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IEEE Guide for the Interoperability of Energy Storage Systems Integrated with the Electric Power Infrastructure

IEEE Standards Coordinating Committee 21

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

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Abstract: This guide applies the smart grid interoperability reference model (SGIRM) process (IEEE Std 2030™-2011) to energy storage by highlighting the information relevant to energy storage system (ESS) interoperability with the energy power system (EPS). The process can be applied to ESS applications located on customer premises, at the distribution level, and on the transmission level (i.e., bulk storage). This guide provides useful industry-derived definitions for ESS characteristics, applications, and terminology that, in turn, simplify the task of defining system information and communications technology (ICT) requirements. As a result. these requirements can be communicated more clearly and consistently in project specifications. This guide also presents a methodology that can be used for most common ESS projects to describe the power system, communications, and information technology (IT) perspectives based on the IEEE 2030™ definitions. From this framework, a seemingly complex system can be more clearly understood by all project stakeholders. Emerging cybersecurity requirements can also be incorporated into the framework as appropriate. Additionally, this guide provides the templates that can be used to develop requirements for an ESS project and goes through several real-world ESS project examples step by step.

Keywords: battery, communications technology, electric power system, energy storage system, IEEE 2030.2™, information technology, interoperability, power system, Smart Grid

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Introduction

This introduction is not part of IEEE Std 2030.2™-2015, IEEE Guide for the Interoperability of Energy Storage Systems Integrated with the Electric Power Infrastructure.

IEEE Std 2030.2 is part of the IEEE 2030™ series of standards. The IEEE 2030 series was created to provide guidelines in understanding and defining smart grid interoperability of the electric power system (EPS) with end-use applications and loads. To achieve this, integration of energy technology and information and communications technology (ICT) is necessary to achieve seamless operation for electric generation, delivery, and end-use benefits to permit two-way power flow with communication and control. The IEEE 2030 series is also intended to build a knowledge base across relevant topics including interconnections, intra-facing frameworks, strategies, and design definitions. This expanded knowledge base is needed as a key element in grid architectural designs and operation to promote a more reliable and flexible EPS.

IEEE Std 2030.2 was specifically developed to address the interoperability of energy storage systems (ESSs) with electric power infrastructure. Implementing the IEEE 2030 smart grid interoperability reference model (SGIRM) approach, IEEE Std 2030.2 provides a framework for identifying and organizing the key information that is required to help assure that any given ESS can connect, and be interoperable, with the EPS to which it is connected. The document provides guidance in understanding and defining technical characteristics of ESSs and methods by which discrete or hybrid systems may be integrated with, and used compatibly as part of, the electric power infrastructure. Further, IEEE Std 2030.2 fills the need for guidance relevant to a knowledge base addressing terminology, functional performance, evaluation criteria, operations, testing, and the application of engineering principles for ESSs integrated with the electric power infrastructure.

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IEEE Guide for the Interoperability of Energy Storage Systems Integrated with the Electric Power Infrastructure

1. Overview

1.1 Scope

This document provides guidelines for discrete and hybrid energy storage systems (ESSs) that are integrated with the electric power infrastructure, including end-use applications and loads. This guide builds upon IEEE Std 2030™-2011.[1]

1.2 Purpose

The purpose is to provide guidance in understanding and defining technical characteristics of ESSs and methods by which discrete or hybrid systems may be integrated with, and used compatibly as part of, the electric power infrastructure. Further, the document fills the need for guidance relevant to a knowledge base addressing terminology, functional performance, evaluation criteria, operations, testing, and the application of engineering principles for ESSs integrated with the electric power infrastructure.

[1] Information on references can be found in Clause 2.