

电气工程

基于时变相量的配电网PT过电压原因分析研究

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摘要:

在配电网中性点不接地系统中,利用相模变换理论得到系统的0模等效电路,分析了导致电压互感器(potential transformer, PT)铁磁谐振过电压发生的内在原因。基于时变相量的数学模型建立0模网络,得到系统的 $\Delta I(\phi L)$ 曲线;通过对曲线的分析,可知系统中稳态谐振点的存在是导致铁磁谐振发生的主要原因;最后根据扰动的大小,基于李亚普诺夫能量函数提出了加速能量和减速能量的概念,并提出了判断系统发生稳态谐振准则——等面积法则。电力系统暂态仿真软件(alternative transient program,ATP)仿真结果验证了上述理论的正确性。此研究成果对分析配电网电压互感器(PT)烧坏事故及后续抑制铁磁谐振的研究工作提供了重要的理论依据。

关键词: PT 铁磁谐振 过电压 时变相量

Study of the reasons of the over-voltage of PT in the distribution network based on a time-varying vector

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Abstract:

In distribution networks in a non-ground neutral system, the phase-mode transformation theory was used to get the 0-mode equivalent network system, and the inner reasons of the over caused potential transformer (PT) ferroresonance were studied. Then, the mathematical model of the 0-mode network was established based on the theory of time-varying vector, according to which the curve of $\Delta I(\phi L)$ was obtained. Through the analysis of the curve the results showed that the existence of the system steady-state resonant point was the reason that caused the occurrence of ferro-resonance. Finally, according to the size of the disturbance, the concept of speed up energy and slow energy was put forth based on the Lyapunov energy function, and the judgment system steady-state resonance standards, such as the happened-area of law was also given. Alternative transient program(ATP) simulations showed that the forward theory was efficient. The analysis of the distribution network PT accidents and subsequent inhibit burn out could provide an important theoretical basis for the research work of ferro-resonance.

Keywords: potential transformer (PT) ferro-resonance over-voltage time-varying vector

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