



TRANSIENT-BASED LINE PROTECTION RELAY ALGORITHMS BASED ON TRAVELING WAVES

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Tuesday, October 3 • 11:00 AM – Noon (PT) • EME 26

OVERVIEW

Fault current characteristics continue to change as more wind-powered generators and inverter-based sources are added to the electric power grid. The system fault response is not only different than in the days of large synchronous generators, but it also varies based on the source design and the utility grid code. We have three ways to tackle the rising protection challenges: fine-tune the present protective relays, enforce a better fault response of the sources, and use protection principles that are less dependent on the sources. This presentation introduces the principles of transient-based line protection, shares field experience, and shows how transient-based protection helps solve today's line protection challenges. Transient-based protection responds to short-lived features in the relay input currents and voltages: traveling waves and fast incremental quantities. Fault transients are not powered by the sources present in the system but by the energy stored in the system components prior to the fault. Therefore, transient-based protection is independent of the source characteristics and fits very well systems with high penetration of renewable sources. This presentation is a deep dive into traveling wave line protection principles.

BIO

Dr. Bogdan Kasztenny has over 30 years of experience in power system protection and control. In his decade-long academic career (1989–1999), Dr. Kasztenny taught power system and digital signal processing courses at several universities and conducted applied research for several relay manufacturers. In 1999, Bogdan left academia for relay manufacturers where he has since designed, applied, and supported protection, control, and fault-locating products with their global installations numbering in the thousands. Bogdan is an IEEE Fellow, an IET Fellow, a Senior Fulbright Fellow, a Distinguished CIGRE Member, and a registered professional engineer in the province of Ontario. Bogdan has served as a Canadian representative of the CIGRE Study Committee B5 (2013–2020) and on the Western Protective Relay Conference Program Committee (2011–2020). In 2019, Bogdan received the IEEE Canada P. D. Ziogas Electric Power Award. Bogdan earned both the Ph.D. (1992) and D.Sc. (Dr. habil., 2019) degrees, has authored over 220 technical papers, holds over 60 U.S. patents, and is a Senior Editor of the IEEE Transactions on Power Delivery.

