

Review on the Command Platform of Production and Rush-Repairs for Distribution Network

Honghao Wang, Jing Zhou, Wenbin Zhang, Xinhe Chen, Chao Zhang

State Grid Electric Power Research Institute, Beijing, China
Email: wanghonghao@sgeprissgcc.com.cn, zhoujing_0419@126.com

Received September, 2012

ABSTRACT

The command platform of production and rush-repairs for distribution Network is a supporting platform, based on information technology, for the business applications of the command center. This article briefly described the basic functions and structural features of the platform, and discussed in detail the integration of business information, the contents and solutions needed to be focused on during inter-system data exchange, and the implementation techniques of the command platform. The benefits of the platform in the improvement of the distribution network production and rush-repairs are finally summed up. The entire above are provided as references.

Keywords: Production and Rush-Repairs; Information Integration; Service-Oriented; Severity

1. Introduction

The key business of the distribution network production is distribution network assets operation and maintenance which include equipment management, defect management, patrol inspection, fault repair, field operation, and instruments management, involving other related business such as outage management, power management, and etc.

With continuous investment in information construction of power grid company, support has been realized from information for most production and management business in recent years, e.g., PMS realized the equipment management, defect management, patrol management, and etc. In the fundamental platform construction, electric power companies have mostly constructed GIS system and dispatching automation system. Distribution network automation has been under construction during the past two years. However, information support is relatively weak for production and fault repair business.

The following problems still exist in current power company:

1) Lacking of unified technique for production command: production and management personnel cannot timely master and check production operation situation. Operation crew cannot effectively master and check equipment information, real time information, and operation related information of distribution network.

2) Operation field is not connected to PMS, DMS, and the like system information: PMS realizes all-life cycle management and related patrol repair and other produc-

tion business for distribution network equipment, but it cannot share information with field production operation. Even though mobile operation technology is adopted, mainly off-line, real-time interaction cannot be realized to support operation field.

2. Propose of the Command Platform of Production and Rush-Repairs for Distribution Network

In 2011, State Grid issued distribution 156 document^[1], where standardized rush-repair for distribution network is put forward: aggressively develop distribution network production standardization management, distribution network state management, online operation, standardized rush-repair operation and the like system construction; strengthen management of the entire process of the distribution network production; comprehensively improve the work quality of the distribution network operation, maintenance, repair and technical reform; form systematic and organizational guarantee for the improvement of the supply reliability and service quality.

With the progression of standardization, distribution network command organization has a larger and larger demand on information acquisition, integrated command, and unified resources dispatch. In 2012, state grid production technology department promulgated the construction of practical and efficient distribution production and rush-repairs command platform^[2] so as to improve the function of the information communication bus, strengthen resources integration of the geographic infor-

Distribution network production and rush-repairs command platform realizes information communication with marketing systems, 95598, distribution automation, usage information acquisition, PMS, GIS and other related systems through information communication bus which is in the accordance with distribution automation information communication standard. Production and rush-repairs command are core applications, and information integration application is realized.

1) Integration with GIS

Distribution network production and rush-repairs command platform receives diagram and module data through the GIS system interface. Distribution network topology information and map information is visualized in the command platform. And network topology simulation analysis is realized by GIS topology information. Data interactive method is request response.

2) Integration with PMS

Distribution network production and rush-repairs command platform receives outage plan, work ticket, scheduling command ticket, equipment defect, account information, and other information from PMS interface. Interactive method is request response. And the command platform will feed the fault, fault treatment, and other related information back to the PMS system. Interactive method is PMS push. In addition, the platform also has access to PMS interface for distribution network on-line monitoring information, such as distribution network equipment online temperature, sub-section post environment, and SF6 gas concentration.

3) Integration with distribution automation system

Distribution automation system pushes switch position information, fault and its treatment information to distribution network production and rush-repair command platform through the information communication bus. The command platform obtains switch state section on demand. Data interactive method is active push by distribution automation.

4) Integration with dispatching automation system

Distribution network production and rush-repairs command platform receives main network real-time information from dispatching automation system interface. Dispatching automation system releases the following information through the bus: switch deflection information (real-time), fault information (real-time), and real-time information section (fixed cycle, such as 30 minutes). Data interactive method is active push by dispatching automation system.

5) Integration with marketing system

Marketing system (CIS) provides equipment account inquiry service, customer file inquiry service, important customer information, and etc. for distribution network production and rush-repair command platform. Interactive method is request response.

6) Integration with 95598 systems

Distribution network production and rush-repair command platform receives real-time distribution system fault repair work order form 95598 system, and feeds repair process information back to the 95598 system. Interactive method is active push by 95598 system. 95598 systems also provides power failure inquiry service and release of power failure analysis results.

7) Integration with electric energy data acquisition system

Electric energy data acquisition system actively finds out abnormal distribution network power supply, real-time analyzes fault location together with PMS and GIS platforms, pushes fault location information to the command platform, assists repair commander determine whether it is distribution fault or not, precisely locates fault range, and provides service support for 95598 system. Interactive method is active push.

8) Integration with vehicle management system

Vehicle management system sends vehicle location information to production and rush-repairs command platform. Interactive way is active push by vehicle management system.

9) Integration with inventory management system

Production and rush-repairs command platform receives instrument inventory information. Data interactive method is request response.

5. Implementation Techniques of the Command Platform of Production and Rush-Repairs for Distribution Network

Distribution network production and rush-repairs command platform should be built in the city-level power supply company [3], coupled integrated with related systems by data communication bus or data center. Service-oriented architecture (SOA) is adopted and service is released through the bus. Models and interactive standards comply with the IEC61970/61968-CIM and SG-CIM standards and specifications. Resources of original information systems can be made full use of. Construction costs can be reduced as well as construction period. And comprehensive benefit of information system application can be improved.

4.1. Service Oriented Architecture

Service-oriented architecture (SOA) is an emerging technology solution to enterprise application integration. It retrieves discrete business functions of enterprise application, and organizes them into an interactive, standard-based service. SOA offers a flexible and efficient system integration scheme by providing services to the enterprise. It combines and reuses modular and portable service in the composite application to meet business

needs rapidly. Service, which refers to the function of defining interface specification (including format and transmission protocol) based on the open and neutral standard, is the most important part of the SOA system. Because interface specification has no relation to the specific hardware platform, operating system, and programming language, the caller and service provider can communicate in a unified and standard way. And service acts as a link connecting various business applications, technical standards, and implementation technologies.

4.2. Data Communication Bus

Data communication bus responses for the data transmission channel across isolation, interfaces with upper application system using standard web service interface, JMS message and etc., and supports transparent data transmission among upper application systems. From the viewpoint of the network, work completed in information interaction bus basically belongs to the transport layer, and transfers, but not analyzes the data of the upper application system. When application system transfers data through the bus, interface program should be developed and data should be encapsulated and analyzed in accordance with the interface format agreed to the bus.

4.3. Information Integration Technology

Information integration is a management process, which is based on the trend of information development, and led by certain organization, to realize orderly, shared, and controllable information resources, and further information resource configuration optimization, to broaden the application fields of the information resources, and to maximize the information value. The purpose of the information integration is to realize sending the right information to the right user in the right time, in the right way, and in the distributed environment. Integration architecture is shown below.

4.4. Portal Technology

Considering the function of the production and rush-repairs command platform as a production command center, its own content need to be displayed, besides, interface information of the other systems need to be integrated in the future. Portal technology will be adopted. The interface demonstration is combined with GIS, charts, Gantt chart, instrument panel, and etc., through dynamic pages to meet the display demand of different

roles (leaders, business specialties, and etc.).

As a comprehensive platform across multiple professional fields, distribution network production and rush-repairs command platform has to combine and integrate with multiple professional systems in various levels. It will be a challenge to make full use of the information resources of the professional systems, and at the same time consider personal view of different business domain users. Interface integration will be one of the important techniques to combine the system with different professional applications.

5. Conclusions

The covered area of the distribution network production is expanded in the context of the Three-Integrated and Five-Big, and professionalization rises up the operation requirement of maintenance and repair. Technical support is lacked for the unified management of production operation. Existing information flow and interaction must be accelerated to improve the efficiency of production operation.

Distribution network production and rush-repairs command platform helps command staff grasp production operation information, including the involved people, tools, and etc. The field operation condition can be very intuitively monitored in the platform. And interaction is realized among the crew. Therefore, the platform will be one with artificial intelligence, scientific analysis, operation simplification, and application practiced production and repair management platform. And it will further strengthen distribution network production and rush-repairs command, improve distribution network repair efficiency, and continuously rise up power supply reliability and service level.

REFERENCES

- [1] "Functional Specifications of Production and Repair Command Platform for Distribution," Distribution of State Grid Production and Technology Department, 2012, p. 82.
- [2] "About Promoting the Standardized Repair Work of Distribution Network," State Grid production and technology department, 2011, p. 156.
- [3] "Notice about Issuing the Program of Acceleration Demonstration Projects for Urban Distribution Grid," State Grid Production and Technology Department, 2012, p. 148.