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IEEE Guide for Distributed Energy Resources Management Systems (DERMS) Functional Specification

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IEEE Power and Energy Society

Developed by the
Transmission and Distribution Committee

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Abstract: A key concept and requirement for an operational and effective deployment of a large number of distributed energy resources (DER), which include sources of power and demand response, to enable the provision of flexibility and grid services, is the aggregation of DER. This aggregation function, as well as the functions required to enable grid services, are provided by DER management systems (DERMS). A functional specification for a DERMS and a description of the grid services that aggregated DER can provide the distribution and transmission systems is provided by this guide. Implementation issues and the interoperability requirements of a DERMS with its environment, including the transmission and distribution systems, and the communication and information infrastructure of modern grids are addressed by this guide.

Keywords: advanced distribution management system, aggregation, ancillary services, demand response, DERMS, distributed energy resources, distributed energy storage system, distributed generation, distribution system, energy management system, grid and system services, IEEE 2030.11™, microgrid, transmission system, virtual power plant

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Introduction

This introduction is not part of IEEE Std 2030.11–2021, IEEE Guide for Distributed Energy Resources Management Systems (DERMS) Functional Specification.

The technologies and operational concepts to properly aggregate, integrate, and manage distributed energy resources, which include sources of power and demand response, deployed in distribution and transmission systems to enable the provision of grid services, are increasingly being developed and deployed. These systems are known as distributed energy resources management systems (DERMS).

The purpose of this guide is to propose a structured approach to the development of a functional specification for DERMS. It provides the mandatory and optional functional requirements needed to assure a technically sound operation of DERMS in its interaction with distribution and transmission system operators and their management systems. It is not intended to be a design or application guideline for a DERMS.

The guide describes the function required for the operation of a DERMS, both the mandatory and optional functions. It details functionalities that can be designed into the DERMS to support grid services at the distribution and transmission system levels. It discusses implementation approaches that allow interaction of the DERMS with energy management and controls used in distribution and transmission systems. It provides examples of implementation. It addresses interoperability requirements with reference to a smart grid interoperability reference model (SGIRM). The model codifies the interaction of the DERMS with the different elements of its environment, power system hardware, software, and communication and information systems.

The guide is intended to provide a common language and define core functionalities for a DERMS to a wide range of stakeholders, including vendors, utilities, energy service providers, developers, codes and standards organizations, regulators and legislators, and governing bodies.

Contents

IEEE Guide for Distributed Energy Resources Management Systems (DERMS) Functional Specification

1. Overview

1.1 Scope

This document provides a guide for the development of a functional specification for distributed energy resources (DER) management systems (DERMS). It includes guiding principles for the application and deployment of DERMS and DERMS control systems, addresses the basic functional requirements, and proposes a set of core functions. These include: DER discovery, visualization, and monitoring of active and reactive power flows and voltage at specific nodes; DER production estimation and scheduling, and dispatch of active and reactive power; DER ancillary services provision, including voltage and frequency control/ support. The approach is extended to virtual power plant (VPP) control systems.

1.2 Purpose

The purpose of the DERMS is to aggregate and dispatch multiple DER, coordinate their operation in the electric system, and optimize their output. With the increased deployment and penetration of DER, aggregation of DER can be an effective approach to integrate DER into the planning and operation of distribution systems and transmission systems.

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.