UI-ASSIST WEBINAR 1: US-India Federated Testbed: Impact Analysis of Communication Rate on T&D Co-Simulation during the Fault
Thursday, February 23, 9:00 am PT (10:30 pm IST)

U.S. INDIA COLLABORATIVE FOR SMART DISTRIBUTION SYSTEM WITH STORAGE

Presenter: Viresh Patel (IITK)

The penetration of widely distributed DERs into the power system increases the size requirement of the models as the case studies do not allow for simplification of sections of the model as lump load or source. Part of the interest in studying DER penetration is how the distributed microgrid-type resources have an effect on the power system as a whole. This causes a new resource problem for smaller research labs as more expensive, real-time simulators must be purchased to sufficiently simulate large enough models. However, researchers have built communication tools that allow labs to pool their resources by connecting their individual real-time simulators together through the internet, allowing them to co-simulate larger/more detailed models that were previously too large for their individual labs. This webinar intends to cover the effect of the data rate and latent communication that are used to connect the two labs during the co-simulated transient events was analyzed. Which will help define network requirements for co-simulated events.

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Viresh is pursuing his PhD in Power Engineering from the Electrical Department, Indian Institute of Technology, Kanpur. His research topic for his PhD is the development of state estimation, parameter estimation, and fault analysis modules for an advanced distribution system using data analytic methods.

He has completed his M.Tech in power systems from the Electrical Department, Veermata Jijabai Technological Institute, Mumabi. His B.E. degree is in Electrical and Electronics Engineering from the Rajiv Gandhi Proudyogiki Vishwavidyalaya University.

He has work experience related to research projects, industry projects, and teaching. Following his M.Tech., he taught for three years at Veermata Jijabai Technological Institute, Mumbai. Along with this, he has completed a few freelancing projects for industries. He has experience as a project engineer at the Indian Institute of Technology, Kanpur, for 3 years.

UI-ASSIST WEBINAR 2: Modeling of AC Microgrid with DER for Protection in Distribution Grid Operation by Simulation Analysis
Thursday, February 23, 9:00 am PT (10:30 pm IST)

U.S. INDIA COLLABORATIVE FOR SMART DISTRIBUTION SYSTEM WITH STORAGE

Presenter: Jorge Cisneros-Saldana (TAMU)

The design of a AC microgrid (MG) with candidate protection solutions is presented in this work. Design model of smart inverters at the interface of PV solar and the rest of the microgrid includes several relevant features (limiters, current, voltage, and frequency control, as well as the internal over-/under- current, voltage, and frequency protection). Designs also differ depending on the intended use of the inverters as grid-forming, or grid-supporting (or following) inverters. Assuming large-scale integration of rooftop residential, as well as commercial PV solar generators in distribution network enables portions of it to operate in autonomous mode (supplying the local load), or in grid-connected mode when the operating conditions allow it. Also, when operating at multiple voltage levels, the microgrids may include transformers, further complicating the operation of the system when exposed to faults at various locations in the microgrid.

Thus, we investigate such systems under a variety of stable operating regimes, as well as faults (especially asymmetrical faults) in the network. The widespread deployment of DER to non-active distribution feeder protection (typically based on combination of reclosers, fuses and time-delay-coordinated overcurrent relays) no longer can assure secure and dependable protection under all fault conditions, and requires consideration of the other types of protection. Some candidates for that role will be analyzed in principle, and their limitations and advantages discussed. Some among them require synthesis of the locally measured information with remote measurements, involving communication, which adds another layer of complexity (and reduction of reliability) to protective relaying operation. It also involves consideration of backup protection methodology under communication breakdown mode.

The webinar will cover the following topics: literature, different topologies of microgrids, control systems, design configurations, current protection systems, communications, and results of case studies. It shows an actual distribution grid and its protection systems contrasted with the new type of microgrid in distribution with high penetration of DER. Among the challenges and problems explained, proposing new protection schemes to resolve this emergent need. Time domain simulations in MATLAB/Simulink will be used to illustrate the control, protection, and communication system performance in designing effective protection strategies for modern distribution networks.

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Jorge I. Cisneros-Saldana (Student Member, IEEE) received a B.E. degree in Electromechanical Engineering from Universidad Privada Boliviana (UPB), Bolivia, in 2013, a M.B.A. with emphasis in the Power and Energy sector from Universidad Privada Boliviana (UPB), Bolivia, in 2016 and, a M.S. degree in Energy Systems Engineering from Texas A&M University, College Station, TX, USA, in 2017. He is working towards his Ph.D. in Electrical Engineering at Texas A&M University, College Station, TX, USA. His current research interests include microgrids, distribution grid protection systems, relay scheme design, distributive energy integration, DC/AC inverter design & control, grid control, monitoring and operation, grid protections, relay design, mathematical optimization, grid automation, control systems, and data science for power systems.