

A Joint Possibilistic-Probabilistic Tool for Load Flow Uncertainty Assessment-Part I: Formulation

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Abstract : As energetic and environmental issues are getting more and more attention all around the world, the penetration of distributed energy resources (DERs) mainly those harvesting renewable energies (REs) ascends with an unprecedented rate. This matter causes more uncertainties to appear in the power system context; ergo, the uncertainty analysis of the system performance is an obligation. The uncertainties of any system can be represented probabilistically or possibilistically. Since sufficient historical data about all the system variables is not available, therefore, they do not have a probability density function (PDF) and must be represented possibilistically. When some of system uncertain variables are probabilistic and some are possibilistic, neither the conventional pure probabilistic nor pure possibilistic methods can be implemented. Hence, a combined solution is appealed. The first of this two-paper series formulates a new possibilistic-probabilistic tool for the load flow uncertainty assessment. The proposed methodology is based on the evidence theory and joint propagation of possibilistic and probabilistic uncertainties. This possibilistic- probabilistic formulation is solved in the second companion paper in an uncertain load flow (ULF) study problem.

Keywords : probabilistic uncertainty modeling, possibilistic uncertainty modeling, uncertain load flow, wind turbine generator

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