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以靈敏度因子為基礎之快速線路流量計算之研究

Study on Fast Line Flow Calculation Based on a New Sensitivity Factor

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摘要

本文提出一種新的靈敏度因子，賈可比矩陣分佈因子，用於求解即時線路流量計算。此一方法乃推導自牛頓－拉佛生電力潮流法基態解，在即時線路流量計算時維持賈可比矩陣不變。有別於其他著名的分佈因子 GSDF 、GGDF 與 ZBD，本文所提之因子可反應各母線實功及虛功注入量，當負載需求由基態解以一致性或非一致性變動後，可再不需經由任何疊代程序迅速地求解線路流量。最後，本文所提之方法利用 IEEE 14-Bus 測試系統驗證理論正確性與實用價值，由數值模擬之結果證明該方法極適合應用於電力系統之線上即時流量計算。

This paper proposes a new sensitivity factor, Jacobian Based Distribution Factor (JBDF), to solve the real-time line flow calculation problem. It is derived from the Jacobian matrix of the base case Newton Raphson power flow solution, and kept constant during real-time line flow calculation. Differing from the well-known distribution factors, such as Generation Shift Distribution Factor (GSDF), Generalized Generation Shift Distribution Factor (GGDF) and Z-Bus Distribution Factor (ZBD), it reflects the changes of active and reactive power in each bus. When the loading conditions change from the base case loads, either conforming or

non-confirming changes in real and reactive power, it can rapidly and precisely compute the active line flows without any iterations. The proposed JBDF method is tested on the IEEE 14-Bus System. The numerical simulation results demonstrate the proposed method is very accurate and rapid in computation. It is highly suitable for real-time line flow calculation.

Key words: JBDF;Line Flows;Real-Time Applications;
Sensitivity Factor;Power Flow