

Power Factor and Load Factor Important on Energy Contracts

WHAT load factor and power factor do you maintain upon your system? How much do they cost you per year? What limitations do they place upon your operation?

It is needless to emphasize again the losses in capacity of equipment, efficiency, regulation and net income resulting from operation at low power factor and load factor upon the system for which electrical energy is generated by the railway company itself. However, with the increased tendency to purchase energy for railway operation, or at least to allocate cost of energy between the railway and lighting departments of combined utilities, the problems of load factor and power factor are confronted in slightly different form.

The tendency of large central stations to penalize such low factors or to offer a bonus for the maintenance of high factors is increasing. Whatever may be the arguments against such a practice, they are principally applicable to the small consumer, who has difficulty in understanding both the meaning of the terms and the justification of the claims.

In the wholesale contract it should be relatively easy to reap a considerable saving as a result of a bonus for load factors 40 per cent and above and power factors between 85 and 100 per cent. In no case is it easier to maintain high power factor than in the average railway substation, equipped with synchronous converters or motor-generator sets. In the case of load factor the problem of obtaining sufficient diversity of load is rather more difficult. However, in large city systems, combined urban and interurban utilities and electrified steam railroads with regenerative braking relatively high load factors should be available. Recent reports from the Chicago, Milwaukee & St. Paul Railroad indicate that load factors have been increased from 40 to 60 per cent. This is an excellent showing for such a system.

A portion of the saving, particularly in the case of power factor, might well be passed along to the substation operator who is active in maintaining such a condition. It should not be necessary to install an elaborate metering system upon which to base such a plan. Regular reading of the substation power-factor meter, checked occasionally by an inspector, should be sufficient to determine the average value for the month. Even if a recording instrument seemed desirable for each substation the saving would probably be much greater and the expense involved in recording considerably less, respectively, than in the case of coasting clocks and energy measurements made at present upon individual cars as a basis for a bonus system for motormen.

It is possible that in our attempt to run down and eliminate every possible operating and maintenance cost, in these days of conservation, we have neglected this very important saving. As a result of a recent investigation made by H. C. Thuerck of Purdue University 88 per cent of the central stations questioned were found to include load factor clauses in their contracts and 50 per cent include clauses involving power factor. As these central stations represent the largest utilities of the country the practical possibility of closing contracts in the future involving such clauses is very evident.

A typical clause, involving both load factor and power factor, taken from the wholesale contract form of one of the large central stations reads as follows:

The maximum demand shall be determined from actual measurements of the customer's demand and a consideration of the power factor at which these measurements are taken and shall be calculated by multiplying the greatest integrated fifteen-minute demand occurring at any time within the twelve months ending with the month under consideration (eliminating from consideration, however, peaks or demands due to short circuits, line disturbances, etc.) by 80 per cent divided by the actual power factor at which the measurement is taken.

The average annual load factor of the central stations reporting was 52 per cent, with a range of from 32.5 to 92.2 per cent. The monthly load factors vary from 40 to 92.8 per cent, with an average of 61 per cent. Power factors were found to cover the entire field from 70 to 100 per cent, with an average of 90 per cent.

It does not follow, of course, that the addition of a relatively low load-factor load of a railway system will lower the load factor of the central station. In fact, it is very likely to raise it, due to the diversity of the two peak loads. As increased load factors and power factors mean increased economy and greater conservation of fuel such problems are worthy of extensive detailed study.

Interlocked Planning of Transportation System and Town

AVERY desirable new residential suburb of Cleveland was recently made more desirable by the placing in operation of a new rapid transit railway which makes it possible for the suburbanite to go from his home to the Public Square in less than thirty minutes despite a distance intervening of 9 miles. This new railway is described on another page of this issue. The interesting part about this is that the planning of the railway was interlocked with the planning of the suburb. Transportation was just one phase of a very comprehensive plan worked out by a firm of real estate operators for opening up a great tract of land outside of Cleveland for residential properties.

These men have demonstrated a pretty good knowledge of transportation matters as well as real estate. They realized that high speed transportation connecting their property with the heart of the city would be a tremendous advantage in disposing of the land at a profit. They made the high speed service possible by securing a private right-of-way from their property all the way to the Public Square and built a road without any grade crossings except those in the suburb itself. Then they accomplished what in effect is an excellent skip-stop system in the suburb by so laying out the streets that there are only three through street crossings with the railway per mile and hence only three stops per mile. This secures the economy of few stops and makes possible a high schedule speed—the advantages of skip-stop operation—without introducing any of the criticism of the skip-stop plan, for if the street on which a man lives does not run through to the car line he is not going to kick because the car doesn't stop at his corner.

Furthermore, by limiting the number of stops and thereby multiplying the number of riders to board and leave the cars at each stop there will develop there a business center, resulting in a great enhancement of land values. This joint real estate and railway development in Cleveland will be at least one case, apparently, where the builders of the railway will derive some benefit from the great appreciation of property values that always follows good transportation.