Modeling and Simulation of the Effects of Dispersed and Distributed Generation Dynamics on Electric Distribution Networks Impact of Distributed Generation Dynamics on Distribution Systems

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Abstract:
In recent years with growing concerns over carbon emission and uncertainties in fossil fuel supplies, there is a growing and broad interest in distributed and dispersed generation (DG) for residential, commercial, and industrial applications. DG provides a multitude of service to utilities and consumers, including grid support, increased life of transmission and distribution equipment, increased reliability, improved power quality, and reducing risk from uncertain fuel prices. DG includes a wide range of technologies including wind, solar, biomass, diesel, fuel cell, and hybrid power plants. Integration of each type into the electrical networks can cause a great number of challenges. The associated changes to the design and operation of distribution network has frequently pointed to the potential destabilizing effect of the dynamic interactions of the DGs. This effect can vary with the level of penetration and type of DG technology and is dependent on the characteristics of distribution network. The proposed research involves developing suitable dynamic models and control parameters for proper operation of various DG types and determining the impact of existing DGs (different penetration levels), interaction with other types of DGs, and on the power distribution network. The software and simulation to be developed and implemented will be in Matlab/Simulink, and Power System Simulation Packages PSS/E and DIgSILENT platforms. The proposed research has a strong engineering and mathematical components. It involves a mix of theoretical, computational, modeling & simulation, and software development to address practical future energy systems and education/training of graduate and undergraduate students.