考虑风电不确定性的振荡稳定裕度概率评估 【上架时间： 2023-03-30】

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详细信息

【标题】考虑风电不确定性的振荡稳定裕度概率评估

【Title】Probabilistic Assessment of Oscillatory Stability Margin of Power Systems Incorporating Wind Farms

【摘要】我国风电的集群开发、弱电网接入、长距离外送等特点，严重威胁着系统的振荡稳定性，导致互联振荡的阻尼下降，进而减小了相应的振荡稳定裕度(Oscillatory Stability Margin，OSM)。考虑到风电的波动性和间歇性，本文从概率分析的角度，结合Nataf变换技术、OSM确定性求解模型和蒙特卡罗仿真建立了电力系统OSM的概率评估模型，并提出了概率指标和风险指标。进一步针对四机两区域系统和16机五区域系统，对风电场接入位置、风电装机容量以及风速相关性对系统OSM的影响进行了深入探讨。算例结果表明，所提模型能以定量评估指标直观地表达含风电场电力系统OSM的概率分布，反映各种因素对系统OSM的影响，可以为电力系统规划和运行提供指导意见和决策支持。

【Abstract】With the increase in penetration of wind power which is essentially intermittent and random, the dynamic performance of the power system will change significantly, and so will the characteristics of the oscillations and their stability margins. This paper is dealing with the probabilistic evaluation of the oscillatory stability margin (OSM) of power system with stochastic wind generation. Nataf transformation approach is applied to generate the wind speed samples, which models the correlation between the various wind farms. The mathematical model of OSM for wind farm integrated power system is formulated and is calculated by the integration-based eigenvalue tracing approach. Considering the uncertainties of the wind power, several statistical indices are presented to evaluate OSM. Monte Carlo simulation (MCS) is used to calculate these statistics. The impact of wind power uncertainty on OSM restricted by inter-area mode is investigated in four-machine two-area test system and 16-machine five-area test system, respectively, for different wind farm locations, wind power penetration levels and wind speed correlation degrees. Appropriate conclusions are finally drawn.

【关键词】振荡稳定裕度；蒙特卡罗法； Nataf变换;风电并网

【Keywords】oscillatory stability margin; Monte Carlo simulation; Nataf transformation; wind power

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