

电力系统运行与规划

架空线路冰风荷载风险建模及模糊预测

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摘要:

极端冰灾天气会给电力系统带来巨大的经济损失, 应对极端冰灾电力系统缺乏及时预警。基于架空输电线路设计标准Q/GDW 179—2008与IEC 60826—2003, 建立了架空线路设计冰风荷载曲线。根据线路荷载 - 强度的随机特性与干涉理论, 建立了线路冰风荷载风险模型, 即线路冰风荷载的时间相依可靠性模型, 用于计算线路不可靠度与故障率, 以反映输电系统群发性故障的风险与短期可靠性的共模故障水平。进一步把线路荷载划分为5个运行状态, 给出线路的冰风荷载风险裕度。应用模糊理论对线路的短期冰风荷载风险进行预测, 并给出了时间尺度上线路的风险测度, 可为系统运行人员提供极端冰灾天气时电力系统的预警信息。

关键词: 极端冰灾天气 电力系统预警 时间相依可靠性模型 模糊风险预测

Wind and Ice Loading Risk Model and Fuzzy Forecast for Overhead Transmission Lines

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Abstract:

Power systems suffer tremendous economic loss in extreme ice disaster weather, suggesting that it lacks immediate precaution system. According to standards Q/GDW 179—2008 and IEC 60826—2003, the wind and ice loading design curves for transmission lines were built up. According to the random character of load-strength and load-strength interference theory of transmission line, a time-dependent wind and ice loading risk model was established. Unreliability and fault rate can be calculated based on the proposed model, which indicates the risk for cluster fault and common fault of short-term reliability. Furthermore, the line loads were divided into five states, which could reflect the risk margin of the line. Short-term wind and ice load risk forecast was conducted based on fuzzy theory, and presented risk measurement on time scale, which could provide precaution information for operator.

Keywords: extreme ice disaster weather power system precaution time-dependent reliability model fuzzy forecast

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