Research on Transmission Resource Allocation in Communication Management System

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Abstract. This paper studies the completion of power communication technology and transmission network planning. It summarizes the basic research and current situation analysis of transmission technology and business network planning. First, it focuses on the functions of power communication business, information flow, transmission channels and bearing requirements. The characteristics of various power grid technologies and grid communication business models in China are analyzed. Secondly, it carried out analysis and research on the basic design principles of power communication technology and transmission network business planning, evaluation of main indicators, and focused on elaborating the digital communication network management system of synchronous transmission of power communication, the characteristics of ason power communication technology, network protection and management and basic principles of power communication technology and transmission network such as restoration.

Keywords: Communication business, demand, power communication, planning.

1. Introduction
Power communication technology and transmission network planning are important technical foundations and supporting facilities for the construction of modern power systems. In recent years, China's power communication optical cable transmission network technology has been continuously improved and developed. It provides efficient, high-quality, and fast power communication services and a wide range of applications for production companies that use a lot of power. It is safe, stable, and healthy for China's power system. Operation and development have made all due guarantees and contributions.

2. Networking and structural characteristics of power communication transmission network
China's power communication optical cable transmission network mainly uses opadss (all-fiber dielectric self-supporting) and opgw (fiber-optic all-media composite self-supporting overhead ground wire) that are laid in the same tower and same trench with 500kV to 35kV cables., Oppc (all-dielectric fiber composite overhead phase line) and other special communications in China Power use optical cable transmission network as the main medium for power communication data transmission. China's power communication optical cable transmission network usually takes 500kV and some optical
cables as the core layer of the business of China's power communication data transmission network, 0kV and some pipeline optical cables as the core layer of the network convergence, 110kV and 35kV. And the convergence layer of part of the pipeline optical cable as the core layer of network access.

This hierarchical network structure is the same as that of China Telecom's data transmission network operators. However, China Electric Power's data transmission network, regardless of the type of service or the amount of data information carried by the business, is less than the early telecommunications public network operators. Therefore, in the current China power communication transmission network, most regions still tend to use the early sdh communication equipment with mstpc multi-service transfer platform (sdh-based multi-service data transmission platform) function for networking, core layer data the transmission rate is generally about log, the rate of the convergence layer is generally. 5g or 6m, the access core layer mainly uses the 155m rate data channel networking, and the data access network of the power communication transmission network generally adopts a tree shape The network with chain structure is the main part, which is the weak part of data security in the entire core network.

![Network structure diagram of power communication transmission network.](image)

The data service on the power communication transmission network carries all services including all kinds of power grid-specific services such as line relay protection, safety automatic device system, energy management automatic device system, and such as video conference management system, voice, information, etc. Common types of grid business. These multimedia services directly carry the power grid in the power communication transmission network by circuit connection, and the scheduling and organization of transmission work are directly carried out by the power communication transmission network operation and maintenance staff through the transmission circuit network management system to transmit the intermediate time slot and transmission of the transmission circuit the configuration of the ports at both ends of the circuit is in progress.

3. Analysis of common power grid business types

Power transmission network services can be roughly divided into power communication data services, voice data services, and multimedia services according to their main services and application methods. Among them, voice data services and multimedia directly carry various power grid-specific data services such as line relay protection, security services and automatic device system services to the power communication data transmission network. Production quality dispatch management system automation business, including power production dispatch system automation management system, power line energy management and measurement automation system, wide area phasor measurement automation system, fault detection recorder automation system, power market automation system, power line energy measurement Automated data services such as information management systems are mainly stored and carried on the national power production dispatching system data network, and some are mainly carried on the power communication data transmission network; power production
information management automation system data services are mainly stored through the power integrated data network system and hosting. The automation data business can be subdivided into power line safety protection automation business, security management business, energy management automation business, electrical energy management and measurement automation business, protection management system information automation system, power automation market, hydrological protection management information automation system, optical cable operation monitoring information system and other services.

EAS basic functions: responsible for collecting and managing the real-time transmission, storage, and analysis of data collected by electric energy measurement equipment and terminals distributed throughout China's power grid, and for the construction of information systems such as power management information management and power service marketing for power production enterprises Provide data support. The main station of the power measurement management system of the dispatch center is usually set at the provincial or regional dispatch center. The data collection equipment and terminals must cover all substations and all power plants. Information transmission flow: The data and information transmission flow of the electric energy metering management system of the dispatch center is mainly to transfer data from the collection equipment of each substation to the EAS master station at the dispatch end.

4. Evaluation Index of Transmission Network of Electric Power Communication Network

For communication transmission network planning, relative to circuit performance indicators such as bit error, jitter, drift, etc., in order to consider its effect, the planning work should be comprehensively evaluated from the aspects of power grid business safety and production efficiency. The evaluation should be conducted in terms of reliability, redundancy, and controllability.

a) Reliability

The power communication transmission network is the foundation of the safe production of the power grid. Any short-term failure may lead to serious consequences such as failure of the safety device, misoperation of the relay protection, failure of the dispatch monitoring signal, and failure of the remote control signal, causing significant losses. Therefore, the reliability of the power communication transmission network must be considered first. The factors that affect the reliability of the communication network mainly include the reliability of the network equipment, the topology of the optical cable network and the equipment network, and the routing method of the service channel. In actual operation, network devices with a high degree of redundancy should be used for networking; try to use high-reliability optical cables to open the optical path; use the channel protection ring (PP), subnet cross protection (SNOP) and Network protection technologies such as multiplex section protection (MSP).

b) Redundancy

Redundancy refers to the need to reserve a part of the reserved backup network channel resources in the communication transmission network. When a network failure situation may occur, various emergency resource allocation measures can be used to achieve timely recovery of the business transmission channel. The level of redundancy can be measured by calculating the ratio between the number of reserved network channels and the total number of reserved channels. According to the use area of the power service transmission channel circuit, the different use areas of the service transmission network can be calculated, and the calculation method of the data link occupancy rate of different rates and levels can guide the business, such as the aggregation node at the entrance of multiple core nodes by calculating the ratio of the number of reserved backup channels of the incoming node and the total number of channels, the redundancy of the reserved backup channels from the aggregation node to multiple core business nodes is obtained.

c) Controllability

It refers to a controllable degree in the management of power network in the face of the production of business transmission circuit equipment, including the response time of business transmission channel spare parts and the complexity of high-order channel load. The response time of the service
channel spare parts refers to the response time of the spare parts required by the aggregation node to receive the data and guide the opening of the service transmission channel according to the requirements for service opening. Its value is mainly used to meet the time limit for business opening of China's power grid. The complexity is affected by the management mechanism, channel planning, the number of circuit nodes required to be opened, the degree of response of spare parts, the use of network emergency resources, and road load. In order to comprehensively analyze the impact of high-end business transmission channel network management functions and the response time of staff spare parts on business conditions. The clarity of the business data used by each time slot node in the high-order pass channel and the complexity of the type of business data carried are comprehensively calculated. Among them, the greater the usage quota and consumption of resources; the fewer types of business data that are included at the same time. The lower the complexity of its business, the higher the clarity.

5. Transmission network service protection and safe recovery

The transmission network refers to the use of various reserved route transmission means between the service transmission node and the protection node to restore resources. When the normal working route in a business transmission channel is interrupted, the transmission network uses various reserved route transmission means to restore resources, so that the signal of the business through the service protection node routing transmission means to continue business transmission. In order to effectively guarantee the reliable and safe transmission of transmission network services, network protection personnel provide a wide variety of transmission network protection methods. The transmission network ssdh self-healing protection loop constructed by various transmission network protection methods does not require human intervention. Protecting and restoring the carried business within an extreme transmission time greatly guarantees network security. The SDH network mainly relies on two mechanisms of protection and restoration to maintain the survivability of the network. At present, in the power communication transmission network, two protection methods, path protection and subnet connection protection, are mainly used.

(a) Path protection: When a service channel failure causes the working path server to fail or the network performance deteriorates to a certain degree, the protected path can replace the working path server to continue to protect the signals transmitted by users to other business channels. Realize the protection method according to the specific situation.

(b) Protection of subnet service connections: In the actual situation where the structure of international power communication and transmission network networks is becoming more and more complicated, subnet connection protection (sncp) can be widely applied to various network topologies and can be A service signal protection method that provides users with high-speed and stable switching transmission rate has been widely used in the international power grid. When the cascading connection of the service and protection subnet fails or the network performance fault deteriorates to a certain protection threshold, the receiver will select the connection of the work and protection subnet as the service protection signal. The protection of sncp adopts the protection method of single-ended high-speed switching on the power grid, and the process of switching does not need to protect the network protocol. For a single service with sncp, the switching service time requirement is 50ms. When a large number of sncp services are involved in the system, there is no specific requirement for the switching time. For the sncp service in multiple networks, it can be resolved by switching by using the grouping method of detecting multiple service groups, that is, multiple service combinations with the same service start time point and the same route in the same network can be detected as one Business is integrated. After a system detects one of the key service groups and sends a request for switching, the service processing channels of the packet in the entire network simultaneously switch the service. After the switching business is over, the system will check and verify all the business switching services one by one, and further update the running status of each business after switching. This grouping method greatly optimizes the faulty network response and time, and improves the efficiency and speed of service switching of the entire system.
Figure 2. Schematic diagram of subnet routing connection protection system.

When a failed route is found in the automatic route identification, a certain network recovery algorithm is used by the system to automatically find a network work processing method as a replacement route for the failed route in the entire network. The calculation process takes a relatively long time, and there are three ways to recover the network: manual configuration, pre-stored semi-automatic recovery, and automatic recovery through dynamic route calculation.

6. Conclusion
This article completes two tasks, one is to analyze and summarize the basic functions, information flow and transmission channel requirements of power services such as data services, voice services and multimedia, and lay the foundation for further analysis of the channel modes and bearing methods of various grid services basis. The second chapter mainly introduces the automatic synchronization digital converter system (sdh) and its basic principles, automatic synchronization digital switching optical network (ason), transmission network topology, protection method, and the basic principles and evaluation indicators of network planning. The description provides a theoretical basis for the subsequent application research and analysis of transmission network planning technology.

Acknowledgements
Research on intelligent auxiliary analysis technology of communication operation mode.

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