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IEEE Guide for Unmanned Aerial Vehicle-Based Patrol Inspection System for Transmission Lines

IEEE Power and Energy Society

Developed by the
Transmission and Distribution Committee

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STANDARDS

IEEE Guide for Unmanned Aerial Vehicle-Based Patrol Inspection System for Transmission Lines

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Abstract: Demonstrated in this document are the UAV-based patrol inspection systems applied in operation and maintenance of transmission lines. The system compositions, application scenarios, functions and performance, test methods, and guidance for field applications are provided. This guide applies to the UAV systems used for patrol inspection on ac and dc overhead transmission lines.

Keywords: 3D ac, dc, IEEE 2821™, infrared thermal imager, inspection, LiDAR, multicopter, overhead line, patrol, powered fixed-wing plane, right-of-way, rotorcraft, scanner, single rotor helicopter, tower, unmanned aerial vehicle, visual camera

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Introduction

This introduction is not part of IEEE Std 2821-2020, IEEE Guide for Unmanned Aerial Vehicle-Based Patrol Inspection System for Transmission Lines.

Patrol and inspection of transmission lines are crucial to safe and reliable operation of power grids. As technologies evolve forward, unmanned aerial vehicles have already been used in a few countries to carry inspection devices to patrol and inspect transmission lines. Compared with foot patrol, the UAV-based patrol inspection is safer, and more efficient and effective while more types of data and records can be maintained. This guide is committed to providing basic but comprehensive information on UAV-based patrol inspection systems as guidance for their effective implementation in operation and maintenance (O&M) of transmission lines.

This guide first introduces the composition of UAV-based patrol inspection systems used for transmission lines. The application scenarios are presented, such as acceptance patrol inspection, routine patrol inspection, fault patrol inspection, and emergent patrol inspection. Main functions and performance requirements are discussed, while test methods are also recommended. Patrol inspection procedures are provided as guidance for field applications. In Annex A, a use case is given to show a complete process in patrol inspection on a 500 kV ac overhead line.

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IEEE Guide for Unmanned Aerial Vehicle-Based Patrol Inspection System for Transmission Lines

1. Overview

1.1 Scope

This guide addresses the composition, general technical requirements, testing method, and testing rules of UAV-based patrol inspection systems.

This guide applies to the UAV systems used for patrol inspection on ac and dc overhead transmission lines.

1.2 Purpose

Patrol inspection on transmission lines is an arduous task involving high electrical safety risks, harsh working environments, and high workloads. The UAV-based patrol inspection is safer and easier than foot patrol inspection to identify the defects and risks in transmission lines and the surrounding environment. With optimized system functions and performance, UAV-based patrol inspection could realize high inspection quality, consistency, efficiency, and coverage. The purpose of this guide is to provide information on the system composition, applications, functions and performance, test methods, and operational procedures of the UAV-based patrol inspection system for overhead transmission lines, and thus help utilities to choose and use the right inspection system for a specific application.

1.3 Word usage

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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.