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Simulation and inspection of fault arc in building energy-saving distribution system

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Abstract

To achieve sustainability in modern society, the energy efficiency is a major concern. Smart cities sustainability depends on the availability of energy-efficient infrastructures and services. Buildings in the city are responsible for most of the energy consumption and emissions to the atmosphere (40%). The smart buildings are required by the smart cities for the sustainability goals achievement. To study the simulation of fault arc in building energy-saving distribution system is the aim of the paper. By modeling the fault arc in low voltage power supply and distribution lines of buildings, the characteristics of fault arc were analyzed. The wavelet analysis method is used to denoise and extract features of the collected data. Compared with Fourier transform method, the situation when the load changes in the circuit is analyzed. The simulation results show that the method can effectively detect the singularity of fault arc and accurately identify fault arc. In one cycle (0.02 s), the electric power input to the arc reaches 1000 W, so the energy input to the fault arc in 3.2–5 s will be very high. Multi-resolution analysis is carried out on the signal by wavelet transform, and the feature vector of the signal is extracted. Artificial neural network is used to identify the fault of the input feature vector. Simulation results show that this method has good fault recognition performance.

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Fig. 1

Fig. 2

Fig. 3

source splitting; **f** load splitting; **g** sum stacking module; **h** difference stacking module

Fig. 4

Fig. 5

Fig. 6

Fig. 7

Fig. 8

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Ethics declarations

Conflict of interest

The authors declare that they have no conflict of interest.

Human and animal rights

All ethical issues including human or animal participation has been done.

Informed consent

No such consent is applicable.

Additional information

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Keywords

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- Multi-resolution analysis
- Wavelet analysis