IEEE Guide for AC Generator Protection

IEEE Power Engineering Society

Sponsored by the
Power System Relaying Committee

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Abstract: A review of the generally accepted forms of relay protection for the synchronous generator and its excitation system is presented. This guide is primarily concerned with protection against faults and abnormal operating conditions for large hydraulic, steam, and combustion turbine generators.
Keywords: ac generator protection, relay protection, synchronous generator

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Introduction

This introduction is not part of IEEE Std C37.102-2006, IEEE Guide for AC Generator Protection.

IEEE Std C37.102 was initially published in 1987. It was subsequently revised in 1995 and reaffirmed in 2002. The guide is designed for the protection of typical steam, hydraulic, and combustion turbine generators (CTGs). Schemes that are judged to be good alternative practice for generator protection are included. New schemes that have gained acceptance and usage have been added to the guide.

In this revision of IEEE Std C37.102-1995, several areas were improved. Among the most notable are the following additions:

— A new clause (Clause 6) on multifunction generator protection systems (MGPS)

— A new annex (Annex A) on sample calculations for setting of generator protection functions

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Contents

IEEE Guide for AC Generator Protection

1. Scope

This application guide for the relay protection of synchronous generators presents a review of the generally accepted forms of protection for the synchronous generator and its excitation system. It summarizes the use of relays and devices and serves as a guide for the selection of equipment to obtain adequate protection. The guide is primarily concerned with protection against faults and abnormal operating conditions for large hydraulic, steam, and combustion turbine generators. Basing generator protection on machine size is difficult because the desired protection may be determined more by the importance of the generator to the power system than by the size of the generator.

The recommendations made pertain to typical synchronous generator installations. However, sufficient background information relating to protection requirements, applications, and setting philosophy is given to enable the reader to evaluate the need, to select, and to apply suitable protection for most situations.

The protective functions discussed in this guide may be implemented with a multifunction microprocessor based protection system (digital system). The protection philosophy, practices, and limits are essentially identical to those of the implementation using discrete component relays. The algorithms used to perform some of the protection functions may be different, but should produce equal or better protection. However, the performance and capability may be superior using the digital systems such as improved frequency response (bandwidth) and thresholds (pickup settings). Other additional features may be available from these digital systems that enhance the functionality.

This guide does not purport to detail the protective requirements of all generators in every situation. For example, standby and emergency-use generators are specifically excluded.

1.1 Description of the guide

Clause 3 presents a brief description of typical generator design and connections, generator grounding practices, excitation systems design, and generating station arrangements. The intent of this clause is to present information that affects the protection arrangement and selection of protective relays.

A discussion of auxiliary system transfer and the possible negative impacts of misoperation and faults on these systems are beyond the scope of this guide.