Digital Substation of Future

Shantanu Kumar

DATE: Friday, 29 March 2019
TIME: 11am – 12pm
VENUE: Curtin University, Building 212 Room 107 (http://bit.ly/2UJWlaG)
COST: Free, please RSVP to k.wong@murdoch.edu.au

Abstract:

Conventional methods of protection, automation and communication based on secondary cables between substation primary plant within the High Voltage (HV) substation switchyard and control room equipment have limitations. It could be time consuming laborious fault diagnosis, lost time of plant down time, diversion of costly resources etc. Utilities have reported catastrophic instrument transformers failure disrupting normal power flow and causing unnecessary power outages. Advancement in digital technology and use of fibre optics in the switchyard equipment have given a new dimension to the application of Non–Conventional Instrument Transformer (NCIT) which has reached a level of maturity and performance. NCIT is an alternative to the Conventional Instrument Transformers (CIT) that offer significant benefit in terms of operational performance, safety, environmental values, and many engineering advantages.

New technology in substation protection, automation and control have made it possible to protect costly primary plant assets, such as switchgears and power transformers by using Intelligent Electronic Devices (IEDs) in the protection schemes. Digital IEDs and Merging Units (MU) exchange Sampled Values (SV) and Generic Object Oriented Substation Events (GOOSE) via fibre optic cables in a process bus environment, replacing heavy copper wires. Use of Ethernet offer faster tripping in the event of a fault.

This presentation discusses digital protection schemes and NCITs, MU and IED's using an Optimized Network Engineering Tool (OPNET) as well as a laboratory based experimentation. Understanding the End to End (ETE) delay in receiving time critical GOOSE and SV messages in a process bus scheme of a smart grid substation provides confidence to use NCITs in future grids.

About the speaker:

Shantanu Kumar received Bachelor of Engineering degree in Electrical from Bangalore University, India in 1990. He obtained his MBA degree from Indore University, India in 1996. He completed postgraduate research in power engineering leading to MSc Eng. from The University of Western Australia, Perth, Australia in 2014. Currently, he is pursuing his research work towards PhD degree in IEC 61850 for Protection, Control and Automation at Curtin University, Perth, WA, Australia. He

has over 27 years of experience as a power engineer in diversified heavy industries spanning from Asia to Australia. He has successfully designed, engineered and commissioned many utilities and resources substations in Asia and Australia. He is a Fellow and Chartered Engineer of Engineers Australia and is a member of EA interviewer panel to certify potential power engineering candidates to achieve CP Eng. He regularly contributes research papers on automation and control to reputed journals, conferences and symposiums.