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Technical requirements for relay protection of microgrid

微电网继电保护技术规定

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1 Scope

This Standard specifies the technical requirements which shall be met by distributed resources protection, electrochemical energy storage protection, transformer protection, grid connection point protection, line protection, bus protection and security automatic equipment for microgrids.

This Standard applies to grid-connected AC microgrid and isolated AC microgrid whose voltage level is 35 kV and below.

2 Normative references

The following documents are indispensable for the application of this document. For dated references, only the dated version applies to this document. For undated references, the latest edition (including all amendments) applies to this document.

GB/T 14285, Technical code for relaying protection and security automatic equipment

GB/T 22387, Residual current operated relay

GB/T 33589, Technical requirements for connecting microgrid to power system

GB/T 33982, Technical specification for grid connection protection of distributed resources

GB/T 34930, Operation and control specification for microgrids connected to distribution network

GB/T 36558, General technical requirements for electrochemical energy storage system in power system

DL/T 314, General specifications for power system under-voltage load-shedding and separation equipment

DL/T 315, General specifications for power system under-frequency load-shedding and separation equipment

d) Requirements for power distribution reliability and power quality;

e) Economy.

4.1.2 The microgrid relay protection shall be able to accurately identify microgrid faults, tie-line faults, unplanned islands, frequency or voltage abnormalities.

4.1.3 The microgrid relay protection shall not cause malfunction due to system oscillation.

4.1.4 When there is a fault inside the grid-connected microgrid, the microgrid relay protection shall remove the fault; if the fault cannot be quickly removed, when the microgrid is connected to the public grid by a dedicated line, the public grid protective action can disconnect the opposite-side switch of the grid connection point; when there are other branches on the microgrid tie line, the grid connection point protection shall disconnect the grid connection point switch before the public grid protection action.

4.1.5 When the grid-connected microgrid tie-line fails, the grid connection point protection shall quickly trip the grid connection point switch.

4.1.6 When the grid-connected microgrid has unplanned islands, the grid connection point protection shall trip the grid connection point switch; the action time is less than the action time of the public grid side standby automatic switching and reclosing.

4.1.7 When formulating a microgrid relay protection configuration plan, it shall be ensured that the fault is removed when two faults occur at the same time.

4.1.8 When the traditional protection principles and methods which are used in the microgrid cannot meet the requirements of reliability, selectivity, sensitivity and quick action, reliable new protection principles, methods and equipment shall be adopted.

4.2 Fix-value setting

4.2.1 The microgrid relay protection fix-value shall be set according to the microgrid working conditions and protection requirements such as the microgrid topological structure, the way of connecting and disconnecting from the grid, the type and status of internal distributed resources.

4.2.2 The microgrid relay protection fix-value shall be coordinated with the fault ride-through capability of microgrid. The setting of the grid-connected microgrid relay protection fix value shall be coordinated with the relay protection of the public grid.

4.3 Fault recording function

generator shall act reliably during out-of-step oscillation; it shall not malfunction during system short-circuit and stable oscillation.

6 Electrochemical energy storage protection

The relay protection configuration of electrochemical energy storage inside the microgrid shall meet the relevant requirements of GB/T 36558, and shall have the ability to link with the operation mode of the energy storage converter.

7 Transformer protection

7.1 General requirements

The protection of the microgrid 10(6) kV ~ 35kV voltage level transformer shall meet the relevant requirements of GB/T 14285.

7.2 Differential protection

The configuration principle of transformer differential protection shall meet the relevant requirements of GB/T 14285, and shall reliably trip the corresponding circuit breaker.

7.3 Non-electricity protection

7.3.1 Oil-immersed transformer shall be equipped with gas protection, heavy gas trip, light gas alarm.

7.3.2 Dry-type transformer shall be equipped with temperature over-limit protection, over-temperature alarm or trip.

7.4 Directional overcurrent protection and overload protection

7.4.1 Transformers without differential protection shall be equipped with current quick-break protection.

7.4.2 The transformer shall be equipped with over-current protection as a backup protection for phase-to-phase short circuit. When the selectivity does not meet the requirements, the overcurrent protection can add directional components.

7.4.3 The transformer shall be equipped with overload protection with constant time-lag or inverse time lag operation characteristics.

8 Grid connection point protection

8.1 General requirements

8.5 Simultaneous closing

For the 380(220) V voltage level microgrid, the point of connection shall be equipped with the synchronous closing function.

8.6 Anti-islanding protection

The point of connection of microgrid shall be equipped with anti-islanding protection. When running in grid-connected mode, the anti-islanding protection shall be used; otherwise, the anti-islanding protection shall be exited. Anti-islanding protection shall be reliable action to trip the grid connection point switch.

9 Line protection

9.1 General requirements

9.1.1 The 10(6) kV ~ 35 kV line protection inside the microgrid shall meet the relevant requirements of GB/T 14285.

9.1.2 The line protection of the microgrid shall be set according to the line type, length and load characteristics; the influence of the operation mode of the microgrid and the characteristics of distributed resources shall be considered comprehensively.

9.2 Differential protection

The internal cable line of the microgrid or the 10(6) kV ~ 35 kV line with difficulty in setting shall be equipped with the longitudinal current differential protection.

9.3 Overcurrent or directional overcurrent protection

9.3.1 The 10(6) kV ~ 35 kV voltage level lines inside the microgrid shall be equipped with overcurrent protection; when the selectivity does not meet the requirements, the overcurrent protection can add directional components.

9.3.2 The 380 (220) V voltage level lines inside the microgrid shall be equipped with instantaneous short-circuit protection, and should be installed with long-time short-circuit protection.

9.4 Ground fault protection

9.4.1 For microgrids that use neutral effective grounding, the 10(6) kV ~ 35 kV voltage level lines shall be equipped with ground fault protection.

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