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RESEARCH AND APPLICATION OF FEEDER AUTOMATION SYSTEM IN DISTRIBUTION NETWORK

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The feeder automation system is a system that uses various devices to monitor and control the lines and equipment in the distribution network. When a fault occurs in the distribution network, the feeder automation system can automatically determine the location of the fault in a short time, and can actively isolate the fault area to restore the normal power supply of the system. With the development of Jiamusi economy, the distribution automation system built in the early stage in this area has not been able to meet the requirements of power supply reliability. In order to improve the power supply reliability of the distribution system, it is necessary to build feeder automation system in Jiamusi area that can monitor the operation of various distribution equipment and can carry out fault location and active fault isolation.

In this paper, first of all, the system mode and fault handling mode of feeder automation are described. The main station centralized control and local control combined system mode are adopted, and the current type fault handling mode is adopted for system design. Furthermore, this paper introduces the principles of various location methods under different fault conditions. According to the specific situation of a certain region, the location method based on the feeder terminal unit (FTU) and network data is finally determined to design the feeder automation system. Secondly, relying on the feeder automation transformation project of Jiamusi regional power grid company, the main station, communication system and feeder terminal of the whole automation system are designed. The overall structure of the main station and the configuration principle and specific scheme of various software and hardware are designed; the construction principle and technical route of the system communication part are designed in detail, and the required equipment is listed in the equipment list; the configuration is designed to meet the functional requirements according to the functional requirements of the system feeder terminal unit (FTU).

The line from the substation to the power user is collectively called the feeder system. The line can be a pure overhead line, a cable line, or a mixed line of the two. When the distribution network is operating normally, the system can monitor the operation of the distribution network through various devices to ensure that the line is always in reliable operation. When a fault occurs in the distribution network, the feeder automation system can automatically determine the location of the fault in a short time, and can actively isolate the faulty area and restore the normal power supply of the system's non-faulty area.

Distribution network feeder automation system mode

Feeder automation plays a very important role in providing reliable electrical energy to power users. When a fault occurs in the distribution network, the feeder automation system can automatically determine the location of the fault in a short time, and can actively isolate the faulty area and restore the normal power supply of the non-faulty area of the system, so it can reduce the impact of various faults on power users, reduce various losses caused by power outages.

The core component of the distribution network automation system is the terminal monitor. The existing terminal monitors are mainly divided into FTU, DTU and TTU according to their functions. When configuring on the actual site, it is generally configured as follows:

1. For important distribution networks and important nodes in the distribution network that require high reliability of power supply, the monitoring points generally select terminal equipment mainly based on "three

remotes". Where the optical fiber communication conditions are met, when a fault occurs, the local control and centralized control are generally used for processing; if the optical fiber communication is not satisfied, the local control is generally used.

2. For general nodes, in order to monitor the distribution network and locate faults, the "two remote" monitoring method with the help of fault indicators can be preferred. If an important branch node is encountered, a tap switch can be installed, and the branch line can be isolated on the spot when the branch circuit fails.

3. Line monitoring and fault locating devices with "one remote" or "two remote" functions are generally used on lines erected in the suburbs of cities and in the vast rural areas, so as to locate faults on the lines in the distribution network. For ordinary radial lines in the distribution network, the automatic opening and closing functions of the reclosers and sectioners installed in the line are used to remove line faults and normal power supply in non-faulty areas. The work mainly depends on local automation. The level of the equipment and the set fault removal plan use the coordination or blocking function between the recloser and the sectioner to isolate the fault.

The system generally includes communication and master station systems, power distribution switches, primary voltage transformer equipment, various power distribution line terminals and communication facilities. When the system is in normal operation, various power distribution terminal devices can be used to monitor various operating conditions in the lines and equipment in the power distribution line, and transmit this information to the master station. However, when a fault occurs in the distribution network, there is no need to use the communication network and the master station for processing. It only needs to use the distribution terminal equipment to monitor the line voltage, current and other parameters, and use the changes of these parameters and the terminal equipment itself. The protection and logic functions perform fault location, and then remove the fault area, restore the power supply in time, and allow the fault to be reported to the master station.

The system monitors the current flowing in the line and the voltage on both sides of the switch by configuring intelligent terminal equipment for the line switch, and combines the operating status of the switch, synthesizes this fault information and uses the logic judgment function of the terminal equipment itself to automatically proceed. In the judgment of the faulty section, after the faulty section is determined, the switches on both sides of the faulty section are automatically disconnected for fault isolation, and the line tie switch is closed to quickly restore the power supply of the non-faulty area.

Centralized control mode automation system

The system has the same equipment composition as the local control mode system, and also includes communication and master station systems, power distribution switches, primary voltage transformer equipment, various power distribution line terminals and communication facilities. Among them, the power distribution terminal has a "three remote" function and a fault detection function. When the system is in normal operation, various power distribution terminal devices can be used to monitor various operating conditions in the lines and equipment in the power distribution line, and transmit this information to the master station. When a fault occurs in the distribution network, the master station uses the fault information detected and uploaded by each power distribution terminal in the network, and analyzes the network structure with the help of the working status of each switch, and then determines the specific section where the fault occurs. Then the main station system automatically controls or uses manual remote control of the line switch to remove the faulty area and restore the power supply in time.

In the centralized control system mode, the fault processing is generally carried out in the system master station, mainly by using the SCADA system to collect information and data in each line in the distribution network to deal with the faults that occur. The master station analyzes the fault data uploaded by each power distribution terminal, and uses the status of each line switch and the distribution network topology to judge the

fault occurrence section, and at the same time judges the type and location of the fault according to the set fault handling procedure.

The system master station can provide one or more operation schemes that can realize fault isolation and quickly restore the power supply of the system after the power distribution network fails to help the staff perform remote control operations.

Local control and centralized control system collaboration automation system

The two modes of local control mode and centralized control mode are mutually backup. By combining these two control modes, the advantages of these two modes can be combined together. The centralized control mode of the master station can quickly remove faults. Section, and the local control mode has lower requirements on the communication system of the system. Therefore, in the design of fault removal, this article adopts a combination of "master station centralized control" and "local fault removal". The specific implementation process is: when the mains of the distribution network fail, the outgoing line at the substation after the switch is tripped, if it waits for the reclosing failure, the master station system determines that the fault is a permanent fault, and then judges the location of the fault according to the characteristics of the fault current in the line, and gives a fault handling plan.

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