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TECHNICAL SPECIFICATION

colour inside

Electrical energy storage (EES) systems – Part 5-1: Safety considerations for grid-integrated EES systems – General specification

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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ELECTRICAL ENERGY STORAGE (EES) SYSTEMS –

Part 5-1: Safety considerations for grid-integrated EES systems – General specification

FOREWORD

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- the required support cannot be obtained for the publication of an International Standard, despite repeated efforts, or
- the subject is still under technical development or where, for any other reason, there is the future but no immediate possibility of an agreement on an International Standard.

Technical specifications are subject to review within three years of publication to decide whether they can be transformed into International Standards.

IEC TS 62933-5-1, which is a technical specification, has been prepared by IEC technical committee TC 120: Electrical Energy Storage (EES) Systems.

The text of this technical specification is based on the following documents:

Enquiry draft	Report on voting
120/89/DTS	120/100/RVC

Full information on the voting for the approval of this technical specification 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.

A list of all parts in the IEC 62933 series, published under the general title *Electrical energy storage (EES) systems*, can be found on the IEC website.

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- withdrawn,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

A bilingual version of this publication may be issued at a later date.

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INTRODUCTION

Many governments' plans for how electricity will be generated and managed in the future have been determined. Such current plans cannot be implemented without long-term storage with capacities in the multi-MWh range.

There are a number of types of storage technologies that have emerged. Examples of these technologies are pumped hydro storage (PHS), electrochemical batteries, flywheel storage systems and hydrogen and synthetic natural gas (SNG). Pumped hydro storage has been widely used in terms of the total amount of the stored energy. A flywheel is a model of kinetic energy storage with a high power density, excellent cycle stability and long life. While some flywheels are intended for short term operation, others can operate over longer periods of time of up to a few hours. Batteries require development primarily to decrease cost, and for some technologies to increase energy density as well. Hydrogen and synthetic natural gas (SNG) added to natural gas are likely to be essential elements of future electric grids because of their energy storage duration and capacity. Hydrogen and SNG should be further researched and developed across a broad front, including physical facilities, interactions with existing uses of gas for supply and distribution network, optimal chemical processes, safety, reliability and efficiency. The IEC White Paper “Electrical Energy Storage” (2011-12) may provide further background information on concerned EES systems.

The IEC expects to keep pace, as in other areas in the past, with the need for international consensus standards for the safety of new storage technologies. It encourages regulators to anticipate the requirement to guarantee the safety of these technologies, and to contribute to shaping suitable international standards upon which harmonized regulations may be based.

For mature EES systems various IEC standards exist covering technical features, testing and system integration. For other technologies there are only a few standards, covering special topics.

Up to now no general standard addressing safety for EES system integration into an electrical grid has been developed.

The rapid growth and the new technologies involved in electrical energy storage in the near future, as well as their installation by consumers will impose particular requirements for safety. At the same time, society and governments will need assurance of safety before the much-needed systems can be deployed.

This document stands as a decisive step towards the gradual alignment with specific technologies and applications concerning the safety of packaged or site-assembled grid-integrated EES system.

ELECTRICAL ENERGY STORAGE (EES) SYSTEMS –

Part 5-1: Safety considerations for grid-integrated EES systems – General specification

1 Scope

This part of IEC 62933, which is a Technical Specification, specifies safety considerations (e.g. hazards identification, risk assessment, risk mitigation) applicable to EES systems integrated with the electrical grid.

This document provides criteria to foster the safe application and use of electric energy storage systems of any type or size intended for grid-integrated applications

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[1], *Electrical energy storage (EES) systems – Part 1: Terminology*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 62933-1 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.1
accumulation subsystem
storage subsystem
EESS 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 (see Figure 8), 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).

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1 Under preparation. Stage at the time of publication: IEC CDV 62933-1:2017.