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IEEE Recommended Practice for Sizing Lead-Acid Batteries for Stand-Alone Photovoltaic (PV) Systems

IEEE Standards Board

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

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(Revision of
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Developed by the

IEEE Standards Coordinating Committees/SCC21—Fuel Cells, Photovoltaics, Dispersed Generation, and Energy Storage (SASB/SCC21)

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Abstract: A method for determining the energy-capacity requirements (sizing) of both vented and valve-regulated lead-acid batteries used in terrestrial stand-alone photovoltaic (PV) systems is described in this recommended practice. Sizing batteries for hybrid or grid-connected PV systems is beyond the scope of this recommended practice. Installation, maintenance, safety, testing procedures, and consideration of battery types other than lead-acid are beyond the scope of this recommended practice. Recommended practices for the remainder of the electrical systems associated with PV installations are also beyond the scope of this recommended practice.

Keywords: battery capacity, battery requirements, IEEE 1013™, lead-acid batteries, photovoltaic (PV), photovoltaic power systems, sizing, sizing lead-acid batteries, solar, stand-alone

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Introduction

This introduction is not part of IEEE Std 1013-2019, IEEE Recommended Practice for Sizing Lead-Acid Batteries for Stand-Alone Photovoltaic (PV) Systems.

This recommended practice describes a method for sizing both vented and valve-regulated lead-acid batteries used in stand-alone terrestrial photovoltaic (PV) systems. Sizing batteries for hybrid or grid-connected PV systems is beyond the scope of this recommended practice. Installation, maintenance, safety, testing procedures, and consideration of battery types other than lead-acid are beyond the scope of this recommended practice. Recommended practices for the remainder of the electrical systems associated with PV installations are also beyond the scope of this recommended practice.

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IEEE Recommended Practice for Sizing Lead-Acid Batteries for Stand-Alone Photovoltaic (PV) Systems

1. Overview

This recommended practice provides a systematic approach for determining the appropriate energy capacity of a lead-acid battery to satisfy the energy requirements of the electrical loads of a stand-alone photovoltaic (PV) system. Since this capacity determination (sizing) assumes that no power is available from the array, the resulting battery capacity should be more than adequate to meet the PV system's load requirements during its normal operation.

1.1 Scope

This recommended practice describes a method for sizing both vented and valve-regulated lead-acid batteries in stand-alone PV systems. Installation, maintenance, safety, testing procedures, and consideration of battery types other than lead-acid are beyond the scope of this recommended practice. Sizing batteries for hybrid and grid-connected PV systems is beyond the scope of this recommended practice. Recommended practices for the remainder of the electrical systems associated with stand-alone PV installations are also beyond the scope of this recommended practice.

Sizing examples are given for various representative system applications. Iterative techniques to optimize battery costs, which include consideration of the interrelationship between battery size, PV array size, and weather, are beyond the scope of this recommended practice.

1.2 Purpose

This recommended practice is meant to assist system designers in sizing lead-acid batteries for residential, commercial, and industrial stand-alone PV systems.