新能源与分布式发电

基于随机规划的含风电场的电力系统节能优化调度策略

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摘要：

含风电场的多电源电力系统优化调度是一个新的具有重要经济和社会效益的复杂非线性问题。针对传统的水火经济调度模型以及新兴的火风互补经济调度模型，提出了基于随机规划的水、火、风混合系统短期优化调度模型，利用机会约束描述目标函数和约束条件，并给出不同置信水平下的调度方案。同时考虑水电站耗水量最小、火电煤耗量最小以及氮氧化物排放量最小3个目标，采用理想点法将多目标转化为单目标问题。针对风电场风速及出力的随机性，采用随机模拟技术，结合序列二次规划法找到目标函数的最优值。实例仿真结果表明了该调度策略的有效性和可行性。

关键词： 风电场 节能调度 随机规划 机会约束规划 随机模拟

A Stochastic Programming Based Short-Term Optimization Scheduling Strategy Considering Energy Conservation for Power System Containing Wind Farms

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Abstract:

Optimization scheduling strategy considering energy conservation and environment protection for multi source power system containing wind farms, which possesses important economic benefic and social effect, is a novel complex nonlinear problem. Based on traditional hydro- thermal economic scheduling model and emerging thermal- wind complemental economic scheduling model, a stochastic programming based short-term optimization scheduling model for power system consisting of thermal plants, hydropower stations and wind farms is proposed. In the proposed model, the chance constraints are used to describe objective function and constraints, and scheduling schemes under differnet confidence levels are given. Meanwhile three objectives, namely minimum water consumption of hydropower stations, minimum coal consumption of thermal power plants and minimum outflow discharge of nitrogen oxides, are taken into account, then by use of ideal point method, the multi objective problem is turned into single objective problem. In allusion to the randomness of both wind speed and wind farm output, the stochastic simulation is combined with sequential quadratic programming to solve the optimal value of objective function. Case simulation results show that the proposed scheduling strategy is effective and feasible.

Keywords: wind farm generation scheduling considering energy conservation stochastic programming chance- constrained programming stochastic simulation

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