

Supplemental Explanation

Isolated operation detection method

Typically, during a power system outage, distribution line circuit breakers are open and the distribution line is in a no-voltage state, but in a distribution line to which distributed power sources such as solar power generation are connected, if operation continues while not disconnected from the power system, the region that should be in a no-voltage state becomes charged. Thus, in a power system that has been disconnected from a commercial power supply, isolated operation is the state in which only the power supplied from the distributed power sources causes electricity to flow through the distribution line.

During isolated operation, there is the risk of serious effects on human body and equipment, such as: (1) electric shocks to the general public, (2) equipment damage, (3) adverse effect on firefighting operations, (4) electric shocks occurring during the search for fault locations and during removal operations. In addition, expansion of the damage at the fault location or a delay in recovery may disrupt the supply of power. Therefore, when connecting distributed power sources to a power system, isolated operation prevention measures are mandatory, and they must detect, either directly or indirectly, the isolated operating state using a protective relay or the like, and then rapidly disconnect distributed power sources from the power system.

There are two methods for detecting isolated operation, and detection is implemented using both of these

methods in combination.

(a) Passive method

The passive method detects sudden changes in the voltage phase or frequency caused by an imbalance between the generated power output and the load during the transition to isolated operation.

(b) Active method

The active method continuously applies fluctuations in voltage and frequency via a power conditioner control system and an externally attached resistance, and detects noticeable fluctuations during the transition to isolated operation.

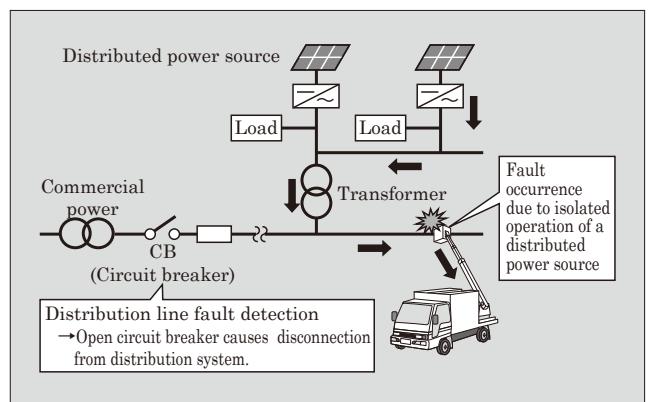


Figure: Failure due to isolated operation



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