



Power Stability Expert

| Case Study |

Substation Retrofit and Updating for TANESCO

Improve reliability of Tanzania national backbone power grid



Overview

Before 2016, the Tanzania's domestic transmission backbone network forced with stability problems that caused by aged equipment and low degree of substation automation, leading to potential risks on the national energy system. On the other hand, it also brought negative influences on people's daily life quality and the development of national economy.

In order to improve reliability and stability of the Tanzania national backbone transmission network, the Tanzania Electric Supply Company Ltd. (TANESCO) decided to upgrade and expand the four old 220kV substations include 220kV SINGIDA substation, SHINYANGA substation, IRINGA substation and DODOMA substation. In this project, NR undertook the retrofit and upgrading of the Integrated Secondary Systems(ISS) of four substations. The scope of work includes secondary devices supply, debugging and setting, secondary system updating and integration.

Customer Needs

To improve reliability and stability of the national backbone transmission network, the TANESCO needs to,

- Replace aged devices with microprocessor-based protection and control devices
- Install the substation automatic control system
- Expand and enhance the entire power grid capacity

NR Solution

In Tanzania substations retrofit project, NR is responsible for secondary system design, site construction guidance, substation automation system installation, the secondary systems commissioning, training etc.

Working Schedule

2014.7-2015.1

Considering the conditions of old substations, NR took six months to study on the existing problems, carefully check retrofit scope, and finally proposed effective retrofit scheme and plan.

2015.1-2015.6

From January 2015 to June 2015, NR has completed the overall design of secondary system and specific implementation plan. Aging cables, lack of secondary signals, and the complexity of whole secondary system are the main challenges for the retrofit. However, NR's design team overcame all these difficulties and challenges, finished all design tasks successfully in time.

2015.7-2015.12

The external construction team has completed inside and outside cable laying for the four substations. Meanwhile, NR has finished FAT tests, and all devices were shipped to site.

2016.1 to 2016.8

The upgrading and commissioning of the four substations are completed in August 2016. In this retrofit project, a lot of time was spent on replacing large amount of messy wiring and cabling in the field which have brought much inconvenience to site construction. To guarantee the quality and progressing of construction, NR has dispatched technical experts and experienced design engineers to site to guide and manage field construction.



Figure 1. Before Retrofit



Figure 2. After Retrofit

NR's secondary system solution for TANESCO substation retrofit project is based on the latest IEC61850 standard protocol. NR's retrofit work scope includes,

- Replacing 220kV single busbar configuration by double busbar configuration
- Supply and commissioning of secondary system devices(covering line protection, reactor protection, busbar protection,ect.) for the extended bays
- Upgrading of substation busbar differential protection(including changing busbar operation mode and busbar differential device)
- Upgrading of substation automation system (based on IEC61850). All 220/132/33kV system equipment is monitored by NR's substation automation system, such as relays, RTU, meters, UPS, etc.



- Interface design and reconstruction of the old system (including some cables)
- Setting calculation and reports
- Factory acceptance test, factory training and on-site training.
- Supply of accessories, such as UPS, operation desk, optic-fibers, cables, etc.



Figure 3. Site Work

Customer Benefits

In two years' time, NR has successfully completed the retrofit task for Tanzania four substations. All the work has passed the acceptance inspection conducted by the main contractor and TANESCO. Till November 2016, 70% of equipment had been put into service and operating well so far. The retrofit of aging substation has brought considerable economic benefits and cost savings for TANESCO.

- The latest substation automation system is operating based on IEC61850 communication protocol, which has improved the compatibility and expandability of the secondary system. The upgraded automation system supports standard communication with IEDs from multiple manufacturers.

The application of high performance protection and control device has enhanced the reliability and stability of the whole system.

- From manual operation to intelligent monitoring and operation, the upgraded automation system has improved the operation efficiency and saved labor cost and maintenance cost.

The retrofit and upgrading of four substations significantly enhanced the reliability and stability of the backbone of Tanzania national

- power grid. It has made great contributions to steady growth of the national economy and people's life quality.

