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# IEEE Guide for Engineering, Implementation, and Management of System Integrity Protection Schemes

STANDARDS

IEEE Power and Energy Society

Developed by the
Power System Relaying and Control Committee

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IEEE

# IEEE Guide for Engineering, Implementation, and Management of System Integrity Protection Schemes

Developed by the

**Power System Relaying and Control Committee**
of the
**IEEE Power and Energy Society**

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**IEEE SA Standards Board**

**Abstract:** Guidance for engineering, implementation, and management of System Integrity Protection Schemes (SIPS) is provided in this guide. General concepts for architecture and communication design to achieve functionality and performance requirements are addressed. Principles for commissioning processes and strategies for life-cycle management are also discussed.

**Keywords:** contingency, IEEE C37.250™, mitigation, power system protection, Remedial Action Scheme, Special Protection System, stability, System Integrity Protection Scheme, system performance

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## Introduction

This introduction is not part of IEEE Std C37.250–2020, IEEE Guide for Engineering, Implementation, and Management of System Integrity Protection Schemes.

This guide is provided to share the knowledge, innovations, and experience of companies that have applied System Integrity Protection Scheme (SIPS) in certain contexts, such as in Remedial Action Scheme (RAS), Special Protection System (SPS), and so on. SIPS are mainly applied to protect the integrity of the power system. Unlike traditional localized equipment protection, SIPS are applied, for example, to avoid cascading outages, equipment damage from unanticipated power system conditions beyond equipment emergency ratings, voltage collapse, angular instability, or other system problems. SIPS are applied for extreme contingencies when outages to critical high-voltage (HV) equipment, components, or elements of the power system have occurred.

This guide describes design, application, deployment, and operational management of SIPS. Best practices are presented along with the rationale for different methods, in some instances, offering a discussion of different solutions for user information. Consideration is given to reliability, design architecture, equipment consideration, deployment location, commissioning, maintenance flexibility, upgradability, documentation and record management, and personnel training.

This information is useful to planners, engineers, managers, system operators, owners, and technicians who are planning, designing, installing, testing, operating, maintaining, replacing, or retiring a SIPS.

## Contents

# IEEE Guide for Engineering, Implementation, and Management of System Integrity Protection Schemes

## 1. Overview

### 1.1 General

Power system conditions requiring mitigation beyond fault protection often are unique problems. The difficulties magnify when the power system, or a section of the power system, is cascading rapidly and system integrity requires rapid detection and remedy. Since the power system and sequence of cascading conditions may vary, System Integrity Protection Schemes (SIPS) are intended to cover the specific circumstances necessary to protect the system. In most instances, however, general design concepts, commissioning principles, and management strategies are applicable to a wide range of SIPS. This guide documents concepts, principles, and strategies as applied in many deployed SIPS. Those responsible for system planning, engineering, implementation, and management of SIPS will benefit from the information provided in this guide.

Not all SIPS are intended to be covered by this guide. SIPS that are covered are those that have a wide-area impact, usually require information exchange among multiple locations, and generally require a complex architecture. See 4.2 for a list of SIPS that are covered by this guide.

### 1.2 Scope

This document provides guidance for engineering, implementation, and management of SIPS. General concepts for architecture and communication design to achieve functionality and performance requirements are addressed. The document also addresses principles for commissioning processes and strategies for life-cycle management.

### 1.3 Purpose

This guide provides information to help properly engineer, implement, and manage SIPS. The document addresses general concepts for architecture and communication design to achieve functionality and performance requirements and principles for SIPS implementation and management.

## 2. Normative references

The following referenced documents are indispensable for the application of this document (i.e., they must be understood and used, so each referenced document is cited in text and its relationship to this document is