data>
  <data id="8" name="Wind Power capacity management (ratio) " group=" WindRectifiers " unit="">0.00</data>
  <data id="9" name="Wind speed" group="WindRectifiers" unit="m/s">15.88</data>
  <data id="10" name=" Max wind speed (one day)" group=" WindRectifiers " unit=" m/s ">15.88</data>

</data_table>
```

E.5 The <data_record> elements of a wind power system

The structure of the data record is really manufacturer dependent and is free.

E.6 The <config> elements of a wind power system

EXAMPLE:

```
<config_table>
  <config id="1" name="DC Bus Voltage Low" group="Bus Voltage Config">48.00</config>
  <config id="2" name="DC Bus Voltage High" group="Bus Voltage Config">58.50</config>
</config_table>
```

E.7 The <control> elements of a wind power system

Here follows some examples of control elements. Writing a '1' to the "innertext" of these elements start the control function.

```
<control_table>
  <control id="1" name="Disconnect the LVD" group="LVD"/>
  <control id="2" name="Reconnect  the LVD" group="LVD"/>
  <control id="3" name="Clear all events" group="Events"/>
  <control id="4" name="Clear the specified level events " group="Events"/>
</control_table>
```

Annex F (informative): Examples of XML elements for a fuel cell power system

F.1 The <description> elements of a fuel cell power system

Here follows some examples of description elements.

This means that the annex A data are mandatory, but not the XML coding, and the existence of the data in the XML file has to be checked.

Name	Group	Description
Manufacturer Name	Manufacturer	The name of the manufacturer
Product Name	Manufacturer	The commercial name of the product
Short Description	Manufacturer	A short description of the product written by the manufacturer
Reference	Manufacturer	The internal manufacturer reference of the equipment/system e.g. ordering code
Serial Number	Manufacturer	The serial number of the system/equipment

EXAMPLE:

```
<description_table>
    <description id="1" name ="Manufacturer Name" group="Manufacturer">Best Manufacturer</description>
        …
    <description id="4" name ="Serial Number" group="Manufacturer">45623-5F-EG</description>
        …
    <description id="10" name ="Reference" group="User">SEP1245-DC</description>
</description_table>
```

F.2 The <alarm> elements of a fuel cell power system

EXAMPLE:

```
<alarm_table>
  <alarm id="1" active="false" name=" DC bus output low voltage " severity_type="major" severity_level="6"/>
  <alarm id="2" active="false" name=" DC bus output high voltage " severity_type="major" severity_level="6"/>
  <alarm id="3" active="false" name=" DC bus voltage sense failure " severity_type="major" severity_level="6"/>
  <alarm id="4" active="false" name=" Load breaker open " severity_type="major" severity_level="6"/>
  <alarm id="5" active="false" name=" One fuel cell Failure" severity_type="major" severity_level="4"/>
   <alarm id="6" active="false" name="Greater than one fuel cell Failure" severity_type="major" severity_level="6"/>
</alarm_table>
```

F.3 The <event> elements of a fuel cell power system

Here follows some examples of event elements.

```
<event_table>
    ...
  <event id="7" datetime="2010-02-11T21:50:43" severity_type="minor" severity_level="4">Alarm Set : Load breaker open </event>
  <event id="8" datetime="2010-02-11T21:50:58" severity_type="minor" severity_level="4">Alarm Clear : Load breaker open </event>
          ...
</event_table>
```

F.4 The <data> elements of a fuel cell power system

EXAMPLE:

```
<data_table>
  <data id="1" name="DC bus voltage" group="General" unit="volt">53.5</data>
  <data id="2" name="DC total load current" group="General" unit="ampere">20.0</data>
  <data id="3" name="DC total energy consumption" group="General" unit="KWh">53.5</data>
  <data id="4" name="DC total power" group="General" unit="watt">20.0</data>

  <data id="5" name="Fuel cell DC current" group="FuelCell" unit="ampere">15.88</data>
  <data id="6" name="Fuel cell DC output power(one day)" group=" FuelCell " unit="watt">15.88</data>
  <data id="7" name="Fuel cell Power capacity management (ratio)" group=" FuelCell " unit=" ">0.00 </data>
</data_table>
```

F.5 The <data_record> elements of a fuel cell power system

The structure of the data record is really manufacturer dependent and is free.

F.6 The <config> elements of a fuel cell power system

EXAMPLE:

```
<config_table>
  <config id="1" name="DC Bus Voltage Low" group="Bus Voltage Config">48.00</config>
  <config id="2" name="DC Bus Voltage High" group="Bus Voltage Config">58.50</config>
</config_table>
```

F.7 The <control> elements of a fuel cell power system

Here follows some examples of control elements. Writing a '1' to the "innertext" of these elements start the control function.

```
<control_table>
  <control id="1" name="Disconnect the LVD" group="LVD"/>
  <control id="2" name="Reconnect  the LVD" group="LVD"/>
  <control id="3" name="Clear all events" group="Events"/>
  <control id="4" name="Clear the specified level events " group="Events"/>
</control_table>
```

Annex G (informative): Examples of XML elements for an external heat engine generator power system

G.1 The <description> elements of an external heat engine generator power system

Here follows some examples of description elements.

This means that the annex A data are mandatory, but not the XML coding, and the existence of the data in the XML file has to be checked.

Name	Group	Description
Manufacturer Name	Manufacturer	The name of the manufacturer
Product Name	Manufacturer	The commercial name of the product
Short Description	Manufacturer	A short description of the product written by the manufacturer
Reference	Manufacturer	The internal manufacturer reference of the equipment/system e.g. ordering code
Serial Number	Manufacturer	The serial number of the system/equipment

EXAMPLE:

```
<description_table>
    <description id="1" name ="Manufacturer Name" group="Manufacturer">Best Manufacturer</description>
        …
    <description id="4" name ="Serial Number" group="Manufacturer">45623-5F-EG</description>
        …
    <description id="10" name ="Reference" group="User">SEP1245-DC</description>
</description_table>
```

G.2 The <alarm> elements of an external heat engine generator power system

EXAMPLE:

```
<alarm_table>
  <alarm id="1" active="false" name=" DC bus output low voltage " severity_type="major" severity_level="6"/>
  <alarm id="2" active="false" name=" DC bus output high voltage " severity_type="major" severity_level="6"/>
  <alarm id="3" active="false" name=" DC bus voltage sense failure " severity_type="major" severity_level="6"/>
  <alarm id="4" active="false" name=" Load breaker open " severity_type="major" severity_level="6"/>
  <alarm id="5" active="false" name="One external heat engine generator converter failure" severity_type="major"
severity_level="4"/>
  <alarm id="6" active="false" name="Greater than one external heat engine generator converter failure"
severity_type="major" severity_level="6"/>
</alarm_table>
```

G.3 The <event> elements of an external heat engine generator power system

Here follows some examples of event elements.

```
<event_table>
    ...
  <event id="7" datetime="2010-02-11T21:50:43" severity_type="minor" severity_level="4">Alarm Set : Load breaker open </event>
  <event id="8" datetime="2010-02-11T21:50:58" severity_type="minor" severity_level="4">Alarm Clear : Load breaker open </event>
          ...
</event_table>
```

G.4 The <data> elements of an external heat engine generator power system

EXAMPLE:

```
<data_table>
  <data id="1" name="DC bus voltage" group="General" unit="volt">53.5</data>
  <data id="2" name="DC total load current" group="General" unit="ampere">20.0</data>
  <data id="3" name="DC total energy consumption" group="General" unit="KWh">53.5</data>
  <data id="4" name="DC total power" group="General" unit="watt">20.0</data>

  <data id="5" name="external heat engine generator converter total output current" group=" external heat engine generator Converters" unit="ampere">15.88</data>
  <data id="6" name=" external heat engine generator converter total output power"  group=" external heat engine generator Converters " unit="watt">15.88</data>
  <data id="7" name=" external heat engine generator converter total output power Max"  group=" external heat engine generator Converters " unit="watt">15.88</data>
  <data id="8" name=" external heat engine generator Power capacity management (ratio)" group=" external heat engine generator Converters " unit=" ">0.00</data>
</data_table>
```

G.5 The <data_record> elements of an external heat engine generator power system

The structure of the data record is really manufacturer dependent and is free.

G.6 The <config> elements of an external heat engine generator power system

EXAMPLE:

```
<config_table>
  <config id="1" name="DC Bus Voltage Low" group="Bus Voltage Config">48.00</config>
  <config id="2" name="DC Bus Voltage High" group="Bus Voltage Config">58.50</config>
</config_table>
```

G.7 The <control> elements of an external heat engine generator power system

Here follows some examples of control elements. Writing a '1' to the "innertext" of these elements start the control function.

```
<control_table>
  <control id="1" name="Disconnect the LVD" group="LVD"/>
  <control id="2" name="Reconnect  the LVD" group="LVD"/>
  <control id="3" name="Clear all events" group="Events"/>
  <control id="4" name="Clear the specified level events " group="Events"/>
</control_table>
```

Annex H (informative): Examples of XML elements for a solar converter

H.1 The <description> elements of a solar converter

```
<description_table>
  <description id="1" name="Product Name" group="manufacturer">RECT850TN</description>
  <description id="2" name="Hardware Reference" group="manufacturer">Best Manufacturer</description>
    ...
</description_table>
```

H.2 The <alarm> elements of a solar converter

```
<alarm_table>
  <alarm id="1" active="false" name="Communication interrupt" severity_type="major" severity_level="6"/>
  <alarm id="2" active="false" name="Converter failure" severity_type="major" severity_level="6"/>
  <alarm id="3" active="false" name="Converter protection " severity_type="major" severity_level="6"/>
  <alarm id="4" active="false" name="Fan failure" severity_type="major" severity_level="4"/>
  <alarm id="5" active="false" name="Over temperature" severity_type="major" severity_level="4"/>
  <alarm id="6" active="false" name="PV array lost" severity_type="major" severity_level="4"/>
  <alarm id="7" active="false" name="At least one PV array failure" severity_type="major" severity_level="4"/>
</ alarm_table >
```

H.3 The <event> elements of a solar converter

```
<event_table>
  <event id="1" datetime="2010-02-11T21:47:41" severity_type="major" severity_level="0">Alarm appeared:
Converter protection </event>
  <event id="2" datetime="2010-02-11T21:47:57" severity_type="major" severity_level="0">Alarm disappeared:
Converter protection </event>
</event_table>
```

H.4 The <data> elements of a solar converter

```
<data_table>
  <data id="1" name="Output power" group="Output" unit="watt">560</data>
  <data id="2" name="Output voltage" group="Output" unit="volt">54.2</data>
  <data id="3" name="Output current" group="Output" unit="ampere">10.33</data>
  <data id="4" name="PV array output voltage" group="PV Array " unit="watt">850</data>
  <data id="5" name="PV array output current" group="PV" unit=" volt ">220</data>
  <data id="6" name="PV array output current max " group="PV" unit="ampere">10.0</data>
  <data id="7" name="Converter temperature" group="General" unit="Degree Celsius">57</data>
</data_table>
```

H.5 The <config> elements of a solar converter

```
<config_table>
   <config id="1" name=" Temperature high " group="General">50.0</config>
</config_table>
```

H.6 The <control> elements of a solar converter

```
<control_table>
   <control id="1" name=" SomeConverterControlName " />
</control_table>
```

Annex I (informative): Examples of XML elements for a wind power rectifier

I.1 The <description> elements of a wind power rectifier

```
<description_table>
  <description id="1" name="Product Name" group="manufacturer">RECT850TN</description>
  <description id="2" name="Hardware Reference" group="manufacturer">Best Manufacturer</description>
    ...
</description_table>
```

I.2 The <alarm> elements of a wind power rectifier

```
<alarm_table>
  <alarm id="1" active="false" name="Communication interrupt" severity_type="major" severity_level="6"/>
  <alarm id="2" active="false" name="Rectifier failure" severity_type="major" severity_level="6"/>
  <alarm id="3" active="false" name="Fan failure" severity_type="major" severity_level="4"/>
  <alarm id="4" active="false" name="Over temperature" severity_type="major" severity_level="4"/>
  <alarm id="5" active="false" name="Wind turbine failure" severity_type="major" severity_level="4"/>
  <alarm id="6" active="false" name="Wind turbine over speed" severity_type="major" severity_level="4"/>
  <alarm id="7" active="false" name=" Surge Protective Device (SPD) failure " severity_type="major"
severity_level="4"/>
</table>
```

I.3 The <event> elements of a wind power rectifier

```
<event_table>
  <event id="1" datetime="2010-02-11T21:47:41" severity_type="major" severity_level="0">Alarm appeared: Over
temperature </event>
  <event id="2" datetime="2010-02-11T21:47:57" severity_type="major" severity_level="0">Alarm disappeared: Over
temperature </event>
</event_table>
```

I.4 The <data> elements of a wind power rectifier

```
<data_table>
  <data id="1" name="Output Power" group="output" unit="watt">560</data>
  <data id="2" name="Output Voltage" group="output" unit="volt">54.2</data>
  <data id="3" name="Output Current" group="output" unit="ampere">10.33</data>
  <data id="4" name=" Rectifier temperature" group="General" unit="Degree Celsius">57</data>
  <data id="5" name="Phase A input voltage" group="Input" unit=" volt ">200.0</data>
  <data id="6" name=" Phase B input voltage " group="Input" unit=" volt ">200.0</data>
  <data id="7" name=" Phase C input voltage " group="Input" unit=" volt ">200.0</data>
  <data id="8" name=" Phase A input current " group=" Input " unit=" ampere ">20</data>
  <data id="9" name=" Phase B input current " group=" Input " unit=" ampere ">20</data>
  <data id="10" name=" Phase C input current " group=" Input " unit=" ampere ">20</data>
 < data id="11" name="Wind turbine speed " group=" General " unit="rpm">1000</config>
</data_table>
```

I.5 The <config> elements of a wind power rectifier

```
<config_table>
   <config id="1" name="Temperature high" group="General" unit=" Degree Celsius ">50</config>
  <config id="2" name="Wind turbine speed Max" group=" General " unit="rpm">1000</config>
</config_table>
```

I.6 The <control> elements of a wind power rectifier

```
<control_table>
 <control id="1" name="SomeWind RectifierControlName" />
    ...
</control_table>
```

Annex J (informative): Examples of XML elements for a fuel cell

J.1 The <description> elements of a fuel cell

```
<description_table>
  <description id="1" name="Product Name" group="manufacturer">RECT850TN</description>
  <description id="2" name="Hardware Reference" group="manufacturer">Best Manufacturer</description>
    ...
</description_table>
```

J.2 The <alarm> elements of a fuel cell

```
<alarm_table>
  <alarm id="1" active="false" name="Communication interrupt" severity_type="major" severity_level="6"/>
  <alarm id="2" active="false" name="Fuel cell failure" severity_type="major" severity_level="6"/>
  <alarm id="3" active="false" name="Fan failure" severity_type="major" severity_level="4"/>
  <alarm id="4" active="false" name=" Fuel cell  over Temperature" severity_type="major" severity_level="6"/>
  <alarm id="5" active="false" name="Inlet pressure low" severity_type="major" severity_level="4"/>
  <alarm id="6" active="false" name="Inlet pressure high" severity_type="major" severity_level="4"/>
  <alarm id="7" active="false" name="Air filter jamming" severity_type="major" severity_level="4"/>
  <alarm id="8" active="false" name="Power output insufficient" severity_type="major" severity_level="6"/>
  <alarm id="9" active="false" name="Fuel leakage " severity_type="major" severity_level="6"/>
  <alarm id="10" active="false" name="Fuel cell temperature sense fail " severity_type="major" severity_level="6"/>
  <alarm id="11" active="false" name="Fuel cell inlet pressure sense fail " severity_type="major" severity_level="6"/>
</ alarm_table >
```

J.3 The <event> elements of a fuel cell

```
<event_table>
  <event id="1" datetime="2010-02-11T21:47:41" severity_type="major" severity_level="0">Alarm appeared: AC
Failure</event>
  <event id="2" datetime="2010-02-11T21:47:57" severity_type="major" severity_level="0">Alarm disappeared: AC
Failure</event>
</event_table>
```

J.4 The <data> elements of a fuel cell

```
<data_table>
  <data id="1" name="Output Power" group=" Output " unit="watt">560</data>
  <data id="2" name="Output Voltage" group=" Output " unit="volt">54.2</data>
  <data id="3" name="Output Current" group=" Output " unit="ampere">10.33</data>
  <data id="4" name="Output Power Max" group=" Output " unit="watt">850</data>
  <data id="5" name="Output Current Max" group=" Output " unit="ampere">15.68</data>
  <data id="6" name="Inner temperature" group=" Temperature " unit=" Degree Celsius ">20.0</data>
  <data id="7" name="Inlet pressure" group=" Pressure " unit="Pa">100</data>
</data_table>
```

J.5 The <config> elements of a fuel cell

```
<config_table>
  <config id="1" name=" Fuel cell temperature high" group="General" unit=" Degree Celsius ">50</config>
  <config id="2" name="Rated power output" group=" General " unit="watt">200</config>
  <config id="3" name="Inlet pressure high" group=" General " unit="Pa">100</config>
  <config id="4" name="Inlet pressure low"  group=" General " unit="Pa">50</config>
</config_table>
```

J.6 The <control> elements of a fuel cell

```
<control_table>
  <control id="1" name="SomeFuelCellControlName" />
</control_table>
```

Annex K (informative): Examples of XML elements for an external heat engine generator rectifier

K.1 The <description> elements of an external heat engine generator rectifier

```
<description_table>
  <description id="1" name="Product Name" group="manufacturer">RECT850TN</description>
  <description id="2" name="Hardware Reference" group="manufacturer">Best Manufacturer</description>
    ...
</description_table>
```

K.2 The <alarm> elements of an external heat engine generator rectifier

```
<alarm_table>
  <alarm id="1" active="false" name="Communication interrupt" severity_type="major" severity_level="6"/>
  <alarm id="2" active="false" name="Converter failure" severity_type="major" severity_level="6"/>
  <alarm id="3" active="false" name="Converter protection " severity_type="major" severity_level="6"/>
  <alarm id="4" active="false" name="Fan failure" severity_type="major" severity_level="4"/>
  <alarm id="5" active="false" name="Over temperature" severity_type="major" severity_level="4"/>
  <alarm id="6" active="false" name="External heat engine generator lost" severity_type="major" severity_level="4"/>
  <alarm id="7" active="false" name="At least one external heat engine generator converter failure"
severity_type="major" severity_level="4"/>
</ alarm_table >
```

K.3 The <event> elements of an external heat engine generator rectifier

```
<event_table>
  <event id="1" datetime="2010-02-11T21:47:41" severity_type="major" severity_level="0">Alarm appeared:
Converter protection </event>
  <event id="2" datetime="2010-02-11T21:47:57" severity_type="major" severity_level="0">Alarm disappeared:
Converter protection </event>
</event_table>
```

K.4 The <data> elements of an external heat engine generator rectifier

```
<data_table>
  <data id="1" name="Output power" group="Output" unit="watt">560</data>
  <data id="2" name="Output voltage" group="Output" unit="volt">54.2</data>
  <data id="3" name="Output current" group="Output" unit="ampere">10.33</data>
  <data id="4" name="External heat engine generator output voltage" group=" External heat engine generator "
unit="watt">850</data>
  <data id="5" name=" External heat engine generator output current" group=" External heat engine generator " unit="
volt ">220</data>
  <data id="6" name=" External heat engine generator output current max " group=" External heat engine generator "
unit="ampere">10.0</data>
  <data id="7" name="Converter temperature" group="General" unit="Degree Celsius">57</data>
</data_table>
```

K.5 The <config> elements of an external heat engine generator rectifier

```
<config_table>
   <config id="1" name=" Temperature high " group="General">50.0</config>
</config_table>
```

K.6 The <control> elements of an external heat engine generator rectifier

```
<control_table>
  <control id="1" name=" SomeConverterControlName " />
</control_table>
```

Annex L (informative): Bibliography

ETSI TR 102 336: "Environmental Engineering (EE); Power and cooling system control and monitoring guidance".

History

Document history			
V1.1.1	July 2012	Membership Approval Procedure	MV 20120831: 2012-07-02 to 2012-08-31
V1.1.1	September 2012	Publication	