FEEDER Foundations for Engineering Education for Distributed Energy Resources

Fall 2018 Seminar Series

Dynamic Model of a Ternary Pumped Storage Hydropower Plant

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Abstract: Hydropower is the largest source of renewable energy in the United States. Pumped storage hydropower (PSH) is a hydropower plant that will play an important role in future electric power grids to help manage the variability from high penetration levels of renewable generation. The conventional role of PSH is as an energy arbitrage: it sells power when the price of electricity is high (i.e., during peak hours of energy demand), and operated as a pump during times when the price of electricity is low (e.g., midnight to dawn). PSH is an important part in hydropower generation whose total installed capacity is approximately 22 GW currently. Recently, a new type of PSH was developed, called ternary PSH (T-PSH). T-PSH is a type of advanced PSH that is different from conventional PSH and adjusted-speed PSH. This seminar presents the development of a dynamic model of T-PSH for power system analysis in PSLF platform. T-PSH can be operated in three different modes which will be presented in this seminar. A new combined governor is developed to represent the hydraulic short-circuit (HSC) operation mode, which is a special mode for T-PSH. Simulation and validation results are presented to verify the performance of the governor model and the characteristics of T-PSH.

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Bio: Zerui Dong received the B.Sc. degrees in electrical engineering from the China University of Petroleum, Qingdao, Shandong, China, in 2013, and the M.EE. degrees in electrical engineering from Auburn University, AL, USA, in 2015. He is currently working toward the Ph.D. degree at Auburn University, AL, USA. His research interests include pumped storage plant, power inverter and control, harmonic filter, and renewable energy.