SLOVENSKI STANDARD
oSIST prEN IEC 62933-4-2:2023

01-julij-2023

Sistemi za shranjevanje električne energije - 4-2. del: Ocenjevanje učinkov na okolje pri odpovedi baterije v sistemu, ki temelji na elektrokemičnem hranilniku

Electric Energy Storage Systems - Part 4-2: Assessment of the environmental impact of battery failure in an electrochemical based storage system

Ta slovenski standard je istoveten z: **prEN IEC 62933-4-2:2023**

ICS:

27.010	Prenos energije in toplote na splošno	Energy and heat transfer engineering in general

oSIST prEN IEC 62933-4-2:2023 **en**

120/316/CDV

COMMITTEE DRAFT FOR VOTE (CDV)

PROJECT NUMBER: **IEC 62933-4-2 ED1**	
DATE OF CIRCULATION: **2023-05-19**	CLOSING DATE FOR VOTING: **2023-08-11**
SUPERSEDES DOCUMENTS: **120/283/CD, 120/288B/CC**	

IEC TC 120 : ELECTRICAL ENERGY STORAGE (EES) SYSTEMS

SECRETARIAT: Japan	SECRETARY: Mr Hideki HAYASHI
OF INTEREST TO THE FOLLOWING COMMITTEES: TC 21,SC 21A,TC 111,ACEA	PROPOSED HORIZONTAL STANDARD: ☐ Other TC/SCs are requested to indicate their interest, if any, in this CDV to the secretary.

FUNCTIONS CONCERNED:

☐ EMC ☒ ENVIRONMENT ☐ QUALITY ASSURANCE ☐ SAFETY

☒ SUBMITTED FOR CENELEC PARALLEL VOTING ☐ NOT SUBMITTED FOR CENELEC PARALLEL VOTING

Attention IEC-CENELEC parallel voting

The attention of IEC National Committees, members of CENELEC, is drawn to the fact that this Committee Draft for Vote (CDV) is submitted for parallel voting.

The CENELEC members are invited to vote through the CENELEC online voting system.

This document is still under study and subject to change. It should not be used for reference purposes.

Recipients of this document are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

Recipients of this document are invited to submit, with their comments, notification of any relevant “In Some Countries” clauses to be included should this proposal proceed. Recipients are reminded that the CDV stage is the final stage for submitting ISC clauses. (SEE AC/22/2007 OR NEW GUIDANCE DOC).

TITLE:

Electric Energy Storage Systems - Part 4-2- Assessment of the environmental impact of battery failure in an electrochemical based storage system

PROPOSED STABILITY DATE: 2029

NOTE FROM TC/SC OFFICERS:

This CDV hae been reflected the observations of 120/288B/CC.

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

ELECTRICAL ENERGY STORAGE (EES) SYSTEMS –

Part 4-2: Assessment of the environmental impact of battery failure in an electrochemical based storage system

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with can participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.

2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.

3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.

4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.

5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.

6) All users should ensure that they have the latest edition of this publication.

7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.

8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.

9) Attention is drawn to the possibility that some of the elements of this IEC Publication can be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

IEC 62933-4-2 has been prepared by IEC technical committee 120: Electrical Energy Storage (EES) Systems. It is an International Standard.

The text of this International Standard is based on the following documents:

Draft	Report on voting
120/XX/FDIS	120/XX/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives,

IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

ELECTRICAL ENERGY STORAGE (EES) SYSTEMS –

Part 4-2: Assessment of the environmental impact of battery failure in an electrochemical based storage system

1 Scope

This part of IEC 62933 defines the requirements for evaluating and reporting of the negative impact on the environment caused by the failure of a cell, flow cell, battery or flow battery in the accumulation subsystem of the battery energy storage system (BESS).

The mainstream batteries currently used in BESS are classified in this document according to the type of their electrolyte. These electrolyte types are aqueous, non-aqueous or solid.

In flow batteries, the aqueous electrolyte contains additionally the dissolved electrochemically active species and recirculates from external storage volumes through the flow cells.

The environmental impacts directly caused by the failure of other components of the BESS are not within the scope of this standard.

IEC TS 62933-4-1 outlines notions concerning environmental issues pertaining to electrical energy storage systems. These notions relate to product life cycle, system aspects and the nature of electrical energy storage technology.

2 Normative references

The following document is referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 62933-1: *Electrical energy storage (EES) systems – Part 1: Vocabulary*

IEC TS 62933-4-1: *Electrical energy storage (EES) systems – Part 4-1: Guidance on environmental issues – General specification*

3 Terms, definitions, abbreviated terms and symbols

3.1
cell
basic functional unit, consisting of an assembly of electrodes, electrolyte, container, terminals and usually separators, that is a source of electric energy obtained by direct conversion of chemical energy

[SOURCE: IEC 60050-482:2004/AMD1: 2016, 482-01-01, modified – Note has been deleted.]

3.2
flow cell
secondary cell characterized by the spatial separation of the electrodes and the movement of the energy storage fluids

[SOURCE: IEC 62932-1 3.1.14]

3.3
flow battery
two or more flow cells electrically connected including all components for use in an electrochemical energy storage system

3.4
battery
one or more cells fitted with devices necessary for use, for example case, terminals, marking and protective devices

[SOURCE: IEC 60050-482:2004/AMD1: 2016, 482-01-04]

3.5
battery system
assembly of cells or flow cells installed on racks or in cabinets with associated electrical, electromechanical, environmental control components and ready to operate

3.6
battery management system
BMS

electronic system associated with a battery which has functions to control current in case of overcharge, overcurrent, overdischarge and overheating and which monitors and/or manages the battery's state, calculates secondary data, reports that data and/or controls its environment to influence the battery's safety, performance and /or service life

[SOURCE: IEC 62619:2022 ED 2. 3.12]

3.7
failure
loss of ability of the cell, flow cell, battery or flow battery to perform as required. This failure results in a fault of the accumulation subsystem and by derivation, of the BESS

[Source IEC 60050-192:2015, 192-03-01 – modified - replaced item with the cell, flow cell, battery or flow battery and added sentence: This failure results in a fault of the accumulation subsystem and by derivation, of the BESS]

3.8
failure cause
set of circumstances that leads to failure

Note 1 to entry: A failure cause can originate during specification, design, manufacture, installation, operation or maintenance of an item

[SOURCE: IEC 60050-192: 2015, 192-03-11.]

3.9
environment
the surroundings in which the BESS exists, including air, water, land, natural resources, flora, fauna, humans and their interrelations

[SOURCE: IEC 60050-904:2014, 904-01-01, modified with added term BESS]

3.10

system integrator

entity that specializes in planning, coordinating, building, implementing and testing of systems

3.11

manufacturer

entity that actually produces the specified item and owns the manufacturing process by which it was created

3.12

Abbreviated terms

BESS	battery energy storage system
EES	electrical energy storage
LFP	lithium iron phosphate
LTO	lithium titanium oxide
MSDS	material safety data sheet
NCA	nickel cobalt aluminium oxide
NMC	nickel manganese cobalt oxide
PCS	power conversion system
POC	point of connection
SDS	safety data sheet

4 General

The environmental impact of a battery failure depends on the battery type, design and structures. The document provides guidance and requirements how to identify the potential impacts on the environment when the battery of an electrochemical energy accumulation system fails.

5 Failure of the electrochemical accumulation system in a BESS resulting in environmental issues

5.1 General

A failure is defined in this standard as a loss of ability of the cell, flow cell, battery or flow battery to perform as required. This failure results in a fault of the accumulation subsystem and, by derivation, can result also in a failure of the BESS with possibly environmental issues.

The environment is defined as the surroundings in which the BESS exists, including air, water, land, natural resources, flora, fauna, humans and their interrelations.

For the present document, only those failure-inducing causes shall be considered if the ensuing cell(s), flow cell(s), battery (batteries) or flow battery(ies) failure(s) negatively impact the environment in and surrounding the BESS.

The failures shall represent mainstream failures as observed with the concerned electrochemistry and state-of-the-art designs.

The operation, under conditions licensed by the local authorities, of the BESS including its batteries, shall be considered to occur without any negative environmental impact.

The failure causes of cell(s), flow cell(s), battery(ies) or flow battery(ies) to be considered are the result of:

i) internal causes such as a fault developing due to weakness of materials or of an assembly or divergent chemical or electrochemical reactions.

or

ii) external causes such as a fault developing due to a failure of ancillary equipment, unfavourable environmental conditions or loss of essential parameters, data and functions needed for safe operation.

Ancillary failures of BESS components resulting for example in a fire in a power conversion system (PCS) or a leakage of refrigeration fluid from an air conditioning system are not assessed within this standard for their negative impact on the environment.

5.2 Classification of BESS Types

The BESS types are categorized in Table 1, according to IEC 62933-5-2, into five types based on the specific features of the installed electrochemical storage system i.e., the installed battery type and its electrolyte.

Table 1 – Classification of BESS types

BESS type designation	Distinguishing design features
C-A	Cell with non-aqueous electrolyte (e.g., Li-ion)
C-B	Cell with aqueous electrolyte (e.g., Pb acid, NiMH)
C-C	Cell with solid electrolyte and operating above 250°C or defined as HT (high temperature) cell (e.g., NaS, NaNiCl)
C-D	Cell with aqueous but recirculating electrolyte or defined as Flow cell (e.g., V5+/V2+)
C-Z	Cell with any other electrochemical couple, electrolyte and energy storage concept or combinations thereof. (e.g., Li metal with solid electrolyte, electrochemical double layer capacitors)

The classification of the battery types used in a BESS and reported in Table 1 is subject to evolutions as advances in battery technology bring changes in electrolytes and cell designs.

The attributes of a BESS type designation, based on the installed battery and reported in the environmental impact assessment document, is only informative in nature. It does not release the system integrator and battery manufacturer carrying out the environmental impact assessment of a battery failure according to this document, from considering all features of the battery or flow battery of the BESS at hand.

5.3 Schematic view of the component groups in a BESS

An example of the control and primary subsystem of the BESS is shown in Figure 1 with the location of the battery highlighted. This figure is related to IEC TS 62933 4-1 Figure 1.

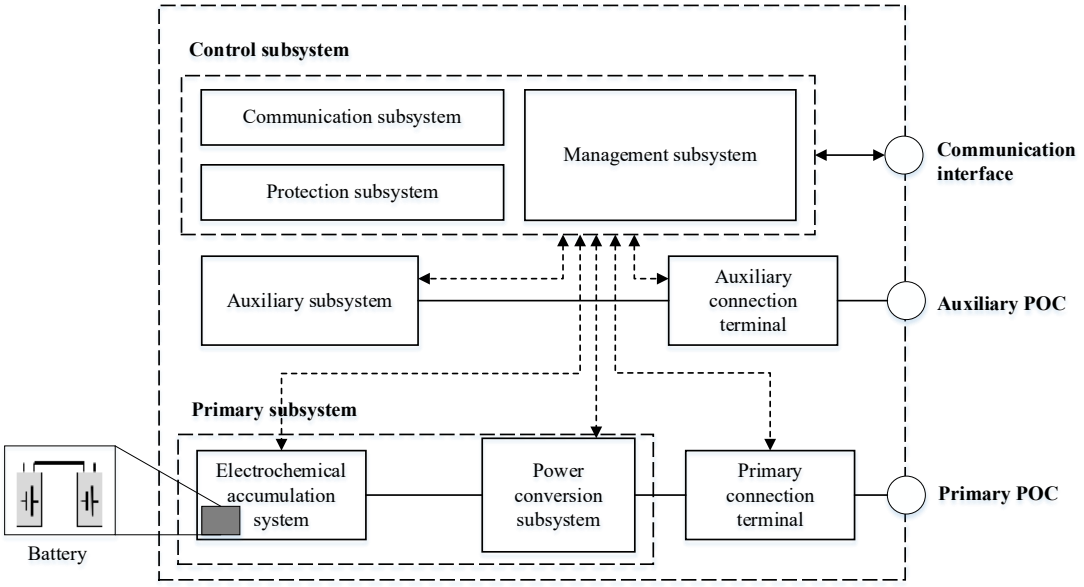

Figure 1 – Example of a BESS structure with the location of electrochemical accumulation system and its battery highlighted

The document defines the assessment of the environmental impact of the failure of the battery only, as highlighted in Figure 2.

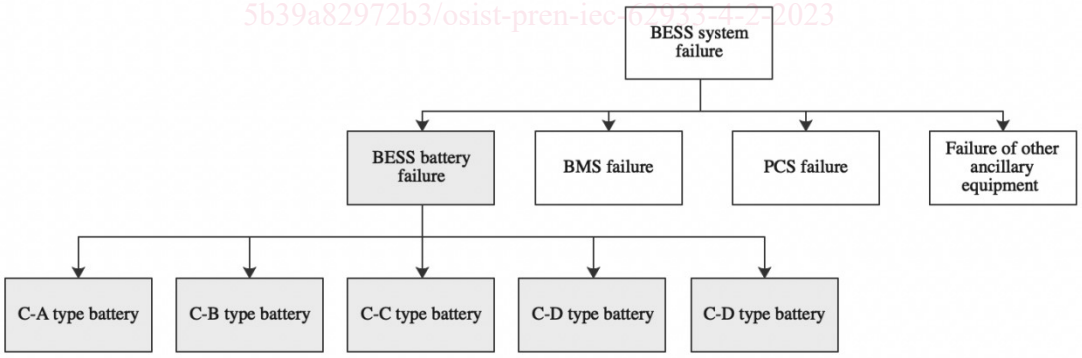

Figure 2 – The failure sites within the scope of the document (shaded in grey)