

Good progress has been made with the second year's tests, the power-house, the Mangaore-Bunnythorpe, Bunnythorpe-Wanganui, Bunnythorpe-Woodville, Woodville-Mangamaire-Masterton, and Woodville-Dannevirke sections being completed, and Mangaore-Khandallah section completed except for about seven miles of line. A start has also been made on Dannevirke-Waipukurau section.

The work of replacing defective units has also been commenced, and is being carried out as opportunity offers.

Generally, the transmission-lines have operated exceedingly well during the past year, few troubles due to the lines themselves having been experienced.

All lines have now been brought up to standard with regard to jumpers, weights, clearances, &c., except for about five miles north of the power-house on the Bunnythorpe line, which still needed revised weights.

A large proportion of the interruptions to supply have had their origin in troubles on Power Board feeders. Due to the short time delay on relays at remote substations, necessary to provide discrimination to the relays on different sections of the Bunnythorpe east line, a fault on a Power Board feeder—say, Hawke's Bay Power Board—has often produced enough short-circuit current to bring out oil circuit-breakers on other parts of the system as far back as Dannevirke, Woodville, Bunnythorpe, or even the power-house. Further investigations are now being made to try and overcome this difficulty.

Earth-leakage relays have now been set up at the power-house with a time delay of 1·8 seconds, with a time difference of 0·4 seconds between relays at consecutive substations.

Sap-testing has now been completed on the poles of the whole system, and a few poles have been replaced on the Bunnythorpe-Wanganui and Waipukurau-Napier sections. Generally, poles have proved to be quite up to standard, but there are a few which will require to be replaced or strengthened owing to a proportion of sap being found much larger than allowed for in designing the lines.

As lightning is one of the worst factors that is met with on transmission systems, a check is being kept on all such storms in the area traversed by the Mangahao lines. A total of fifteen lightning-storms was reported during the year, but only one very severe storm caused trouble on the system. Fuses were blown on the lightning-arresters at Wanganui, Bunnythorpe, Mangamaire, and Masterton, the worst of the storm centring round Bunnythorpe and Mangamaire.

Substations.

The apparatus at the various substations operated very satisfactorily throughout the year. The main 11,000-volt oil-switch at Masterton Substation gave trouble, so a new oil-tank, 1½ in. deeper than the original, was made and fitted, and no further trouble has been experienced.

A large amount of work has been done at all substations, levelling and draining the grounds.

All metering-apparatus has been checked up during the year.

Two rotating insulators on air-break switches at Mangamaire and one at Dannevirke failed during the year and were replaced. The insulators that have failed have all been of the hollow type, and new insulators of the solid type have been ordered as spares.

New metering equipment has been ordered for Khandallah, Bunnythorpe, Mangamaire, Dannevirke, and Waipukurau Substations. This has now mostly come to hand and is in process of being installed.

Spare transformers (1,000 kv.a. three-phase) ordered for Dannevirke and Mangamaire Substations, have now arrived.

GENERAL.

Due to the Waikaremoana scheme being due for operation shortly, new remote-controlled oil circuit-breakers have been ordered for Napier, Waipukurau, Dannevirke, and Bunnythorpe Substations, with necessary isolating switches and steel framework.

Also due to the Waikaremoana scheme being expected to come into operation before the end of the year, synchronous condensers are being erected at Khandallah, Mangamaire, Dannevirke, and Napier to obtain proper voltage-regulation when both schemes are in parallel operation.

With the whole system of transmission-lines and substations in operation throughout the year, the operation of the system has been very satisfactory. The oil circuit-breakers have reduced the time of interruptions to a very marked extent, owing to the ease with which sections can now be cut out and in, also owing to the automatic cutting-out of troublesome sections by means of the O.C.B. relays.

The buzz-stick method of testing insulators on live lines has been persevered with, and the second series of tests over the whole of the live insulators is well under way.

This system is fortunate in its linemen, for, in selecting men for training in live-line testing, only two were found who, owing to very slight deafness, could not be trained. This work demands a rather keen sense of hearing as well as a natural inclination, and not every man can be suitable.

With these exceptions, every lineman on the system has been trained in this work, which enables the testing to be done with much less disorganization of the ordinary routine than was the case last year, the men going out testing on suitable days on their own sections of line and carrying on their ordinary duties when the weather was unsuitable for testing.

The results so far this year confirm the results obtained last year, except that one make of insulator has proved much better this year than last. One make shows deterioration much above the average, as was also the case last year.

Generally the insulation of the lines proves to be of a very high standard, and no trouble has been experienced due to failure of insulators since the inception of the scheme.