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Električne naprave za shranjevanje energije (EES) - 5-3. del: Varnostne zahteve pri izvajanju nenačrtovanih sprememb elektrokemičnih sistemov EES

Electrical energy storage (EES) systems - Part 5-3: Safety requirements when performing unplanned modification of electrochemical based EES systems

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120/301/CDV

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<input checked="" type="checkbox"/> 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.	<input type="checkbox"/> NOT SUBMITTED FOR CENELEC PARALLEL VOTING

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TITLE:

Electrical energy storage (EES) systems Part 5-3: Safety requirements when performing unplanned modification of electrochemical based EES systems

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NOTE FROM TC/SC OFFICERS:

This CDV has reflected the observations of 120/299/CC.

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

ELECTRICAL ENERGY STORAGE (EES) SYSTEMS

Part 5-3: Safety requirements when performing unplanned modification of electrochemical based EES systems

FOREWORD

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International Standard IEC 62933-5-3 has been prepared by IEC technical committee 120: Electrical Energy Storage (EES) Systems.

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

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

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

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

- reconfirmed,
- withdrawn,

- 122 • replaced by a revised edition, or
123 • amended.

124

125 The National Committees are requested to note that for this document the stability date
126 is 202X..

127 THIS TEXT IS INCLUDED FOR THE INFORMATION OF THE NATIONAL COMMITTEES AND WILL BE DELETED
128 AT THE PUBLICATION STAGE.

129

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130

INTRODUCTION

131 The initial design or planning cannot cover all modifications that are made to a BESS over its lifetime.
132 Unplanned modifications require a careful evaluation of their potential impact on the safety of the
133 BESS.

134

135 This document provides safety requirements, considerations and process steps when unplanned
136 modifications of the BESS are to be carried out.

137

138 Such modification activities of the BESS require appropriate attention to safety issues in the relative
139 redesign, installation, commissioning, operation and maintenance phases.

140 Unplanned modifications which are dealt with in this standard are:

141 – changes in energy storage capacity;

142 – changes of chemistries, design and manufacturer of the accumulation subsystem;

143 – changes of a subsystem component using non-OEM parts;

144 – changes to mode of operation;

145 – changes of installation site;

146 – changes in an accumulation subsystem due to an installation of reused or repurposed
147 batteries.

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ELECTRICAL ENERGY STORAGE (EES) SYSTEMS

Part 5-3: Safety requirements when performing unplanned modification of electrochemical based EES systems

1 Scope

This part of IEC 62933 applies to those instances when a BESS undergoes unplanned modifications. Such modifications can involve one or more of the following:

- changes of a subsystem component using non-OEM parts,
- changes to mode of operation,
- changes of installation site, or
- changes in an accumulation subsystem due to an installation of reused or repurposed batteries.

Any such modification shall not impair the original state of safety of the BESS.

This document complements IEC 62933-5-2, which relates to the overall safety aspects of a BESS. The requirements covered by this document are applied in addition to the requirements in IEC 62933-5-2 in accordance with each situation.

2 Normative references

The following documents are 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 62933-5-1, *Electrical Energy Storage (EES) systems – Part 5-1: Safety considerations for grid integrated EES systems – General specifications*

IEC 62933-5-2, *Electrical Energy Storage (EES) systems – Part 5-2: Safety requirements for grid integrated EES systems – Electrochemical based system*

IEC 63330(future IEC), *Requirements for reuse of secondary batteries*

IEC 63338(future IEC), *General guidance for reuse of secondary cells and batteries*

3 Terms and definitions

3.1

accumulation subsystem

storage subsystem

EES subsystem, comprising at least one electrical energy storage, where the energy is stored in some form

Note 1 to entry: Mechanical energy, electrochemical energy, electromagnetic energy are frequent forms of stored energy.

Note 2 to entry: Generally, the accumulation subsystem is connected to the power conversion subsystem that performs the necessary power conversion to electrical energy; however, in some cases, a power conversion is embedded in the accumulation subsystem (e.g. in electrochemical secondary cells the energy is directly available in the electrical form).

[SOURCE: IEC 62933-1: 2018, 2.27]

- 194 **3.2**
195 **battery energy storage system**
196 **BESS**
- 197 electrical energy storage system with accumulation subsystem based on batteries with
198 secondary cells
- 199 Note 1 to entry: Battery energy storage systems can include a flow battery energy system (IEC 62932-1:2020, 3.1.15).
- 200 **3.3**
201 **battery operating range**
202 range of voltage, current and temperature to ensure the safe use of the accumulation subsystem
- 203 **3.4**
204 **critical stakeholder**
205 party concerned with the critical part of BESS safety affected by the modification
- 206 **3.5**
207 **unplanned modification**
208 modification that has not been intended to be carried out or planned prior to the start of
209 operation of the BESS
- 210 Note 1 to entry: IEC 62933-5-2 7.13.1 "Operation and maintenance plan" deals with planned modification.
- 211 **3.6**
212 **OEM part**
213 part supplied to or by an original equipment manufacturer (OEM)
- 214 Note 1 to entry: OEM parts are generally used to manufacture new equipment and can also be purchased for
215 maintenance and repair.
- 216 Note 2 to entry: A part that is not an OEM part is called "non-OEM part".
- 217 **3.7**
218 **relocation**
219 moving an installation physically from its current location
- 220 **3.8**
221 **reused battery**
222 battery that is used again in the same application as it was used for when commissioned the
223 first time
- 224 **3.9**
225 **repurposed battery**
226 battery that is used again in a different application as it used for when commissioned the first
227 time
- 228 **3.10**
229 **residual usable period**
230 actual or estimated remaining length of service life
- 231 **3.11**
232 **safety margin, <of an EES system>**
233 margin defined within battery operating range considering system application, environmental
234 conditions and so on for safe operation of BESS
- 235 **3.12**
236 **safe-operating range, <of an EES system>**
237 range excluding safety margin from battery operating range
- 238 **3.13**
239 **state of energy, <of an EES system>**
240 **state of charge, <of an EES system>**
241 EESS SOE
242 EESS SOC
243 ratio between the available energy from an EES system and the actual energy storage capacity
244 [SOURCE: IEC 62933-1:(future revision), 6.2.7]

245 **3.14**
 246 state of health, <of an EES system>
 247 EESS SOH
 248 general condition of the EES system based on measurements that indicate its actual performance
 249 compared with its either nominal or rated performances

250 Note 1 to entry: The state of health includes also the temporary degradation due to faults inside the EESS subsystems.
 251 [SOURCE: IEC 62933-1:(future revision), 6.2.8]

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253 **4 Guidelines for safety when performing unplanned modifications**

254 **4.1 General**

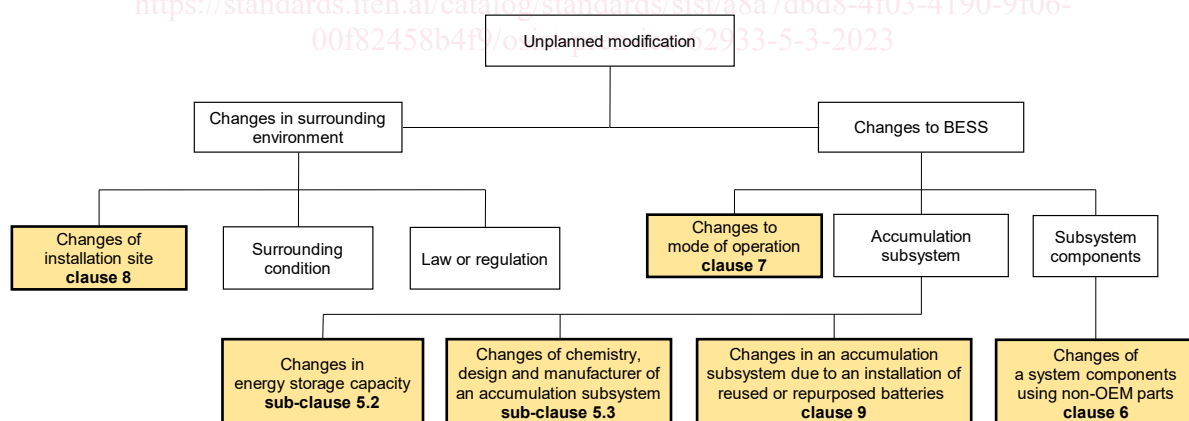
255 The BESS, including the batteries, can be exposed to the following changes in safety conditions
 256 during its operation:

- 257 1) Changes in safety conditions due to changes in the surrounding environment,
- 258 2) Changes in safety conditions due to unplanned modifications of the BESS,
- 259 3) Changes in safety conditions due to aging, and
- 260 4) Changes in safety conditions due to modifications planned at the time of the initial design.

261 This standard describes the safety measures that shall be taken for BESS in the event of items
 262 1) and 2) above. The events of items 3) and 4) should be considered and addressed at the time
 263 of initial design of the BESS, which is under the scope of IEC 62933-5-2.

264 NOTE: The modifications that occur in the BESS can be at the component, subsystem or system level. While the
 265 primary focus of this document is on changes in safety and their evaluation at the system level, the process can also
 266 require evaluation at the component or subsystem level (e.g., interactions between subsystems).

267 Figure 1 shows the modifications that affect safety, which are made by subdivision of changes
 268 in items 1) and 2). This standard deals with the modifications shown in the yellow boxes in
 269 Figure 1.



270

271 **Figure 1 – Major modifications and their classification**

272

273 An unplanned modification of a BESS can result in conditions where multiple safety related
 274 conditions are potentially affected at the same instance.

275 In such an event, the impact on safety of the individual modifications is to be assessed and all
 276 the resulting risk mitigation actions are to be implemented. The detailed requirements of
 277 assessment or measures etc., are described in each clause of this standard.

278 A wide range of stakeholders are involved in the modification process. Examples of
 279 stakeholders are shown in Table 1. The requirements described in this standard shall be met
 280 as appropriate in cooperation with the stakeholders.