Future of Electric Power and Electrict Heating of Houses

In a very instructive address recently given before the Electrical Association of Montreal, Mr. H. E. Randall, the sales manager of the Shawinigan Power Co., introduced a new phase relating to the future of electrical energy, which reads as follows:—

"At this time when we hear so much about hydro-electric power and the utilization of our water powers, the transmission of power become most important. We electricians think only of electricity as a means of transmitting power, but what is a train of coal but a means of transmitting power—latent power, it is true—but it is transmission nevertheless. What is the conduction of oil through pipe-lines but the transmission of power? And it is interesting to note that these two methods of transmission far outstrip the transmission of power by electricity in distance, there being pipe lines in the United States nearly 3,000 miles long. So then, since there are several kinds of transmitted power, the electrically transmitted water power has to compete at the receiving and with the power transmitted by the railway line or otherwise, and in this country where heating is used for such a large portion of the year, a still further advantage exists for other kinds of power, but nevertheless with cheap power at the source and careful transmission, with low loss which in good lines should not exceed 5 to 10 per cent, it is possible to economically compete with other transmitted power, and as a result these transmission lines which you see have grown up."

"However, going back to basic principles, it is open to serious doubt whether the future commercial loads, as we know them, will be handled by Hydro-Electric plants and transmission system or by steam plants. The present efficiency of conversion from power in water to electricity is well up to 90 per cent; the present efficiency of conversion from heat in coal to electric power is around 20 per cent. In the one case you have practically no possibilities of betterment; in the other case you have tremendous possibilities of betterment."

"At the present time, for ordinary commercial city loads a well designed steam plant, with large units, properly located with respect to water, etc., can supply in most parts of North America now settled electric power for distribution in city streets at a price which favorably compares with hydraulic power electrically transmitted. This is shown by the remarkable success of the 100,000 H.P. steam plant now located at Buffalo, twenty miles from Niagara Falls."

"What then would result if somebody should produce—as no doubt will be produced—metals capable of withstanding temperatures of a red heat at high pressure? Why, immediately the efficiency of conversion from heat to electricity would jump, and all our elaborate transmission systems would be open to obsolescence, due to changing methods, because they can be materially improved."

"Transmission, however, has another aspect, and that is an aspect which will no doubt in the future become a most important aspect, that is, transmission lines will not be used so much for transmission of hydraulic power to its centres of use, but rather for the tying togethe rof all sources of power, so that the use of electricity, or of the powers of the country transmitted to your door by means of electricity, may be well nigh universal.. Transmission lines of Canada and the United States, have been built up almost exclusively around water powers, there being a few through Ohio, Pennsylvania and Illinois which are steam transmission systems—these three States show the new aspect, the linking together of large stations, feeding a vast net-work, which brings about a uniformity and continuity of supply at low prices, so that the Public Utility is able to supply the public with that which it desires at the lowest possible cost, and is, therefore, successful."

"I dare to predict that these transmission lines will in the next ten or twenty years become pretty well inter-connected so that we will have not a large number of large or small separate systems, but a large inter-connected system, presumably made up of a few large organizations interchanging their energy on some equitable basis."

"What I mean by all this is that we must not let our enthusiasm run away with our better judgment when it comes tto hydro-electric power. To-day it is a fetish in some parts of Canada, but it is subject to many pitfalls; the most important one of which is other kinds of transmitted power. It has nevertheless a big future, especially for those kinds of loads which we call high load factor loads, that is those loads which will use the tremendously heavy investment in Hydro-electric generating stations and transmission lines the greatest number of hours in a year. For other loads, that is, low load factor loads, other means of producing power will probably show up more advantageously than the present harnessing of hydraulic power."

MR. RANDALL ALSO TOOK UP THE SUBJECT OF ELECTRIC HEATING ALONG THE FOLLOWING LINES:

"We are hearing to-day a great deal about electric heating. The Shawinigan Company has for several years carried out experiments in electric heating of houses, and while this data has been crudely gathered, nevertheless there is available a pretty good indication of the facts. The basic principle of electric heating is that electricity can be turned into heat and distributed through the room at 100 per cent efficiency, whereas coal or other sources of heat can only be turned into usable heat and distributed at some fractional—say, probably 50 per cent—efficiency. We must never forget, however, that 1 k.w.h. fundamentally and absolutely has only the intrinsic heat value of one-quarter of a lb., of good coal, and that it only has the equivalent heat value of about one-third or one-half of a lb. of coal burned in the ordinary manner. So we cannot hope, therefore, in the future for more efficient use of electricity for heating except in the distribution of the heat, that is, no electric heater will give or put into the room more heat than there is in the electricity, and almost any kind of electric heater from the standpoint of heat alone, not long life or ease of operation, is the equivalent of any other.

"Most of us have been working on electric heating as an off-peak proposition, realizing that it must be done with cheap electricity. Now, an off-peak proposition can only be worked when the ruling load is bigger than the off-peak load. Data from electrical distributing companies shows that the average city house takes a maximum demand of about 400 watts on the average—say, one-half a kilowatt. Our experiments on electric heating of houses show that the average house requires about 20 k.w. of maximum demand, or with properly designed heaters. oYu can see, therefore, that electrical heating can never be an off-peak load unless some other load can be developed which would be off-peak to it, and sold at a fairly high price."

"We also find that it requires some 1300 to 300 k.w.h. per year for each k.w. of demand for each house, so that the average house would consume some 30,000 to 40,000 k.w.h. a year for heating, and this in the winter time when our hydraulic electric powers are at their lowest. Let us see what this means in horse power. To be ultra-conservative, let us say that instead of 30 k.w. the average house would only take 20 h.p. Now, the city of Montreal has roughly 125,00 houses—say 100,000. Now, 100,000 houses at 20 h.p. per house is only 3,000,000 h.p., a figure which is greater than the entire hydro-electric system of Canada to-day; and in fact, there is not enough hydro-electric power developed in the entire continent of North America to-day to heat the little Province of Quebec."

"Considering the kilowat hour side of it, reliable statistics for nUited States and Canada show that the use of electricity in 1917 amounted to about 250 k.w.h. per capita per year for all purposes, lighting, power, electric furnaces, heating and everything."

"If we assume five people in each of the above houses, this means between 6,000 and 8,000 k.w.h. per year per capita for heating, that is, twenty-five to thirty times as much electricity as is now used on the average per capita throughout this entire country—so it would, therefore, seem that tremendous additions to our present development would have to be made to even heat one-tenth of our homes."

"But now let us examine what would be the cost. With some knowledge I could say that on this tremendous scale electricity could not be delivered to your door for less than $20.00 per h.p. for the season's service, that is, the average householder would have to pay $400.00 a year, or the city of Montreal householders would have to pay $40,000,000 a year for heating their houses, whereas actually they pay, at $10.00 a ton for coal, not over $7,000,000; that is, there is quite a margi nbetween electrical heating of the houses of Montreal and heating them with coal; but you say: "What would we do if we had no coal?" The answer is, there is always commerce, and while there is commerce there will