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IEEE Recommended Practice for Performance Testing of Electrical Energy Storage (EES) System in Electric Charging Stations in Combination with Photovoltaic (PV)

IEEE Power and Energy Society

Developed by the
Energy Storage and Stationary Battery Committee

IEEE Std 2836™-2021

IEEE

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Abstract: Performance testing of electrical energy storage (EES) system in electric charging stations in combination with photovoltaic (PV) is covered in this recommended practice. General technical requirements of the test, the duty cycle development, and characteristics are given. Based on these, detailed test protocol based on duty cycle, such as stored energy, roundtrip efficiency, step response time, ramp rate, and duty cycle roundtrip efficiency, etc. are provided.

Keywords: electrical energy storage (EES) system, duty cycle, duty cycle roundtrip efficiency, IEEE 2836™, ramp rate, reference signal tracking, roundtrip efficiency, step response time, stored energy, test protocol

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Introduction

This introduction is not part of IEEE Std 2836-2021, IEEE Recommended Practice for Performance Testing of Electrical Energy Storage (EES) System in Electric Charging Stations in Combination with Photovoltaic (PV).

There are no standards defining performance tests of electrical energy storage (EES) system for complex application scenarios that require both photovoltaic (PV) smoothing and electric vehicle (EV) load regulation. The need for such standards is increasing due to improvements in the manufacturing processes of energy storage modules and converters, the development of energy storage application technology and the increased use of energy storage systems.

EES systems that connect to an electric charging stations in combination with PV should meet the requirements specified in related IEEE standards. Standardized test procedures are necessary to establish and verify compliance with those requirements. This recommended practice is to document performance tests for EES systems, provide references to duty cycle-based test protocols based on engineering practice experiences. Results information can help the users to evaluate the application of EES system in electric charging stations in combination with PV.

This recommended practice is comprised of six clauses and two annexes. The main content includes general technical requirements, duty cycle for EES system, and testing protocol based on duty cycle.

This recommended practice may promote advanced applications of the energy storage technology with complex strategies and fills in the standard gaps of testing protocol in the application scenario of electric charging stations in combination with PV.

Contents

IEEE Recommended Practice for Performance Testing of Electrical Energy Storage (EES) System in Electric Charging Stations in Combination with Photovoltaic (PV)

1. Overview

1.1 Scope

This recommended practice focuses on the performance test of the electrical energy storage (EES) system in the application scenario of PV-storage-charging stations with voltage levels of 10 kV and below. The test methods and procedures of key performance indexes, such as the stored energy capacity, the roundtrip efficiency (RTE), the response time (RT), the ramp rate (RR), and the reference signal tracking are defined based on the duty cycle derived from the operational characteristics of the EES system.

1.2 Purpose

The purpose of this recommended practice is to document performance tests for the EES system and provide references to duty cycle-based test protocols based on engineering practice experiences. Availability of this information promotes advanced applications of the energy storage technology with complex strategies and fills in the standard gaps in the application scenario of PV-storage-charging stations.

1.3 Word usage

The word *shall* indicates mandatory requirements strictly to be followed in order to conform to the standard and from which no deviation is permitted (*shall* equals *is required to*).[1,2]

The word *should* indicates that among several possibilities one is recommended as particularly suitable, without mentioning or excluding others; or that a certain course of action is preferred but not necessarily required (*should* equals *is recommended that*).

The word *may* is used to indicate a course of action permissible within the limits of the standard (*may* equals *is permitted to*).

[1]The use of the word *must* is deprecated and cannot be used when stating mandatory requirements; *must* is used only to describe unavoidable situations.
[2]The use of *will* is deprecated and cannot be used when stating mandatory requirements; *will* is only used in statements of fact.