provide for such large special metallurgical processes as are referred to above, but is confined to providing for the ordinary lighting, heating, and industrial load, together with limited amounts for railway electrification, electro-chemical and electro-metallurgical industries. Each of the two main generating sources, however, has a considerable capacity in excess of what it is proposed to develop, and this can be cheaply drawn upon to meet further special demands as they may arise. The system can also be further extended by developing other sources, such as Aratiatia Rapids and the Kaituna River, if necessity arises. The possibility of having considerably increased loads in certain localities has been carefully considered in laying out the main system of transmission. The scheme submitted herewith has been designed and estimated on the basis of being able to supply 0·2 h.p. per unit to a present-day population of 650,000, or 0·16 h.p. to the prospective population ten years hence. The maximum demand on the system would be 130,000 h.p., requiring a plant capacity of 160,000 h.p. in the generating-stations.

Outline of Scheme of Generation and Distribution.

The three main generating-stations—Mangahao, Lake Waikaremoana, and Arapuni Gorge—are shown by heavy hollow squares, and it will be noted that the Mangahao power-station is almost ideally situated for the supply of the Wellington district, as it is within a few miles of the centre of gravity of the load; so also Waikaremoana is very favourably situated for the supply of the East Coast district. Arapuni, or alternately Aratiatia, is rather far south for the most efficient supply of the Auckland districts, but when we consider that Mangahao is unfortunately rather small for the ultimate requirements of Wellington and Taranaki, which will later have to augment their supply from sources farther north, these Waikato stations are particularly well situated.

To make the arrangement of generating plant ideal we would need to have a source of 50,000 h.p. in place of the present limited one of 24,000 at Mangahao, a cheap source of about 20,000 h.p. capacity in the Taranaki district, and another of 10,000 h.p. in the Whangarei district. A search for a suitable and economical source in the Taranaki district of the desired size has proved fruitless. Smaller developments are possible, and at comparatively great expense for the limited amount of power obtainable, and it is found that the Taranaki district can be more economically and better served by transmission from Arapuni and Mangahao.

The main high-tension lines from these main sources of power are shown on the map, and will be seen to follow the most practicable route to serve the load centres, while at the same time they have been laid out with due consideration to the locations in which development is most likely to extend. From the substations shown other lines at lower pressure will radiate out to other substations, ensuring a supply to the whole of the Island. It is proposed that the Department should sell power wholesale to local bodies, who will erect all distribution-lines and operate the retail business within an area of supply surrounding each of the main Government substations.

Acquisition of Waihi Company's Plant.

The need for having an immediate market available for the power to be generated in these generating-stations is particularly marked in the case of the Waikato schemes, whether Arapuni or Aratiatia is developed. Either of these schemes, which have very large ultimate capacity, and which will later become the main source of supply to the Island, involves heavy expenditure in the earlier stages and will take some time to construct. The acquisition of the Waihi Company's plant at Horahora suggests a possibility of obviating this difficulty to some extent. At present this plant is only working to half its capacity, and, the Waihi Company's main interest being gold-mining, no great efforts are made to develop the power business, and so dispose of this surplus power. It is probable that if this plant were taken over by the Department and lines built into Hamilton the balance of power would soon be absorbed there and in the mining districts on the company's existing line. The license issued to the company gives the Government the right to take over these works at any time at valuation. Up to the present the station has been working to only about half its full rated capacity, and further expenditure on headworks would be necessary in order to secure the full rated output of the 6,000 kilowatts now installed with the freedom of interruption which is essential in an ordinary commercial undertaking. It is possible, as shown in interim report of 1916, to augment the supply at Horahora by a development on the Pokaiwhenua River giving 16,000 h.p. in all, but is not recommended. The amount of power to be so obtained would be so small that after supplying the needs of the balance of the mining districts near the Waihi Company's existing lines, and running lines to Hamilton, Cambridge, and local markets, there would only be a limited amount—about 7,000 h.p.—left to supply Auckland. This amount is not nearly sufficient for the present requirements of Auckland, and would only emphasize the need of the larger development.

Mangahao Development.

For the supply to the southern districts the Mangahao River has been selected as the best available source of power. The power is obtained by diverting the waters of the Mangahao by a tunnel, one mile long, from a dam on the river through the hills, first into a large regulating and storage reservoir formed by damming the Tokomaru Creek near the old sawmill, and then from this reservoir through a second tunnel, 1 mile 26 chains long, out on to the hills at the back of Shannon. From the end of this second tunnel steel pipes, 56 chains long, will carry the water to the power-house at the junction of the Mangaore and Mangatangi Creeks, about three miles from Shannon, and give a fall of about 900 ft. The flow in the Mangahao River is very variable, and provision has had to be made for storing water to carry over the periods of low flow which occur periodically The main storage will be in a dam on the Tokomaru near the sawmill, which will be directly connected through