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IEEE Standard for the Electrical Protection of Communication Facilities Serving Electric Supply Locations Through the Use of On-Grid Isolation Equipment

IEEE Power and Energy Society

Sponsored by the
Power System Communications Committee

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Abstract: Workable methods for protecting wire-line telecommunication circuits entering electric supply locations are presented. The electric supply location environment; protection apparatus; service types, reliability, service performance objective classifications, and transmission considerations; protection theory and philosophy; protection configurations; installation and inspection; and safety are covered in this document.

Keywords: electric supply locations, high-voltage tower, IEEE 487.1™, power stations, protection, wire-line telecommunication

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Introduction

This introduction is not part of IEEE Std 487.1™-2014, IEEE Standard for the Electrical Protection of Communication Facilities Serving Electric Supply Locations Through the Use of On-Grid Isolation Equipment.

Wire-line telecommunication facilities serving electric supply locations often require special high-voltage protection against the effects of fault-produced ground potential rise (GPR) or induced voltages, or both. Some of the telecommunication services are used for control and protective relaying purposes and may be called upon to perform critical operations at times of power-system faults. This requirement presents a major challenge in the design and protection of the telecommunication system because power-system faults can result in the introduction of interfering voltages and currents into the telecommunication circuit at the very time when the circuit is most urgently required to perform its function. Even when critical services are not involved, special high-voltage protection may be required for both personnel safety and plant protection at times of power-system faults. Effective protection of any wire-line telecommunication circuit requires coordinated protection on all circuits provided over the same telecommunication cable.

Some electrical environments, collectively called electric supply locations, require the application of unique electrical protection techniques because of their special nature. One such environment is the electric power station or substation. Another is at, or near, power line transmission and distribution structures such as towers or poles. Such structures often provide a convenient site for the location of wireless, personal communications service, and cellular antennas and their associated electronic equipment that is served by a link to the wired telecommunications network.

This standard presents workable methods for protecting wire-line telecommunication circuits entering electric supply locations. It is important to note that special high-voltage protection for the purpose of personnel safety and plant protection may be required even when critical services are not involved. In the case of leased circuits, mutually agreeable methods for the installation of protective equipment owned by either party are presented.

This project is part of a reorganization of IEEE Std 487™ [a] in which the main document is broken down into a family of related documents (i.e. dot-series) segregated on the basis of technology:

— IEEE 487™: general considerations

— IEEE 487.1™: for applications using on-grid isolation equipment involving metallic wire-line

— IEEE 487.2™: for applications consisting entirely of optical fiber cables

— IEEE 487.3™: for applications of hybrid facilities where part of the circuit is on metallic wire-line and the remainder of the circuit is on optical fiber cable

— IEEE 487.4™: for applications using neutralizing transformers

— IEEE 487.5™: for applications using isolation transformers

This standard covers the use of modular-type on-grid isolators, either transformer or optical, for the electrical protection of wire-line (metallic) telecommunications facilities serving electric supply locations. The use of discrete hard-wired isolation transformers is covered in IEEE Std 487.5 [B21][b].

[a] Information on references can be found in Clause 2.
[b] The numbers in brackets correspond to those of the bibliography in Annex A.

This standard has been prepared by the Wire-Line Subcommittee of the Power System Communications Committee of the IEEE Power and Energy Society. This standard represents the consensus of both power and telecommunications engineers.

Contents

IEEE Standard for the Electrical Protection of Communication Facilities Serving Electric Supply Locations Through the Use of On-Grid Isolation Equipment

1. Overview

1.1 Background

Wire-line telecommunication[1] facilities serving electric supply locations often require special high-voltage protection against the effects of fault-produced ground potential rise (GPR), induced voltages, or both. Some of the telecommunication services are used for control and protective relaying purposes and may be called upon to perform critical operations at times of power-system faults. This requirement presents a major challenge in the design and protection of the telecommunication system because power-system faults can result in the introduction of interfering voltages and currents into the telecommunication circuit at the very time when the circuit is most urgently required to perform its function. Even when critical services are not involved, special high-voltage protection may be required for both personnel safety and plant protection at times of power-system faults. Effective protection of any wire-line telecommunication circuit requires coordinated protection on all circuits provided over the same telecommunication cable.

[1] In general, "wire-line telecommunication" will be referred to throughout this document as "telecommunication."