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### QC systems to ensure stable power supply at multiple stages

#### < Introduction >

In order for transmission system operators (TSOs) to earn the trust of customers, it is necessary to ensure a stable power supply of electricity and to restore electric power system quickly in the events of failure. For such achievements some Japanese TSOs are reducing the risk of manufacturing stage and construction stage by establishing a certification system for purchased products and cable jointers.

In operation stage, TSOs carry out advanced preventive maintenance with the preparation maintenance manuals. In addition, some Japanese TSOs secure spare materials and regularly execute recovery trainings to solve sudden failure of underground transmission lines.

The author will show the quality certification systems for purchased products and appointment of cable jointers, and the efforts for early recovery by Some Japanese TSOs.

#### < Quality Assurance of Purchased Products >

Some Japanese TSOs have introduced a type approval system to ensure the quality of purchased products such as cables and joints. This is a system in which the performance of products with high equipment importance and versatility are inspected based on standards in advance in terms of design, production method and test results by specialized department, and only these products are basically purchased and used as regular items. Since type approved products are manufactured with the already approved specifications and production/construction method, it is possible to omit some quality inspection items for these products, which enables quick product arrangement and cost reduction. When the specifications or constituent materials of a type approved product are changed, the product is reappraised as a type approved product after the quality inspection according to the changed contents.

#### < Quality Assurance of Cable Jointing Work >

The cable jointing work of underground transmission lines is an important quality control matter to prevent construction failure, because joints are assembled in the field under various environments and the assembling quality depends on the skill of the jointers. At some Japanese TSOs, workers at not from cable manufacturers but subsidiary of TSOs or local construction companies, carry out the cable jointing work for 77 kV or less to deal with the large amount of construction work. In order to have high skill jointers carry out the cable jointing work, a certification system for jointers has been established. To be certified, subsidiary's and local construction company's jointers need to be trained by the manufacturer's engineers and have to pass assembly and electrical tests.

#### < Efforts for Early Recovery >

When a fault occurs in underground transmission lines, it generally takes more time to find the fault location than in overhead lines. In order to quickly identify fault locations, some Japanese TSOs have fault location devices at all maintenance offices and regularly train their maintenance staff to identify fault location. In addition, cables and joints necessary for recovery from failure are stored in TSOs warehouse, and ready to be dispatched at any time by subsidiary's repair team in the event of failure. The team can install cables and assemble joints at 77 kV or less. The flow from the occurrence of failure to recovery is made into a manual, and the spare materials and the initial response method are arranged for each underground transmission line.

In addition, with the aim of building a system that enables recovery even faster, some Japanese TSOs are working to train their own employees to make them have advanced skills of identifying failure location and jointing skills at 77 kV or less.

#### < Conclusion >

As described above, the quality of underground transmission lines are secured by the fact that the workers certificated for the quality of cable jointing skill assemble the type approved joints.

Also, in the event of failure, early recovery is realized by the through preparation such as fault location devices, spare materials and skillful jointers.