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IEEE Guide for Control of Small (100 kVA to 5 MVA) Hydroelectric Power Plants

IEEE Power & Energy Society

Sponsored by the
Energy Development and Power Generation Committee

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IEEE Guide for Control of Small (100 kVA to 5 MVA) Hydroelectric Power Plants

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Introduction

This introduction is not part of IEEE Std 1020-2011, IEEE Guide for Control of Small (100 kVA to 5 MVA) Hydroelectric Power Plants.

This document is a guide for the power industry for the control of small hydroelectric power plants. The document was prepared by the Working Group for Computer-Based Control for Hydroelectric Power Plant Automation of the Hydroelectric Power Subcommittee of the Energy Development and Power Generation Committee of the IEEE Power & Energy Society (PES).

During preparation of the original version of this document, it was planned to be a recommended guide strictly for the application of control systems to small hydroelectric power plants. However, as development work progressed, it was determined that the guide would lack depth if some treatment of the controlled electrical and mechanical systems and equipment was not made. For completeness, it was considered desirable to mention salient civil features of small hydroelectric projects, and to offer discussion of equipment protection and operation. The result of that effort, although termed a guide to control of small hydroelectric power plants, is a tutorial document that presents descriptive information for use in planning the control system design and operation of small hydroelectric power plants. It is intended to provide a working knowledge of the terminology used in the hydroelectric field and an understanding of the principles of operation of hydroelectric generating units. It addresses the control requirements from an electrical standpoint. It does not discuss in any great detail the civil, hydraulic, and mechanical considerations that should be taken into account when planning a hydroelectric project. It deliberately omits discussion of topics such as economics, environmental factors, financing, and licensing.

Many small hydroelectric power plants commissioned during the early 1980s have been in service for several decades and reflect the technology and operating practices common at the time the existing guide was prepared. Since then, significant changes have occurred in electrical control and protection technology applicable to small hydroelectric power plants. Furthermore, the environment in which these plants operate has changed due to regulatory and ownership issues. The purpose of this revision is to address the impact of the changes in technology and the plant operating changes environment on the practices recommended in the original guide and to harmonize this revision with a companion document, IEEE 1010™, IEEE Guide for Control of Hydroelectric Power Plants.[a, b] This revision does retain much of the original guide tutorial material but in a reorganized format.

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1. Overview

This guide presents descriptive material intended to assist in the planning for design, development, and operation of small hydroelectric power plant control systems. It does not purport to cover every possible variation that can be encountered, but it should suffice to impart a working familiarity with the terminology and principles involved.

The guide contains five annexes: Annex A provides general guidelines for evaluating the feasibility of a potential small hydro project. Annex B provides information about typical turbines used in small hydro plants. Annex C describes components of a typical protection system that might be applied to a small hydro plant. Annex D contains a glossary of terms common to the small hydro industry. Annex E provides bibliographic references.

1.1 Scope

This guide describes the electrical control and monitoring requirements for equipment and systems associated with small (100 kVA to 5 MVA) hydroelectric power plants.