Analysis on Real-Time Control Channel and the Construction of Emergency Channel

Wei Xiang

State Grid Corporation of China, Dept. of Operation and Maintenance, Nanjing 211106, China

Keywords: Real-time control business, Average interruption time, Emergency channel.

Abstract. The real-time control channel plays an important role in power communication system. Taking the average interruption time of the channel as production index by China Southern Power Grid indicates that power system has higher requirements on communication service ability. In order to reduce influence of node failure from power communication network, the weak links should be improved. In this paper, the statuses of the real-time controlling channel are analyzed, and it also proposed configuration and using method of emergency channel. It improves the rapid recovery ability, and meets the requirement of assessment indicators.

Introduction

With the development of power grid, power communication is widely used in power grid production control, management, operation and other aspects, and has become an organic part of power system. Meanwhile, with the deepening of the power system reform, the requirements of power grid safety and high quality operation are further improved, and the power industry technology and communication technology are further developed. Smart grid has become a worldwide topic of widespread concern, it is the inevitable trend of global economic and technological development, but also it is the common choice of the international power industry to respond to the challenges of the future actively. With the development of smart grid, and the development goal of “2006-2020 year national informatization development strategy” which is put forward by the nation, it brings great challenges to power communication. It is urgent to study the new communication architecture, application mode and communication technology for power system service. This paper focuses on the application and development of power communication business through the application of communication technology in the two power system and the power grid enterprise.

Analysis of Power Communication Service and Application Status

Power system communication service is divided into power grid operation and enterprise management business according to its function and characteristics. Power grid operation services are divided into operation control and operation information business; the enterprise management business is divided into information business and office business. These services are dependent on the support of the communication network, but the requirements for communication are not consistent.

Development Status of Power Grid Operation Services

As a link of power grid control, operation control is directly related to the security of power grid, because of this kind of service is extremely demanding on communication transmission delay and channel reliability. At present, communication network is mainly used. Such services mainly include relay production, security, stability devices and dispatching automation, etc.

Operational information service covers a wide range of channels, high reliability requirements, communication error rate requirements less than 10^-6, channel delay requirements are relatively low, generally it is allow within a few hundred milliseconds. The communication mode is based on private network communication, and the public network communication is supplementary. The
business is mainly divided into the protection and management of information (including fault location and fault recorder), monitoring device (PMU, Performance Monitor Unit), water control management information automation, dispatching management, production technology, power market, and measurement automation and so on.

The main function of the protection management information system is to collect the operation and fault information of the substation in real time, so as to provide scientific basis for the analysis of the accident, fault location and setting calculation, in order to make the correct analysis and decision-making of dispatching management department, ensuring the safe and stable operation of the power grid.

Development Status of Enterprise Services

Management information business mainly includes financial management, marketing, production planning management, human resource management, safety supervision, party and mass information, information support system and so on, it is the support system for operation and management of electric power enterprises. The requirement of communication availability, reliability and security is very high, and the requirement of time delay is relatively low. Within a few seconds, the communication mode is based on private network communication, and the public network communication is supplemented.

Management Office Business

Management Office business is mainly divided into two kinds of office communication and office information, mainly to meet the internal and external communication needs. Office communication includes video conference system, office telephone (inside line, outside line), mobile phone, Internet, mobile office (CDMA/GPRS/3G), etc.

All of the above services use the power private network in the power grid enterprise, mainly using the integrated data network technology. When networking with the China Telecom, China Mobile, China Unicom and other systems units, using public network communication.

Domestic power communication network to develop optical communications, on this basis, data network, voice switching network, clock synchronization network, video conference system and unique power carrier of power system are developed as the main communication modes of power grid. And satellite communication and public network communication are used as emergency communication or auxiliary communication mode. In recent years, optical communication technology has been widely used in relay protection, automatic safety devices and automation, and the channel reliability has been greatly improved. Getting rid of the constraints of bandwidth, delay, reliability and other original communication conditions, crossing regional control becomes possible, and crossing system monitoring and analysis become reality. Current differential protection, new EMS system and other new power grid control technology can be widely promoted.

New Requirements for Communications in Business Development

During the “12th Five-Year” period, the relay protection communication service will promote the adoption of optical fiber channels. At the same time, the device can be connected to the station automation system and the relay protection information system through Ethernet, and it should be able to receive the synchronization clock signal provided by the station time synchronization system. The time requirement is consistent with the current requirement, and the transmission delay of the protection signal should be within 12m/s; Reliability requirements are 500kV lines, each main protection and 220kV lines. Two sets of main protection use 2 completely independent communication channels.

The distribution network automation system remote, telemetry, remote control data required bandwidths are very small, but the amount is huge. Most of the distribution network equipment is installed on the line and the hanging cabinet in the distribution room. The operation space is narrow. The communication equipment of the distribution network is required to be convenient for installation and debugging, and the daily maintenance is reduced. Communication equipment must
have remote management function because of wide coverage of distribution network communication.

From the development trend of the Power Grid Corp information service, in-depth development of the application of information technology can be summarized as four aspects of the direction of network industry centralized transaction processing, decision support, high bandwidth enterprise data center under the support of the mobile office, virtual reality and Internet application etc.

The development direction of power enterprise management is centralized development, That is to say, information service is based on the idea of "unified architecture, two level center, multi-tier application.

**New Demand for Communication in Smart Grid Development**

The core idea of the smart grid is using modern information and communication, control and other advanced technology, to improve the intelligence level of the power grid, to renewable energy access, interactive and other diversified network service requirements, to provide safe and reliable power supply, sustainable and efficient economy. Power communication network is the basis of smart grid implementation, and its performance determines the overall performance of intelligent system.

**Conclusion**

At present, the domestic power grid has built a reliable power communication network, the formation of the optical fiber communication based, microwave, carrier, satellite and other communication methods coexist, and the hierarchical self-healing ring network as the main feature of power private communication network architecture. Transmission media optical fiber, business bearing network, operation monitoring and management are gradually realizing automation and information. Compared with the requirements of smart grid communication, there are still some urgent problems to be solved in power communication system: Unbalanced development of information technology; The integration and integration of information resources need to be further strengthened; The application depth and practical level of information system need to be improved; Lack of communication network resources between distribution side and user side; The structure of power communication transmission network needs further optimization; Communication information resources need to be optimized and integrated; Lack of power emergency communication scheme and communication disaster resistance system against extreme weather; Communication network bandwidth and reliability, security need to be further improved.

**Reference**


