Discussion on the integration of intelligent substation operation and maintenance

Yong Yu

State Grid Tangshan Power Supply Company China

yuyong270@163.com

Abstract. In the development of intelligent power grid system construction in China, the scale of urban power grid construction is getting larger and larger. How to realize the integration of substation operation and maintenance has become the main issue explored by scholars in the field. Because there are still many problems in the operation and maintenance management of intelligent substation, such as ignoring safety measures, rising work risk factor, lack of high-quality talents, etc., the construction of smart grid should explore how to change from the traditional management mode to the integrated operation and maintenance mode. After understanding the basic concept of integrated operation and maintenance mode of intelligent substation, this paper mainly explores the system construction and application effect of integrated operation and maintenance management of intelligent substation according to the basic objectives and common problems of practical management, and finally proposes effective countermeasures for specific problems.

Keywords: Intelligence; Substation, Operation and maintenance; Integration; System module.

1. Introducion

In the process of urban construction and development, the demand for electricity and the demand for electricity are getting higher and higher, and the operation and maintenance mode of the traditional power system can no longer meet the needs of the intelligent substation system. Therefore, the operation and maintenance personnel of the substation should propose effective improvement measures according to specific problems, and the responsible units should regard the operation and maintenance work of the intelligent substation as an important content. Only in this way can we lay the foundation for the rational use of electric energy. Generally speaking, smart grid refers to the intelligent development mode of power grid, will be based on the integration and high-speed two-way communication network construction, will be skilled in the use of advanced sensing and measurement technology, equipment technology, control methods and decision support system technology and other content, will be safe use, high-quality environment, cost-effective, safe and reliable as development goals. The integrated operation and maintenance management of electric power, as a new mode of operation and maintenance of intelligent substations, can scientifically deal with the operation and maintenance work of electric power and operation regulation, can use the integrated working mode to change the traditional single mode, truly realize the objective of intelligent monitoring and management, and enhance the cooperation between monitoring and regulation of the two work. In the context of integrated power operation and maintenance, the staff can flexibly and conveniently complete the operations according to the instructions, reduce the difficulty of practical work, improve the efficiency of practical work, and finally guide the computer operation management to develop steadily in the direction of intelligence and efficiency.[1-3]

From the current operation of intelligent substation, the integrated management of power system mainly has the following problems: First of all, although the integration of operation and maintenance has changed the traditional single management mode and let the employees of the department assume more responsibilities, it also increases the security risk of operation and maintenance management. In the traditional management mode, each staff member has a clear definition of responsibilities, and equipment operation and maintenance management need to be carried out in the state of power failure. However, in the new integrated operation and maintenance management mode, part of the work will be unified to one person, who may be responsible for the operation inspection, system maintenance, software upgrade and other work of the equipment at the same time. During the management period, work quality and work safety are likely to be ignored in order to improve work efficiency, which ultimately leads to the lack of effective control of system management. Secondly, the new integrated operation and maintenance management mode reduces labor productivity, and the number and intensity of work that employees need to deal with will gradually increase. During operation and maintenance management, multiple problems need to be dealt with at the same time, which leads to higher and higher security risks of system operation. Finally, the basic requirements and main contents of each work link of operation and maintenance management are different. For example, the inspection work requires employees to master comprehensive knowledge and correctly deal with various problems during the inspection, and the maintenance work requires proficiency in various maintenance skills to find the problem area as soon as possible. Therefore, the integrated management of intelligent substation operation and maintenance needs to reserve a large number of excellent high-quality talents to correctly cope with the strict requirements of one post and multiple positions, but at present, most employees of power enterprises usually only have one side of the skills, and few talents have a variety of skills, which is difficult to meet the needs of intelligent substation construction and management in the new era.[4-6]

From a macro point of view, China's social and economic development speed is getting faster and faster, the level of science and technology is getting higher and higher, smart grid has become the main basis for the construction of power grid system. Therefore, in order to ensure the normal operation of the smart grid, the most important thing is to explore the system maintenance method that conforms to the current power grid operation mode, scientifically solve the problems caused by the traditional mode, the region, human and material resources and other factors, and finally regard the major overhaul and operation as the main goal to improve the comprehensive level of operation and maintenance.[7-9]

2. Methods

2.1 Construction objectives

Using advanced information technology and power system operation control technology, the OS2 architecture design is completed in an orderly manner, and the pilot construction of the main station and terminal system is comprehensively promoted, and unified technical standards, construction standards and management standards are finally proposed. In accordance with the working principles of the standard construction of the new system and the technical upgrade of the existing system, the standardization construction work is promoted in the whole network, and the problems existing in the construction of the current intelligent substation operation and maintenance

integration system are thoroughly solved, and the comprehensive and unified development is truly realized.

2.2 Technical Architecture

Intelligent substation operation and maintenance integration system is mainly composed of two aspects, on the one hand refers to the main station at all levels, on the other hand refers to the plant station system. Among them, each level of master station and plant station system is divided into operation control system, operation management system, power system operation cockpit, etc. OCS of the overall system design regards online monitoring and automatic control as the core, OMS regards operation analysis and auxiliary decision as the core, through the coordination of the two can truly realize the power grid operation and management. POC is based on the construction of the main station, mainly for the key positions of power grid operation and operation management decision-making personnel, service users as the basic goal, to provide one-stop operation display and decision support. SOC is based on the central station paper construction, mainly for the key positions of power transformation operation, providing comprehensive services such as equipment management and station operation to facilitate service. Bus will follow the working concept of "everything is for service", is the specific application of SOA in the field of power production, will run through the overall system design, and is an important link between information transmission and service interaction. The vertical OSB is used to complete information exchange and service call between the master station and the plant station system, and the horizontal OSB is regarded as the basis internally, and the plug-and-play of each application module is guaranteed by means of unified information coding and standard interfaces. WEB services interaction is selected between the system and the enterprise information system to ensure that information can be shared and applied.[10-12]

2.3 Functional Requirements

According to the analysis of the business requirements of intelligent power grid operation, in order to better meet the requirements of practical business capabilities, the main station system should be divided into POC, four application centers, OSB, basic platform and mirror test training system, etc. Each module is composed of several small modules, as shown in Figure 1. The division principle of small modules of power system operation model should meet the single business requirements and can be built and packaged independently. For example, the intelligent monitoring center is proposed based on basic data collection, which can further complete basic work such as state perception, online statistical analysis, risk assessment and early warning, and intelligent fault diagnosis. The basic platform provides basic functions such as security protection and resource management. The division of the plant and station system includes the logic of SOC, appropriate motion center, intelligent telecontrol, basic platform, comprehensive intelligent group price, secondary standardized design, etc., and the overall modular sub-structure. In addition to the differences in the implementation method, the difference between the two systems is mainly reflected in the intelligent telecontrol and the spacing layer on the comprehensive intelligent group price and secondary standardized design. From the perspective of practical application, intelligent telecontrol mainly solves the problems of data preprocessing and information transmission between the two systems, aiming at unifying the exit and simplifying the channel, and truly realizing the effective maintenance of the system and information sharing in the whole network. Integrated

intelligent component is the use of function integration and structure integration, effective integration of secondary devices, comprehensive optimization of secondary machinery.

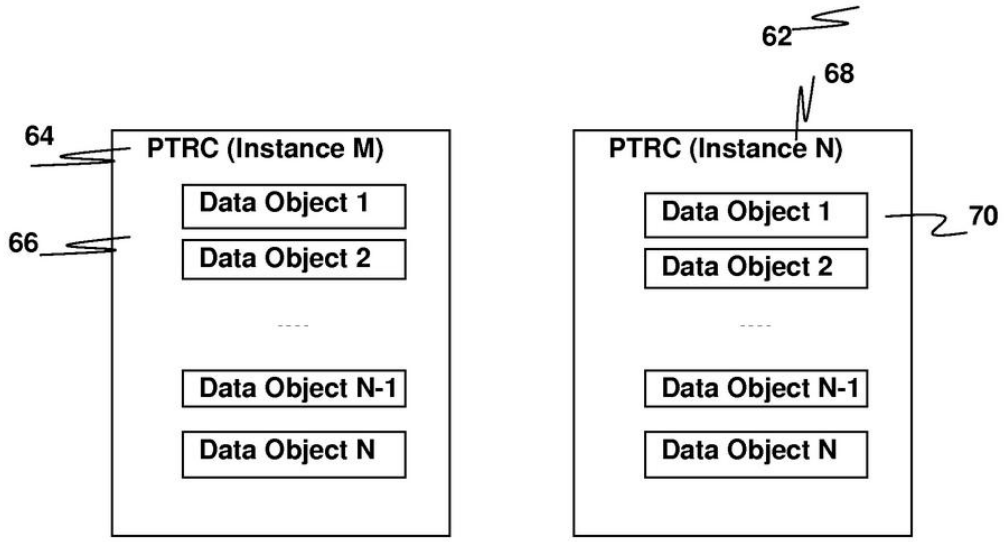

Figure 1 Operation model of the power grid system

2.4 Organizational Structure

According to the analysis of the system operation and maintenance organization structure, the work of the operation and maintenance service department is divided into two aspects, one refers to operation and maintenance, and the other refers to service response. In the process of centralized monitoring and customer ringing, the department staff should centrally monitor the operation of the intelligent substation system, provide pre-sales technical support and after-sales service response; In the network maintenance center, department employees should provide basic services such as operation and maintenance management, resource management and scheduling, power system, power coal, IP network management, etc. In the IT maintenance center, the staff of the department should do a good job in IT system operation and network information security protection to ensure the normal operation and production of the base data center and IT system, and ultimately provide users with efficient and stable security services.The specific structure is shown in Figure 2 below:

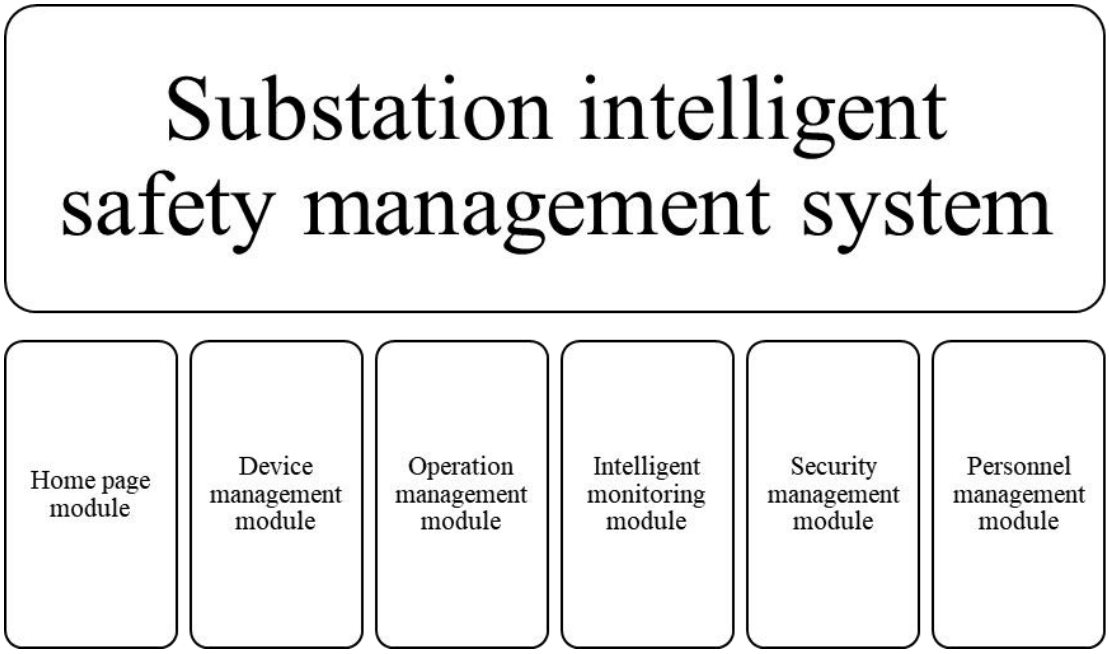

Figure 2 The module structure diagram of the backbone system

In the construction of intelligent substation operation and maintenance integrated management system, it is necessary to ensure the integration of internal resource management. In the process of unified resource management, it is necessary to scientifically improve the efficiency of resource use. On the basis of establishing resource management system and paying attention to data assessment, a large number of intelligent substation resource data and information are collected, and effective scheduling is carried out according to practical requirements. Finally control operating costs.

3. Result analysis

As the inevitable trend of the future construction and development of power grid system, intelligent substation how to realize the integration of operation and maintenance is the core issue of power grid industry. On the one hand, the rewards and punishments system of intelligent substation operation and maintenance management is clearly defined, internal employees are regularly organized to participate in skills training activities, and material or spiritual rewards are provided for employees with strong working ability and high quality, which can not only ensure the orderly progress of operation and maintenance integration, but also fully mobilize the enthusiasm of employees in all departments. On the other hand, intelligent substation as a more complex structure of the system structure, which includes transmission lines, substation equipment, electrical equipment three parts. By making full use of geographic information platform for resource integration, improving the accuracy of deployment work, using new equipment and new technology to update computer data information, information management can avoid blind spots, and truly understand the change of power units within the control range. In the rapid development of the socialist market economy, China's power grid operation and maintenance development is still in the initial stage, in order to give full play to the application role of intelligent substation operation and maintenance integration system, relevant managers should put forward detailed testing and operating processes according to the work of the power grid department, and carefully inspect the working status of the electronic maintenance system. A large number of excellent smart grid

maintenance technology experts have been hired to propose effective solutions to specific problems.[13-15]

Conclusion

In summary, under the background of rapid economic and technological development, based on the traditional power grid division of labor mode, the integrated work mode of intelligent substation operation and maintenance is proposed, which can not only improve time work efficiency, but also reduce unnecessary energy consumption. Therefore, the future power grid system should, on the basis of clear operation and maintenance integration construction principles, regard safety and high quality standards as development goals, and build an intelligent substation operation and maintenance integration system in line with the development of The Times after following the development requirements of social economy and science and technology, organically combine supervision and management. This solves the problems existing in the operation of traditional substation system.

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