Substation upgrading and refurbishment project

by Rui Marques, Roshqott

Mogale City local municipality (MCLM) has awarded a R100-million project comprising of the complete rehabilitation of 25 existing 33 kV and the construction of 13 new 33 kV feeders as well as grid reinforcement at the Condale main intake substation in Mogale City to a local company.

Condale substation forms the backbone of Mogale’s city electrical reticulation ring network feeding the city’s commercial, residential and industrial networks. The substation was officially opened in 1960 and is 53 years old. Having reached the end of its designed life cycle it placed at risk the city’s ability to supply secure, reliable and safe energy to its industrial and residential consumers.

The city’s ability to supply secure, reliable and safe energy to its industrial residential consumers is of paramount importance. For this reason the main intake substation is of strategic importance to Mogale City, which has ambitious plans to regenerate Krugersdorp’s business facilities, recreational spaces and living areas, following rapid residential, commercial and industrial growth over the last two decades, the rehabilitation and increased capacity of Condale is of utmost importance.

Scope of the project
To supply, deliver, install, erect and commission equipment for the upgrading and refurbishment of the Condale / Teddy Neil substations.

The project is one of the most, engineering challenging and technically complex large scale electrical project ever undertaken by a municipality in recent times, where it is required to undertake a major upgrade whilst maintaining uninterrupted supplies. The project was awarded to Royal HaskoningDHV as the lead consultants and to Roshqott as the main contractor.

The client’s engineering team is led by Mpako Dennis Mokotedi, the executive manager for infrastructure and Frik Erasmus, the manager for energy services. The Condale project is one of the many electrical infrastructure development projects being implemented by MCLM. Current projects under planning include further reinforcement and upgrading of substations, electrification of rural areas and transmission lines. The total published capital budget stretching to 2014/5 for electrification projects is approximately R240-million.

Importance of the project
Energy is of growing economic importance if South Africa is to meet required economic growth targets for economic growth and social transformation.

The project’s specific social, economic and skills development aims have already produced benefits in the form of:

- More than R7-million spend has benefitted the local economy.
- 125 temporary jobs within the local community have been created and more than 15 people have received training in various civil and electrical trades.
- Aged networks will be replaced with more reliable switching, control and protection equipment based on the latest technology ensuring a reliable, secure and safe network.
- New equipment, grid reinforcement and planned capacity will caters for foreseeable system growth for the next 20 years.

Current project situation
The project began in November 2012 and is nearing completion of phase one. This includes the completion of the 13 new 33 kV bays and the new control building that will house the new 54 panel 6.6 kV double busbar switchgear, one of the largest switchgear boards manufactured by ACTOM.
The building is complete with busbar trunking and fire walls.

The project is divided into four phases and will entail detailed load planning and moving of loads so that the 25 existing 33 kV bays can be refurbished without causing unnecessary outages.

The project construction period is planned over a thirty month period in line with MCLM’s capacity and new grid reinforcement requirements.

All of the MV equipment has been factory tested and delivered to site in preparation for the start of phase two early in 2014.

The bulk of the MV and protection equipment was procured from local OEM ACTOM, ensuring maximum local content and value add. The placement of local orders also necessitated a joint development initiative with the supplier to develop, and type-test locally, 33 kV, 3 kA current transformers and isolators. This initiative was supported by Mogale City technical staff.

The 33 kV outdoor substation is unique in that no flexible conductors were permitted between equipment. This requirement presented some unique challenges, which were overcome by Roshqott’s engineering department and its tube bending supplier Delberg Engineering. In excess of 6 km of 120 mm, 100 mm and 80 mm electrical grade aluminium tube will be used in this substation.

MCLM has installed four ripple control units that will be used to switch off local geysers during peak load times. This is achieved via frequency injection onto the 6,6 kV network. The order for load management equipment supply was awarded to a local supplier, Farad Engineering. Four capacitor banks will also be installed to ensure that MCLM will be operating at the most cost effective power factor.

Civil and building works have been constructed and project managed by Roshqott’s own civil/building technical and production teams. The new switchgear and control building which will house the new MV switchgear comprising 54 new DB 6,6 kV switchgear panels, protection control panels and PFC and ripple control equipment, measures approximately 800 m².

Equipment maintenance during the warranty period and subsequent years will be performed by Roshqott’s own switchgear and transformer maintenance division.

Despite the project’s unique design features and equipment supply concepts, the contract’s programme is on track and should be completed early 2015.

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