

The Waimakariri possibilities have been investigated by the Christchurch City Council, and, comparing these results with the results of investigations made by the Department on other sources, it would appear that the capital cost to deliver power on to the main trunk transmission-line would be greater than in the case of the Waitaki sources. The point of supply on to the main transmission-line would be somewhat nearer the centre of gravity of the prospective load in from six to ten years hence, but it is extremely likely that, as further loads in excess of Waipori develop in Otago, and as South Canterbury and Otago Central go ahead, the load-centre will progressively move south. It does not appear that any advantages that Waimakariri may possess in this particular outweigh the disadvantages it has from the point of view of capital cost or location on the general main trunk transmission system.

Security from interruption is now reasonably secured to the Christchurch load by means of the favourable location of Lake Coleridge, and it would appear that to secure additional security to the whole system the next source of supply should feed in at some very different point than does Coleridge. This station now feeds in at the northern end of the existing main trunk line, and it would appear that the maximum security to the whole system would be secured by another station feeding in at the present southern end or from some source in the Waitaki basin.

As regards the possibility of extension to meet future growth, there is no doubt that the sources on the Waitaki are much the more favourably situated. The regulation of additional water to increase the capacity of any initial development in the lower gorges can be much more effectively carried out by damming the outlets of the existing lakes than by building large dams in the upper portions of the Waimakariri or Rakaia. The ultimate capacity is also much greater in the Waitaki basin than in either of the other two.

Taking all points into consideration, there is no difficulty in recommending that the next main hydro-electric development for the South Island should be on the Waitaki. To enable the best source to be selected, surveys have been going on for the past two years, and have included alternative sources at the outlets of Lake Tekapo, Lake Pukaki, Lake Ohau, the gorge at the Ohau Bridge, on the Ahuriri, and at various sites on the lower gorges of the Waitaki between the Ahuriri junction and Kurow.

Reports on various schemes at Lake Tekapo were prepared by Mr. J. O. Boving for the Tekapo League, but all of these proposals, whilst no doubt suitable enough for purely local consideration, are too small for consideration as part of a general system of supply. Plans of a larger scheme at Tekapo have been prepared, but it does not compare favourably as an initial development with other alternatives on the lower gorge of the Waitaki above Kurow. A station at a dam on the river above Kurow would be possible of progressive extension to much larger size than would one at Tekapo. The cost per horse-power developed and delivered on to the main transmission-line would also be considerably lower on the Waitaki, and the transmission-lines, though slightly farther from Timaru, would be over much easier country and freer from snow than would one from Tekapo. It would also be much nearer to connect with our southern feed-point at Oamaru and for extension into Otago.

The question of further development on the Rakaia has been considered, but as any station developed here would feed into the main line at Hororata, as from Coleridge, they would have much the same objection as has the Waimakariri. As further power may be required at a still later date, the potential value of development of the Wilberforce diversion to Lake Coleridge, and of possible dam-sites near the Gorge Bridge, should be carefully examined as alternatives to the Waimakariri.

The scheme of development which at present appears the most favourable is to build a dam raising the level about 70 ft. at a point on the Waitaki about four miles above Kurow Railway-station. The works would consist almost entirely in the dam across the river. The power-house would be built into one end of this structure, and the balance, about 1,360 ft. long, used as overflow to discharge surplus and flood waters. Of the total length of about 1,700 ft. of dam, only about 500 ft. would be in the actual river-channel; the balance would be about 40 ft. in height and built in the dry on the banks.

The Waitaki River has decided advantages over the Waimakariri when the question of dams has to be considered. In the first place, on account of the large amount of lake area in the drainage basin, the flood flow as compared with ordinary mean flow is very considerably reduced. For the same reason the amount of shingle travelling in the stream and tending gradually to reduce storage values is very much less in the case of the Waimakariri or the Rakaia. As the minimum flow in the river is about three times the minimum flow in the Waimakariri, the same height of dam affords at least three times the amount of power. The long crest of dam available for overflow reduces very considerably the depth of water flowing over the dam in times of flood, and so reduces the possibility of erosion and damage behind the dam.

It is estimated that a complete development at this point to a capacity of 30,000 kw. and including transmission-lines to link up with the main line, one at Oamaru and one at Timaru, would cost about £1,200,000. In the initial development this might be reduced to £1,000,000 by omission of one unit and one transmission-line. By building subsequent low control dams at the outlet of each of the lakes the capacity of this one station could be brought up to 75,000 kw. on a 50-per-cent.-load-factor basis. Further power both above and below this station can be developed on the Waitaki River, and at the different lakes if necessary at a later date, without in any way interfering with the output from this station.

To develop the station indicated above to the 30,000 kw. stage would take about three years from the date construction is commenced.

It will be remembered that when the Coleridge duplication works (completed last year) were designed, provision was made for the installation of a third unit of 7,500 kw. in the station. This