

## SOUTH ISLAND SCHEMES.

No comprehensive scheme has previously been drawn up for the South Island, and it has not been possible yet to bring the investigations to the stage of a final decision as to the sources of power, but sufficient information has been obtained to enable the general outlines of such a scheme to be laid down for the Canterbury, Otago, and Southland portions of the Island. It will consist ultimately of a completely interconnected transmission-system generally on the same lines as the North Island scheme, and supplied with power from four or five main power-houses and two or three subsidiary sources.

The population of the South Island according to the 1916 census was 448,377, and the amount of power required on the same basis as adopted for the North Island—viz., one to five—is 90,000 h.p. Allowing 22 per cent. of the power delivered for losses in distribution, the generated horse-power required is 110,000, as compared with 160,000 for the North Island. The growth of population is not so rapid in the South Island (only  $6\frac{1}{4}$  per cent. for the five-years period since the 1916 census, as compared with 14 per cent. for the North Island). Moreover, the population in the South Island is more concentrated round certain definite centres, and the main power sources already in operation are nearer these centres of population than those proposed for the North Island. These considerations, combined with the smaller power to be transmitted, point to a lower standard voltage than the 110,000 volts adopted for the North Island. The transmission-pressure already adopted for the Lake Coleridge system and the proposed Southland (Lake Monowai) system is 66,000 volts. This is the highest pressure for which pin-insulator construction is reliable, and this type of construction has a great advantage in first cost over the 110,000-volt suspension-insulator type of construction which has been necessary for the larger powers and longer distances to be transmitted in the North Island. The minimum length of the pole is reduced from 52 ft. to 42 ft., and in this and other directions a saving of about £400 per mile is possible in standard transmission-line construction with the lower voltage. The present transmission-pressure from Waipori Falls to Dunedin, a distance of only 30 miles, is 35,000 volts, but this is too low to be extended economically into general transmission-system.

Surveys are sufficiently advanced to enable a comprehensive scheme to be drawn up for the Canterbury, Otago, and Southland Districts. For the other portions of the Island the surveys are still in hand, and definite proposals cannot yet be laid out. For Canterbury, Otago, and Southland the main 66,000-volt transmission-system proposed is shown on the map herewith, amounting to a total of 759 miles, made up roughly as follows:—

	Miles.
Lake Coleridge to Christchurch .. .. .	63 (double).
Lake Coleridge to Waipara .. .. .	70 (single).
Lake Coleridge to Timaru .. .. .	95 (double).
Timaru to Oamaru .. .. .	58 (double).
Oamaru to Dunedin .. .. .	63 (double).
Dunedin to Waipori Falls .. .. .	28 (double).
Oamaru via Alexandra and Roxburgh to Rae's Junction .. .. .	133 (single).
Rae's Junction to Waipori Falls .. .. .	30 (single).
Rae's Junction to Gore .. .. .	37 (single).
Waipori via Balclutha to Gore .. .. .	84 (single).
Gore to Winton .. .. .	30 (single).
Winton to Lake Monowai .. .. .	48 (double).
Winton to Invercargill .. .. .	18 (single).

Total: Double line, 357 miles; single line, 402 miles: equivalent to 1,116 miles of single line.

It will be noted that there are several large loops in this system, giving the advantages of a duplicate supply to the majority of districts even when a single line only runs through them.

From this main 66,000-volt system supply will be given to the various Power Boards or reticulating authorities, who will be responsible for the secondary 33,000-volt, 11,000-volt, or 3,300-volt feeders and the low-tension distributors.

On the main 66,000-volt transmission-system substations will be located at intervals of 20 to 60 miles according to the demand; but in general it will not be economical to tap the main line unless there is a demand, immediate or in view, for at least 300 h.p. from each such substation. From these main substations supply will be given to the Power Boards at 11,000 or 33,000 volts. At the former pressure the feeders will have an economical range of 20 to 25 miles, and at the higher feeder-pressure a range of 40 to 50 miles for small amounts of power. These ranges from the main 66,000-volt substations with the network described above will economically cover practically the whole districts concerned. There will remain a few isolated spots, such as Queenstown and Hanmer, which can be more economically dealt with by a small local water-power plant, but with the Power Board organization set out in my previous annual report the requirements of the whole Island are taken into account.

The balance of the South Island consists of the settled districts round Blenheim, Nelson, Westport, Greymouth, and Hokitika, with the very sparsely settled areas between.

Taking the whole of the population, both town and country, into account, the following is the total demand, based on the very ample allowance of one horse-power to five head of population; and in these sparsely settled districts it will take many years to reach this stage of development:—

District.	Population.	Horse-power required.
Marlborough .. .. .	16,507	3,300
Nelson .. .. .	23,566	4,700
Buller .. .. .	15,221	3,000
Grey .. .. .	12,382	2,500
Westland .. .. .	7,292	1,500
Totals .. .. .	74,968	15,000