All the schemes put forward in this report are taken to be of an efficiency sufficient to pay interest on first cost taken at 4 per cent. per annum, and all charges for renewals, sinking fund, costs of staff, and management. The revenue has been computed on the assumption that power paid for is 60 per cent. of the b.h.p. on the turbine-shafts, £12 a year per b.h.p. being charged for continuous working. As a matter of fact the tariff would vary with the cost of the scheme within certain limits, and should vary with the time per day for which power is used, also with amount of power taken for any industry. In one large French power-installation the tariff varies for various reasons from £10 to £30 a year per horse-power.

The above conditions impose a limit at which any scheme can be developed under present conditions, and worked as a national undertaking without loss to the State. In the future lower rates of interest and other altered conditions may render it practicable to develop more costly schemes than would at present be justifiable.

NORTH ISLAND.

Wairua Falls.

These falls are situated on the Wairua River, about two and a half miles above the landing at the head of the navigable section of the river. The drainage-area above the falls is about 266 square miles. There are no rainfall-records available within this drainage-area, but at a rain-gauge station (Pakaraka) about twenty miles from the centre of the area the records show an annual rainfall varying from 60·7 in. to 38 in., a maximum fall of 5 in. in twenty-four hours, and a monthly rainfall ranging from 16·7 in. to 0·23 in. There is every probability of corresponding variations in the rainfall on the Wairua basin. A rainfall on the Wairua basin (equal to the lowest of the Pakaraka years) at 70 per cent. run off, would give a mean flow of 520 cubic feet per second. This is probably too high and would only be obtainable by perfect lake-regulation of the flow. The gauging of this river in February last gave a flow of 285 cubic feet per second, but this was not minimum flow. From information given as to the height of the river at its lowest, it is not probable that the minimum flow is more than two-thirds of the above-measured flow. The rainfall-records at Pakaraka and at Parua, one north and one south of Wairua basin, each show two successive months with less than 1 in. of rainfall. Under such conditions the flow in the Wairua would probably fall very low. There are no very high hills in the Wairua basin to catch a higher rainfall than observed on the low ground. Just above the falls the river flows in a channel about 15 ft. deep below the level of the valley-bottom. Below the falls it has cut a canyon 45 ft. to over 100 ft. deep, this depth being attained about a mile from the falls. The height of the falls is given as 45½ ft., but below the falls there are rapids. About a mile below the falls the ordinary water-level is 108 ft. below the water-level at the top of the falls, and, at about a mile and a half, 133 ft. The high-tide level at the landing is 141 ft. below the top of the falls.

Taking the ordinary low summer flow as about two-thirds of the gauging, the power obtainable just below the falls would be about 720 b.h.p., and at a power-station a mile and a half below the falls about 1,600 b.h.p. At about this point the best results will be attained ; fall being lost by going further down the river. A race can easily be constructed between the falls and this point—on the flats along the right bank of the river.

Immediately above the falls the best location for a storage-reservoir requires a dam 1,100 yards long. The cost of a masonry dam of a sufficient height is too great to warrant consideration : an earth dam would cost less. But the necessity of providing for flood-water overflow would involve expensive works. The cost of an earth dam would be £240,000 to hold the water to a height of 50 ft.

To test the probable value of a work of this size the mean run-off due to 38 in. of rainfall, the lowest year recorded at Pakaraka, would be 520 cubic feet per second if all water were conserved by the dam. The maximum power obtainable at a power-station one and a half miles from the falls would be 5,000 b.h.p. for continuous working. As a matter of fact much flood-water would be lost and not nearly the maximum power would be obtained. The cost would be too great for the probable benefit, and the question of constructing a large reservoir just above the fall may be abandoned.

It is possible that dams could be built elsewhere in the river-basin at much less cost. This is a matter for further search : if found, any proposed scheme would be modified to suit the conditions.

The only schemes worth considering at Wairua Falls are : (*a*) the construction of a power-station one and a half miles below the falls to use only the low-water flow of the river. This would give about 1,500 b.h.p. for continuous working. Or (*b*) build a dam costing, say, £25,000 to store surplus water for one week, and instal a plant of 3,000 b.h.p. for intermittent working equal to eighty-four hours full power per week for ordinary low-water flow of, say, 180 cubic feet per second. If future observations show the figure to be too high, as possibly they may, the above estimates of power obtainable would have to be modified to suit the final results.

Rotoiti–Kaituna.

The Kaituna River drains Rotorua and Rotoiti Lakes. Just below the outlet there are a series of falls and rapids. An accurate survey has been made for a distance of two miles, and the total fall has been found to be 177 ft. The fall in the first 62 chains is 101 ft. Aneroid heights give a fall of 325 ft. below lake-level at a point on the river three miles from the lake.

The flow in the river was gauged approximately in October last and found to be 500 cubic feet per second. By putting the tunnel at a proper level below the present low-water level a somewhat larger average flow might be taken to be available. After comparing the measured flow with the rainfall I think 600 cubic feet per second may be taken in view of the storage obtainable.