# THE GENERATION OF ELECTRICAL ENERGY FOR SMALLER TOWNS

## DATA CONCERNING CONSUMPTION OF LIGHT AND POWER — PLANT DUPLICATION FOR RELIABILITY OF SERVICE — FEATURES GOVERNING PLANT DESIGN AND EQUIPMENT.

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IN a paper read at the eighth annual convention of the Union of Saskatchewan Municipalities, and entitled "The Generation and Distribution of Electrical Energy for Light and Power Purposes in Medium and Small Sized Towns," Mr. Inglis began by citing a few statistics covering a number of towns having generating units installed, and the degree of patronage extended to them, but his remarks were based largely upon the comparative suitability of the various types of prime movers, for small installations.

In towns of 1,000 to 1,500 population the average number of consumers is approximately fourteen per hundred.

In towns of 1,500 to 2,500 population the average number of consumers is approximately sixteen per hundred.

In towns of 2,500 to 3,000 population the average number of consumers is approximately thirteen per hundred.

The average consumption per capita in towns from 1,000 to 5,000 remains fairly constant, and from data collected that consumption is approximately 60 watts.

Thus in a town of 1,000 inhabitants the output required of the generating unit would be 60 kw., or taking the efficiency of the generator as being 90%, then the output of the prime mover would be approximately 90 b.h.p. Similarly with a population of 5,000 the output of the electrical equipment would require to be 300 kw., or with a generator efficiency of 92% the output of the prime mover would be approximately 440 b.h.p.

In order to maintain a thoroughly reliable service during the 24 hours of the day, it is absolutely necessary to duplicate the plant. Consequently, for a town of a thousand population the total generating capacity ought to consist of two units of 90 b.h.p. capacity. However, as most towns only run their plant during the lighting period, or approximately ten hours per day out of the twenty-four, on a yearly average, the question crops up as to whether it is necessary to install this duplicate unit. This question is usually decided by the financial position of the municipality and whether there is sufficient demand for power during the remaining fourteen hours of the day. In most cases only one unit is installed.

**Salient Points Governing Installations.**—The most important items to be considered in locating small central stations are:—

(1) The method of driving the generators.
(2) The proximity of fuel supply.
(3) Pure water supply.
(4) Railroad facilities and the possibilities of later expansion.

Although I have numbered these items, I have by no means attempted to place them in their order of importance, because they will each affect to a more or less degree the different type of plant which it is proposed to install. The first mentioned, namely, the method of driving the generators, from an engineering point of view, seems of primary importance. Considering the two types of drive universally used, namely, the belt drive and the direct connected drive, experience has shown that the belt-driven plants are less efficient and much less reliable than the direct connected unit. This is due principally to belt troubles. Much more floor space is also required for the belt-driven type of plant, consequently a larger building is required in which to house them. As important as any of these drawbacks is the inferior regulation which is very apparent when no automatic regulator is connected in the electrical circuit, especially if the load is at all variable. The only advantage the belt-driven type has over the direct connected type is a lower first cost, but this is hardly worth considering when compared with the advantages which accrue from the direct connected type.

The second item: The proximity of fuel supply. This is an item of considerable importance in these parts where freight rates are so high, and the municipality which has close at hand a good source of fuel supply is extremely fortunate, in so far as it will materially reduce the cost of production of energy. It will also be one of the deciding factors in arriving at the type of plant to be installed.

The third item, namely, pure water supply, will also be a deciding factor, as all the prime movers in use to-day use water to a more or less degree, either in the direct process of generation or as a cooling medium.

The last item, but none the less important, is that of railroad facilities and the possibility of later expansion. The railroad facilities we are all familiar with for the handling of the fuel supply, but the possibility of later expansion is one that cannot be given too much consideration, as not a few instances can be seen where inadequate provision has been made for future extensions. If the proper precautions were taken in deciding upon the best type of plant for each individual case, and provision made for future extensions, then a great deal of time and money would be saved as well as greater possibilities obtained of supplying energy at a lower rate in the future.

Taking the case of one unit being installed, and for instance, say, a 100 b.h.p. unit, this is equivalent to an electrical output of approximately 68 kw., taking the efficiency of the generator at 91%. Assuming the plant to run on an average ten hours per day during the period of one year or, say, three thousand hours, then the maximum number of units generated would be 204,000. This is only true if the plant is run on full load during the entire period. In actual experience, however, the total units generated approximate a yearly average 15% of the maximum, which is equal to 30,600 units. Assuming the cost of energy to be 15 cents per unit with no allowance for distribution loss, then the yearly revenue would be equal to $4,600. Knowing the principal and interest payable yearly on the debenture issue, as well as the fuel and operating expenses, with a liberal allowance for depreciation, it is an easy matter to determine whether or not the cost per unit, namely, 15 cents, is sufficient to