

BEN-HAY A HVDC Tower Replacement Project

Project: BEN-HAY A HVDC Tower Replacement Project

Client: Transpower NZ Ltd

Location: Mid/Upper South Island

Contract value: \$8,000,000

DESCRIPTION

As part of Transpower's strategy to increase the capacity of the inter-island 350kV high voltage direct current (HVDC) link, Electrix was engaged to undertake the replacement of transmission towers on the Benmore-Haywards A transmission line in a variety of locations between South/Mid/North Canterbury-Marlborough. The new towers are physically stronger and higher, thus increasing ground clearance of conductors, which both rectified existing ground clearance violations and allows the future operation of this asset at higher ratings.

SCOPE

Work commenced August 2011 and continued until December 2012. Due to the operational criticality of this asset to the NZ electricity grid, the majority of the 89 towers earmarked for replacement were to be replaced using live-line techniques with both Poles 1 and 2 in service and energised to 350kV. Detailed methodologies, procedures, project specific quality systems and crane lift plans were established prior to de-energised trialling of live-line conductor transfers and tower replacement within the corridor between the displaced conductors, upon completion of which procedures were reviewed and finalised prior to commencement of site works.

Separate crews were established to assemble towers (assembly crew), displace conductors live line onto guyed temporary poles (live line crew), and remove existing/erect new towers (tower erection crew). The live line crew would then revisit the site to replace conductors onto the new tower, and the assembly crew would dismantle and arrange for the disposal of the redundant tower steel. Each crew worked independently of the others, with all work carefully coordinated to ensure maximum efficiency and continuity of work. In a further evolution of this procedure, a 2-crane version was developed, which was used when only one temporary pole could be erected due to physical constraints on site, with a second crane displacing and supporting the second live conductor while the tower was replaced. The site work presented a logistical challenge with approx 100T of equipment required at each site, comprising minimum of 80 tonnes of concrete blocks, plus approximately 20 tonnes of temporary poles and associated accessories required to be delivered, positioned, secured and assembled prior to the arrival of the live-line crew to displace conductors. Additionally tower assembly areas, and access for crane trucks, 80 tonne rough terrain cranes (for conductor transfers and tower replacement) and construction team vehicles had to be carefully managed to ensure compliance with landowner access protocols.

This project was the catalyst for the development of New Zealand's first insulated boom for live-line transmission work, which was constructed and tested in time for its inaugural deployment in November 2011. This boom and associated man-bucket was used for the first time in New Zealand's history to access the in-service transmission line conductors to disconnect from the existing tower, and clamp into the new tower using bare-hand transmission live-line techniques.

During a number of planned bi-pole outages, Electrix assembled up to 4 separate crews, who between them completed the de-energised replacement of 38 towers. For each tower, the conductors and earthwire had to be lowered to the ground, the tower then removed, and the new tower erected in preassembled sections,



before conductors and earthwire could be reinstated. Redundant towers were disassembled for disposal by the separate tower assembly crew, and the sites reinstated.

Value to Client

With both HVDC “poles” out of service the need for temporary poles and associated concrete blocks and guy accessories was negated, resulting in a large monetary savings to the client.

Nearly 90 different staff from six organisations throughout New Zealand were rotated through the project over the 18 month project duration, and approximately 60,000 man-hours were expended. High safety and quality standard met are testament to the careful planning and execution of the works, and the commitment of all staff involved to the project’s quality and safety goals.