

电力系统

电网中流通功率和耗散功率及其分量的定义与分析

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摘要:

电路理论中的功率是基于电场力对电荷做功的元件吸收功率,它在电网中的分布不能展现能量流动的连续性。电力网中基于算式定义的流动功率虽能展现能量流动的连续性,但不适用非对称电网。基于电磁场的空间能流密度给出了电网中流通功率和耗散功率的定义,以展现能量在电网中流动的连续性。分析了耗散功率和电路理论中吸收功率之间的关系。推导了一类对称电网中流通功率的求解方法,剖析了一般电网中流通功率的求解难点。基于电磁能流的连续性和能量守恒给出了耗散功率分量和流通功率分量的定义,以进一步展示耗散和流通功率中各电源的分量大小。最后分析了电网中流通功率分量的求解难点,展望了流通功率及其分量的应用前景。

关键词:

Definitions and Analysis of Passing-Power and Dissipation-Power and Their Components in Electric Networks

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Abstract:

The power defined in electric circuit theory is the element's absorbing power, physically based on the work done by electric field force on charges. However, the distribution of elements' absorbing power fails to show the continuity of energy flow in electric networks. The calculation- formula-based flowing power given by electric power network theory shows the continuity of energy flow, but is not applicable to asymmetric networks. In this paper, to reveal the continuity of energy flow in electric networks, the passing-power and dissipation-power are defined based on the spatial energy flow density of electromagnetic fields. The relationship between the dissipation-power and the absorbing power defined in circuit theory is analyzed, and a method to solve passing-power in a special class of symmetric electric networks is derived. The difficulties in the solution of passing-power in general electric networks are pointed out. Furthermore, the passing-power component and dissipation-power component are defined based on continuity of energy flow and conservation of energy to quantitatively show the proportion of each source to a passing-/dissipation-power. The difficulties in the solution of passing-power component are analyzed. It is pointed out that there are wide applications for passing-power and its components.

Keywords:

收稿日期 2009-11-11 修回日期 2010-01-10 网络版发布日期 2010-03-16

DOI:

基金项目:

策动功率分量及其在电网安全经济运营中的典型应用

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