

Analysis on Safety of Live Work on 10 KV Distribution Network

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Abstract. Live work on distribution network is an effective measure to avoid interruption maintenance and ensure normal electricity services. This paper mainly describes the organizational and technical measures and safety precautions for the live work on distribution network.

Introduction

Generally, electricity distribution area contains the newly established and renovated projects in the urban area besides maintenance work.

Technical staff has been accumulating experience in practices of line operation and maintenance to improve the safety level of line operation and to update requirements of construction process. For example, in the replacement of column switch and disconnecting link on the distribution network, live interference fit technology is used in the joints to improve the reliability of distribution network.

Problems in the Types of Live Workers on Distribution Network

With the increasing live work load on distribution network year by year, the author believes that in order to meet the needs of users on line maintenance, the department should pay attention to the carryout of types of live workers on distribution network and continue to introduce technical workers. In the following part, the author lists several ideas on the types of safe live workers based on the actual situation of the department.

Dependence of Types of Live Workers on Distribution Network.

Since types of live workers in the department are scarce, the department should increase the training of workers, fix types of live workers and establish special teams of live workers. Different from the work of interruption maintenance, 10 KV live workers are also responsible for interruption maintenance work, which means they cannot get enough rest. Therefore, the greatly different work habits in the two types of work make habitual peccancy more likely to happen. The department should take measures to prevent workers from incorrect or wrong operations that may lead to great danger in live work.

Complete the Live Work Procedure.

Due to the diversified electrical equipment on the distribution network, multiple types of projects, actual work condition and safety procedure, the live work procedure for this company should be revised annually and the safety requirements should be gradually improved. The revised "Live Working Procedures" should also describe in detail the responsibilities of each live worker, needed tools, operating procedures and precautions.

Requirements on the Tools for Live Work.

Tools for live work should own good electrical insulation properties, high mechanical strength and also low moisture absorption, anti-aging and other features. In order to facilitate field operations, insulated tools should also be light in weight, easy to operate and uneasy to be damaged. A garage and storage with drying facilities should be specially built for live vehicles and live tools respectively.

Field Investigation and Operating Condition Exploration.

(1) Environmental factors. Live workers should follow strictly the field investigation regulations, be familiar with the conditions of the field and live line in advance, be clear about the parking

position and arming direction of insulated vehicles and prepare the needed materials in advance. When carrying out live work by insulated rod method on the distribution line, the human body should keep a safe distance of at least 0.4m with the electrified body. The workers should pay special attention on the complicated structure of single-rod multi-loop wire lines and positions that insulated aerial lift vehicles are difficult to pass through.

(2) Weather factors. Live work should be done under good weather where the wind speed should be under 5th level and without rain, snow, fog and thunders. If there are sudden weather changes that may endanger the safety of workers or equipment during operation, live work should be immediately stopped and recover the normal condition of equipment as soon as possible or take temporary safety measures.

Strict implementation of the Work Permit System and Operating Instructions.

In live work on the distribution network, live work permit should be filled in in accordance of the terms of the "Safety Procedures" and "Two Permit Executive Provisions of the Group" and operating instructions be designed in accordance with the "Safety Risk Identification and Prevention Handbook of Electricity Enterprises". The live work permit and operating instructions should be filled in by the person in charge and become effectively after being checked and signed by permit issuer. Each time before live work, all workers should line up at the field and the person in charge should read out the permit and operating instructions, assign work for workers and be guarding the field work throughout on the operating practices and procedures and correcting unsafe operations promptly.

Maintenance and Testing of Insulated Protective Equipment.

The currently used insulated protective equipment is restricted to insulation jacket, insulation gloves and insulation boots. Made of rubber, insulation gloves are vulnerable to grinding and thorns and likely to be punctured by sharp objects. Therefore, another anti-wear glove should be worn outside the insulation glove to increase its life expend. In addition, if safety protective equipment is not tested in time, the currently used live work tools and instruments are easy to be found safe when the safety tests are done every 6 months according safety test provisions, which is too long a cycle. Damages in daily use may endanger the safety of live workers. As some experts recommend, the test cycle should be shortened, test voltage should be reduced, and the equipment should be managed by specific personnel and placed in certain places. Besides, each time before live work, the workers should check on whether there is any leak in the insulation gloves by blowing method, observe whether there is any pinholes and cracks, etc. on the insulation jacket and the surface of insulation gloves, and if there is any, they should be abandoned and replaced immediately to prevent accidents caused by continuing using them in operation.

Strengthen Personnel Training and Licensing System.

Live workers on the distribution network should be healthy and without harmful physical or mental obstacles, have a good knowledge of the basic principles and operating method of live work on the distribution network and are familiar with the applicable range of operating tools. The workers should pass tests and get the license to work after being trained. The workers should also be familiar with "Safety Procedures" and "Technical Guidelines for Live Work on the Distribution Network" and are capable of provide first aid when there is an emergency or electric shock. Therefore, the working team should arrange regular theory and practice training for live workers to improve their working capability and efficiency of the team.

Dangers Likely to be Overlooked in Live Work on Distribution Network.

(1) Reclosing shutdown. Since the neutral point of distribution line is a non-effectively grounded system, interphase short circuits may occur during operation. Therefore, the person in charge should communicate with the scheduling attendant before live work to shut down the reclosing of all working line and fulfill the licensing procedures.

(2) Existence of capacitive current. In the operation of switching the by-pass jumper, the capacitive current between main line and by-pass jumper increases with the length of switching line. When the line length reaches certain value, capacitive current is likely to occur between the main line and by-pass jumper. The impact of the electric arc includes three aspects: insufficient estimate

of the workers on capacitive current causes psychological panic that leads to a second accident; the electric arc may penetrate or burn down insulation gloves to cause damages.

(3) Live workers should pay attention to the safe distance during operation. The live conductors and insulators, etc. should be isolated with a quarantine distance. The distance range between the insulated rotations should be at least 0.4m more than the activity range of workers; safe distance between workers and grounded objects should be no less than 0.4m; the minimum safe distance should be not less than 0.6m.

(4) Safety awareness of live workers. Live workers should strengthen their self-protection awareness, such as enough rest, mental adjustment, and wearing and appearance inspection of insulation protective clothing before live work and inhibition of taking off insulation protective equipment.

The above several measures only summarize parts of the safety risks in live work on distribution network, and workers should do field investigation carefully according to the actual condition and make appropriate preventive measures to ensure the sound and safe development of live work on distribution network.

Precautions of Personnel Quality of Live Workers on Distribution Network

Technical Training. Live work demands high technical profession and quality of technology. In order to speed up trainings of technical talents and adapt to the demands of modern electricity service enterprises on professional technical talents, the enterprise should complete theory training, strengthen vocational training and improve job training standards and evaluation system to lay a solid foundation for enterprise development by providing technical personnel career development paths, lifting their skills, optimizing the personnel structure and continuously improve the personnel quality.

The enterprise should optimize integrated education and intensive management of training and educational resources, promote unified effective planning, standardizing and graded responsibility principle of quality training resources sharing, intensify management of resources, put more efforts to increase educational content and training plan, complete them while developing training base and materials and network, do training base construction plan to fulfill the objective of training center as the base and multiple skill training as the content, and thus achieve a complementary training base network with an orderly division of labor and a resources sharing system.

The enterprise should carry out skill and technical competition to improve the professional knowledge and technical level rapidly. The inner “competition” between the employees enables them to accumulate knowledge in competition and improve technical capacity, providing adequate support the rapid development of field construction and safety work.

Conclusion

In conclusion, the enterprise should take the following measures on the safety protection of live work on 10 KV distribution network: strengthen the management of live work safety, which needs firstly arranging enough technical trainings for live workers to improve their technical level and familiarity and accuracy of operation and theoretical knowledge; implement strictly the live work procedures and make them the standard and operating procedures for live workers; enhance technical management and communication, improve equipment performance, improve tools and operating method and improve technical capacity.

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