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IEEE Guide for Design, Operation, and Maintenance of Battery Energy Storage Systems, both Stationary and Mobile, and Applications Integrated with Electric Power Systems

STANDARDS

IEEE Standards Coordinating Committee 21

Developed by the
IEEE Standards Coordinating Committee 21 on
Fuel Cells, Photovoltaics, Dispersed Generation, and Energy Storage

IEEE Std 2030.2.1™-2019

IEEE

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Abstract: Application of this standard includes: (1) Stationary battery energy storage system (BESS) and mobile BESS; (2) Carrier of BESS, including but not limited to lead acid battery, lithium-ion battery, flow battery, and sodium-sulfur battery; (3) BESS used in electric power systems (EPS). Also provided in this standard are alternatives for connection (including DR interconnection), design, operation, and maintenance of stationary or mobile BESS used in EPS. Introduction, overview, and engineering issues related to the BESS are given.

Keywords: application, design, energy storage, IEEE 2030.2.1™, maintenance, mobile, operation, stationary

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Introduction

This introduction is not part of IEEE Std 2030.2.1-2019, IEEE Guide for Design, Operation, and Maintenance of Battery Energy Storage Systems, both Stationary and Mobile, and Applications Integrated with Electric Power Systems.

IEEE Std 2030.2.1™ is part of the IEEE 2030 series of standards. The IEEE 2030 series of standards was created to provide guidelines in understanding and defining Smart Grid interoperability of the electric power system with end-use applications and loads. To achieve this, integration of energy storage technologies is recommended as a new effective and supportive measure for electric generation, transmission, distribution, and end-use benefits to permit two-way power flow in operation of electric power systems. IEEE Std 2030.2 intends to address the interoperability of energy storage systems with electric power infrastructure mainly from the perspective of power system interoperability (PS-IAP), communication technology interoperability (CT-IAP), and information technology interoperability (IT-IAP). This expanded knowledgebase is needed as a key element in new grid architectural designs and operation to promote a more reliable and flexible electric power system where energy storage systems play an increasingly important role.

IEEE Std 2030.2.1 was specifically developed to address the design, operation, and maintenance of battery energy storage systems concerning their application in EPS. Implementing IEEE Std 1547™, IEEE Std 2030™ SGIRM approach, and IEEE Std 2030.2, IEEE Std 2030.2.1 helps to understand and apply the key information necessary for configuration, operation, and maintenance of any planned battery energy storage system in its application in the electric power system. IEEE Std 2030.2.1 provides guidance in understanding and defining the general structure of a battery energy storage system, its basic technical characteristics and general applications in an electric system, and how to design the battery system, power conversion system, monitoring, information exchange, and control (MIC) system. Furthermore, the standard also fills the need for guidance key to operating and maintaining a battery energy storage system in its application, including functional performance, optimization especially for batteries, and countermeasures for different emergencies.

Contents

IEEE Guide for Design, Operation, and Maintenance of Battery Energy Storage Systems, both Stationary and Mobile, and Applications Integrated with Electric Power Systems

1. Overview

1.1 Scope

This document provides alternative approaches and practices for design, operation, maintenance, integration, and interoperability, including distributed resources interconnection of stationary or mobile battery energy storage systems (BESS) with the electric power system(s) (EPS)[1] at customer facilities, at electricity distribution facilities, or at bulk transmission electricity facilities.

This standard involves BESSs and applications meeting the requirements of IEEE Std 1547™ -2018 on distributed resource (DR) interconnection. IEEE Std 1547™-2018, IEEE Std 2030-2011, and other IEEE standards related to DR or battery are indispensable for application of this standard.

1.2 Purpose

This standard is intended to be used by BESS designers, operators, system integrators, and equipment manufacturers. It provides an introduction of engineering concerns of BESS, identifies key technical parameters, engineering approaches, and application practices requirements of BESS, and its operation and maintenance (O&M). It addresses not only electric power concerns but also the directly related communications and information technology concerns for BESS and applications integrated with electric power systems. Implementation of this guide will assist in the standardization of BESS applications.

1.3 Limitations

The issues not covered by this standard include, but are not limited to, the following:

— Personal safety or network security

— Contract or supervision considerations

[1]Definitions of EPS, area EPS, and local EPS in this standard follow that in IEEE Std 1547™-2018, IEEE Std 1547.4™-2011, and IEEE Std 2030.2™-2015.