电网技术 2007 31 (12): 52-56 ISSN: 1000-3673 CN: 11-2410/TM

概率潮流分析中节点电流和PV节点无功功率的均值和协方差计算

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收稿日期 修回日期 网络版发布日期 接受日期

摘要
传统的概率潮流分析通常基于节点功率和节点电压的概率分布特性，在此基础上形成了概率最优潮流、概率负荷分析、概率稳定等。文章以节点注入功率和PV节点电压运行曲线为基础，依据随机变量数字特征的基本性质和概率潮流计算的相关方程，分别采用不同的方法推导了节点电流、PV节点的无功功率及平衡节点功率的均值和协方差计算公式，比较和分析了各种算法的计算精度。理论分析和算例结果表明了这些算法的有效性，算法的精确性依赖于节点电压的均值和协方差的计算精度。

关键词 概率潮流；数字特征；均值；协方差；电力系统

分类号 TM744

Expectations and Covariance Calculation of Nodal Current and Reactive Power at PV Nodes Based on Probabilistic Load Flow

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Abstract
Usually, traditional probabilistic load flow analysis is based on the probability distribution features of nodal power and nodal voltage. On this basis the probabilistic optimal power flow, probabilistic load analysis, probabilistic stability and so on are formed. In this paper, taking nodal injection power and voltage operation curve of PV node as foundation, according to the basic property of numerical characteristics of random variables and relevant equations for probabilistic load flow calculation the expectations of nodal current, reactive power at PV node and power at balancing node as well as computing formula of covariances are derived by different methods; the computation accuracy of various algorithms are compared and analyzed. Results of both theoretical analysis and calculation examples show that these algorithms are effective, and the accuracy of algorithms relies on the expectation of nodal voltage and computation accuracy of covariances.

Key words probabilistic load flow；numerical characteristics；expectations；covariances；power system

DOI:

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