Stochastic Evaluation of Transient Stability in Micro-Grids

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The main goal of this research is to provide the necessary tools to analyze the transient stability of a Micro-grid. In traditional stability analysis of large power systems the security and stability of the system is assessed under the worst case disturbance. Due to the nature of the Micro-grid, it is more suited to assess the stability of micro-grid as a probability considering a stochastic distribution of contingencies.

IEEE Std. 1547.4, 2011 [1], introduces intentional islanding operation of the Micro-grids as a valid operational configuration. There are not enough studies of transient stability of a weak network with low inertia machines and voltage source converters as it is mentioned in the standard. In the research, the Micro-grid is modeled in full electromagnetic detail including power electronic converters, wind turbines, rotating machine and other controllers. As yet, photovoltaic cells and energy storage are not included but will be in the future. The Electro-Magnetic Transient (EMT) simulation is controlled by an external Monte Carlo supervisory program capable of applying faults and other contingencies in a stochastic manner. This program conducts multiple runs of the simulation, each with a different set of parameters whose values are determined by given probability distributions. In this manner, the security analysis of the Micro-grid in a probabilistic manner can be done. The approach allows inclusion of aspects such as load types, protection system coordination, generation profile, etc.

In conclusion, this work gives an accurate and systematic method to evaluate the transient stability of a Micro-grid.

REFERENCES