Power Supply Safety Management of High-risk Customers of Regional Grid

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Abstract: Flourishing of domestic electric power industry contributes to the development of various industries and fields, particularly the promotion and popularization of intelligent distribution network, meeting people’s working and living power demand. However, the continuous improvement of the scale and quantity of electric power projects increases the overall difficulty of power supply and distribution management. To be specific, not only modern control technology needs to be applied and advanced power supply & consumption equipment needs to be used, but also scientific and rational power supply & distribution scheme needs to be formulated to ensure the operation reliability of distribution network. In view of this, the paper studies the safety management of power enterprises. First of all, it sets out the defining scope of high-risk customers with the high-risk customers of regional grid acting as the study object, and then, it points out the power supply & distribution safety management problem of high-risk customers, finally, it proposes safe power supply management measures and optimization suggestions from technology, equipment, personnel and management, hoping to provide the practitioners concerned with reference.

1. Introduction.
For power supply & consumption management of power enterprises, it is necessary to formulate efficient power distribution plans based on the actual power supply demand of different regions, and prepare corresponding control measures in advance, so that to make sure emergency power faults can be eliminated at the first time, and the impact caused by power faults can be reduced. Important high-risk customers refer to the power consuming organizations that occupy an important position in social, political and economic life, and power supply interruption of them may lead to personal injury & death, great environmental pollution, great political impact, great economic loss and serious chaos of social public order. Since such customers have strict requirements for power supply & consumption quality and stability, it is required to set up a more perfect power control plan while applying traditional intelligent distribution network management mode. For this reason, this paper studies power supply & consumption management of regional high-risk customers, which is of great significance to ensure the stable operation of power enterprises.

1.1. Definition of High-risk Customers of Regional Grid
The high-risk customers of regional grid mean the important power customers within the power supply region. Power supply interruption of them will result in inestimable economic losses as well as certain degree of personal injury and environmental pollution. Therefore, a power enterprise needs to classify the customers within its power supply region scientifically. If there is any high-risk customer, it is...
necessary to prepare targeted emergency measures in advance and formulate corresponding control system based on the actual power supply condition. Important power customers can be classified into premium, Class I, Class II and temporary important customers [1].

With the deepening of the coordinated development model for power enterprises of all regions and social economy, it is required to control with the focus on the power supply & consumption of high-risk and important power customers, which is able to ensure the operation quality of the distribution networks of power enterprises and guarantee the power supply demand of important customers, meeting power supply enterprises’ demand for participation in market competition. The competition of all industries on the market is becoming fiercer and fiercer, and power enterprise is no exception. To ensure the competitive advantages on the industry market, power supply enterprises need to earn customers’ trust by providing them with stable and reliable electric power resources, so as to ensure their stable development, and they also need to know their key responsibilities. Strengthening of power supply & consumption safety management for high-risk and important customers is not only able to ensure the operation status of the distribution network, but also power enterprises’ legal liability, which is beneficial for power enterprises to build up a good social image and drive sustainable development of social economy.

2. Problems Existed in Power Supply Management of High-risk Customers of Regional Grid

2.1. Insufficient capacity of power supply facilities
The power supply & consumption management effect of current high-risk customers of regional grid is poor due to problems on equipment, personnel, management mode, etc. On one hand, it is impossible to control the operation status of the power supply & distribution network rationally; on the other hand, it is unable to meet high-risk customers’ electric energy demand. First of all, the power supply facilities are inadequate. High-risk customers have high quality requirements for power transmission and distribution lines. However, partial areas have weak grid structure and no independent dual power backup system. On this background, high-risk customers’ working state will be affected in case of power outage. Furthermore, excessively large power supply load will also lead to over-load or serious power outage, thereby causing huge economic losses of customers [2].

2.2. Low technical level of workers
Secondly, workers’ technical level is low. Due to impact from the application of power supply systems, domestic distribution network is developing towards intelligence and automation gradually. However, there are always certain impact and hazards in the coordination between electric power marketing system and distribution automation system. Lack of power utilization inspection will result in many potential safety hazards. Currently, most power supply enterprises are optimizing and renovating application technologies and equipment, which certainly will propose brand new requirements for workers’ comprehensive technical level. Partial enterprises haven’t assigned power supply & distribution management responsibilities to management personnel, which will lead to low working enthusiasm of the workers concerned. So that the problems existed in power management of high-risk customers of grid cannot be found out in time, thus certain degree of safety hazard of distribution network will occur [3].

2.3. Lack of management inspection system
A scientific and reasonable management inspection system is necessary for the power supply safety management of high-risk customers of grid and control with the focus on the operation status of intelligent distribution network. In addition, it is needed to prepare corresponding management measures based on staged power supply plan, implement inspection & maintenance in the management system, check the operation status and corresponding parameters of the power supply system, compare with the operation parameters under reasonable status for analysis, so as to find out the problems existed in the power supply system as soon as possible. On this basis, power supply
technology and power supply equipment can be matched again from management, and corresponding emergency measures can be prepared, so that the problems can be solved quickly in case of sudden power failures, and further escalation of failures can be avoided.

2.4. Strengthening of power supply & consumption management measures

To strengthen comprehensive management level, existing power supply enterprises need to start from power supply & consumption management system, staff management, emergency measures, etc. Specific contents are as follows: (1) Power supply enterprises shall establish and perfect a safety management system, perform overhaul and maintenance of power supply equipment, and rectify and upgrade weak power supply links actively. Besides, it is necessary to make sure the application technologies of specific links can meet regional power supply demand, and provide operation & maintenance personnel with work convenience. Management personnel shall keep renovating related systems; (2) Staff management shall be strengthened. It is acceptable to assign power supply & consumption management responsibilities to specific personnel and posts, so that accountability can be performed in time in case of power accidents, and the responsibility consciousness of the personnel concerned can be strengthened. Meanwhile, the system of survival of the fittest shall be promoted in the enterprise to stimulate employees’ working enthusiasm. Furthermore, employees shall be provided with a strengthening training platform to improve their comprehensive quality; (3) Comprehensive assessment for the power supply & distribution modes of current high-risk customers shall be done on a regular basis to analyze the potential failure risks in the operation of the distribution network. Last but not the least, emergency schemes for different cases shall be prepared in advance, so that the potential power supply & consumption hazards of high-risk customers can be solved as soon as possible, and economic losses of enterprises can be reduced [4].

3. Establishment of a Power Supply Safety Management System for High-risk Customers of Grid

3.1. Adhering to government leading

To strengthen power supply & consumption management quality of power enterprises, government leading shall be adhered to first. To be specific, it is required to attach importance to communication and coordination and establish a trine communication and coordination mechanism with the government and customers. Enterprises need to strengthen internal control quality based on the requirements of the government departments concerned and keep optimizing and renovating power supply technologies and equipment, so that customers’ demand for electric power resources can be satisfied. High-risk customers also need to respond to the call of the state actively and formulate effective power supply schemes together with power enterprises, making sure clear power supply safety management objectives are set up. Furthermore, technologies shall be allocated strictly as per the power supplies and self-contained emergency power supplies of important power customers. High-risk customers shall be verified and identified by government authorities. Moreover, management and operation information ledgers of high-risk customers shall be perfected constantly. In addition, the lines of all high-risk customers of regional grid shall be provided with maintenance to ensure the connection status between equipment and transmission and distribution line. Besides, the operation parameters of key lines shall be monitored in a real-time manner. Corresponding emergency measures shall be taken when the operation parameters exceed the reasonable scope, so as to realize safe and reliable power supply of high-risk customers [5].

3.2. Taking planned measures strictly

Secondly, it is necessary to take planned measures strictly, i.e., it is needed to optimize and renovate current grid structure. On one hand, it is required to provide high-risk customers with dual power supply guarantee, on the other hand, communication shall be strengthened, and great splitting operation mode shall be fully applied. In addition, the management scheme between traditional power supply and intelligent substation shall be optimized and renovated. Grid structure shall be adjusted...
based on line protection measures and high-risk customers’ power supply demand, so as to improve the action and value of relay protection devices. In the meantime, the functional configuration of the distribution network and the safety level of the grid side shall be assessed on a regular basis to find out the potential hazards during grid operation and make sure all emergency measures can be taken in place [6].

3.3. Strengthening risk warning
To strengthen the power supply safety management quality of high-risk customers of grid, it is also required to keep improving the application quality of risk warning, perfect corresponding guarantee measures, check the power supply network of high-risk customers’ areas step by step, focus on the areas with great potential risks, simulate overhaul measures and normal power supply mode, perform comprehensive evaluation of power supply & distribution mode, overhaul arrangement and accident treatment measures, and prepare refined safeguard measures from the perspective of power supply management. In the meantime, it is also necessary to strengthen the relevance between the grid side and the customer side, give out warning notice in time, inform high-risk customers to implement corresponding risk control emergency plans in a timely manner prior to power outage, so as to avoid the adverse impact on enterprises due to temporary power outage or sudden power outage. Power supply enterprises also need to assess the operation risk of the distribution network and strengthen risk warning notice based on high-risk customers’ power consumption demand, making sure the power outage risk on the customer side can be controlled.

3.4. Strengthening technical management
Power supply enterprises shall keep strengthening the operation foundation of the distribution network starting from technical management. Specific contents are as follows: (1) Working mechanisms shall be perfected, periodic inspection shall be performed centering on important customers’ safety power supply management system, accountability intensity shall be strengthened, and important power customers’ safety guarantee shall be clarified, making sure related plans and measures can be optimized, renovated and implemented; (2) Operation & maintenance management shall be strengthened, the equipment demarcation point between power supply enterprises and dedicated line customers shall be clarified, and the power supply & distribution quality of high-risk customers shall be improved on the premise of ensuring general customers’ power supply quality. (3) Overall planning shall be made for equipment, comprehensive inspection of the substation protection setting values of risk coordinated customers shall be done, customers shall be provided with corresponding management schemes based on setting value requirements, and effective coordination between customers and power supply enterprises shall be strengthened, so that any problems found out can be re-checked and adjusted in time, and power supply service of high-risk customers can be extended rationally. In this way, it is able to help customers to establish emergency plans that are in accordance with their power consumption nature.

3.5. Formulating emergency policies in advance
Finally, it is necessary to strengthen emergency control quality. To be specific, it is required to formulate corresponding emergency strategies in advance based on the power consumption status of high-risk customers of grid, stick to linkage disposal mode, remodel important high-risk customers’ emergency treatment systems, divide normal power supply from emergency treatment, apply operation parameters monitoring system, and monitor the operation parameters of high-risk customers’ power supply & distribution lines in a real-time manner, so that corresponding measures can be taken when finding out the operation parameters are beyond the reasonable scope. In the meantime, it is also needed to stick to coordinated development of government and enterprise supply & consumption, establish a power emergency rescue team, train high-risk customers to improve their safe electricity use awareness and fault protection ability, and strengthen customers’ emergency disposal ability for power outage. Furthermore, multi-party linkage shall be adhered to. In case of any power supply
4. Suggestions on Promoting Safety Management of Automatic Power Supply Mode

To ensure stable operation of the power system, the management personnel concerned shall also adjust the safety management system regularly based on automatic power supply mode. Specific optimization contents are as follows: (1) Power supply & consumption technical design shall be perfected, correct and reliable secondary wiring of local areas shall be guaranteed during system operation based on the actual power consumption demand of high-risk customers of grid, and simplification of the wiring in the switchgear shall be done to guarantee the operation status of automation technology. (2) The operation status of power equipment shall be coordinated. When installing the automation equipment of the power system, it is required to control power supply & distribution technologies and equipment parameters based on the actual power supply demand of high-risk customers of grid, making sure safety commissioning can be extended to specific links. Besides, it is also necessary to keep monitoring rated equipment voltage to make sure the equipment is in a stable working status at any time. (3) Technical management shall be standardized, i.e., it is necessary to make sure automation equipment can be upgraded and maintained in time, so as to meet the high requirements for equipment from automation technology. Based on current development trend, there is certain room for improvement for domestic grid development level. Therefore, it is required to keep strengthening power supply & consumption management quality and efficiency while optimizing the resources related to technical equipment, so that power faults can be avoided. (4) For safety management, automation technology is mainly managed by technical maintenance personnel. However, the quality of automation technology safety management personnel is commonly at a low level at present. Therefore, personnel management level shall be improved to ensure safety management of technicians. On one hand, enterprises need to strengthen technical training of management personnel, so as to make them have a deeper understanding of objective management, cost management and quality management. Meanwhile, enterprises also need to assess management personnel’s engineering expertise, so as to improve personnel’s automation management level. On the other hand, enterprises shall introduce more power talents, so as to improve the overall technical management level of enterprises and reducing fault rate of the power system, thereby realizing smoother power supply & consumption. In addition, establish a perfect safety management work process, as shown in Figure 1.
5. Conclusions
To sum up, power enterprises need to take effective management measures actively, focus on reasonable control of high-risk customers’ power consumption safety, and integrate government leading, technical management, accurate strategy implementation, emergency measures, etc. into a whole, so that the power supply safety of high-risk customers of regional grid can be guaranteed. Meanwhile, it is also required to formulate targeted solving measures based on the common problems in power supply & consumption management on the background of wide application of intelligent distribution network, so as to achieve advanced prevention and strengthen safe grid operation. This paper studies power supply & distribution safety management of power enterprises. Firstly, it elaborates the defining scope of high-risk customers, and then, it analyzes high-risk customers’ power supply & distribution safety management problem, finally, it puts forward corresponding management measures. Such measures are as follows: sticking to government leading, taking planned measures strictly, strengthening risk management & technical management and formulating emergency strategies in advance. In this way, power supply & consumption management of power enterprises can be improved comprehensively.

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