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An Economic Indicator Concerning the Efficiency of the Use of Electric-Power Distribution Installations in the Country-Side

"The present five-year plan gives great attention to the diminishing of production material expenses, a decisive factor for raising the efficiency of the entire economic activity, for increasing the national revenue and, consequently, for raising the wellbeing of the working people".

N. Ceauşescu

The activity for the distribution of electricity, as a result of the peculiarities specific of the production of electric energy is an industrial-productive activity.

The qualitative estimation of this activity should be made from the technical point of view — the ensurance of the continuity, safety and nominal parameters of the distributed power — and from the economic point of view, that is its profitableness. The consumers' supply with electric power must be continuously achieved at the nominal parameters and with the lowest expenses, thus in conditions of profitableness. In this connection, the particular case of a consumer in which the technical aspects of his supply would hang heavier in the balance, can in no case be generalized over the entire activity of electric energy distribution. On the other hand, the general rule of any economic activity is applied to the distribution activity — the occasioned expenses must be smaller than the results obtained — for ensuring the necessary sources for the continous development of economy, accumulations.

Being analysed at the level of the national economy, the activity for the distribution of electric power appears profitable, but, if this is regarded from the point of view of the two component parts, the distribution activity in the villages and in towns, the results are different, the first is unprofitable in the present stage and, the second is profitable.

In the sector of transmission and distribution of electricity, the level of the use of the capacity of the installations is given by the indicator "kWh delivered per 1000 lei fixed assets", resulting from the relation between the quantity of electric power annually delivered to consumers and the average value of fixed assets in the respective year, by which this quantity of power has been transmitted and distributed. However, the indicator does not reflect exactly the economic efficiency of the distribution activity, being a static and not a dynamic indicator it does not reflect the economic prospect in the respective activity. In the 1966—1970 five-year plan period, this indicator has presented the following dynamics:

Table 1

	1966	1968	1970
Level in % as compared to 1966	100.0	103.7	106.9

A continuous increase of the level of utilization of the transmission and distribution capacities is being noted. To this has contributed both the rational investment policy and the measures taken for the efficient use of the existent capacities, in view of the ensurance of all consumers' supply in quantitatively and qualitatively adequate conditions, obtaining an increase in the value of fixed assets at a slower rate than the annual rate of increase of the delivered quantity of power.

The distribution capacities in the villages are used at a lower level and differently throughout the country. In this way, in the 1966—1970 five-year plan period, at an average power installed in transformers of about 840 MVA, the circulation of a maximum power of about 310 MVA has been obtained, that is a use of capacity of only 37%. The improper use of capacity is due to the fact that the complete process of electrification of our villages is made on stages distant in time, only 20—30 % of the number of husbandries being electrified in the first stage, though the capacity of the lead-in and of the transformer post put into operation is, generally, envisaged for an advanced stage of electrification. The average coefficient of the level of electrification of the husbandries in the electrified villages emphasizes this situation, being of 45.7%, at the end of 1970. In this way, in the villages with a level of electrification of 90—95%, the level of the use of the distribution capacity is also increasing, amounting from about 226 kWh/1000 lei fixed assets to 480—600 kWh/1,000 lei, that is a use twice-thrice bigger.

The measures which have to be taken for making the electric power distribution activity in the country-side more profitable may be numerous and in no case, can they be exhausted in the restricted space of this material. These measures must concern all aspects — designing, manufacturing and exploitation of installations — and the efficiency of the electric power distri-

bution activity in the rural localities can be achieved only through a perfect blending of all these measures.

Therefore, for the knowing, estimation and determination of the real economic efficiency of distribution activity, on its two aspects, — distribution in villages and distribution in towns — it is necessary for the indicator "electricity delivered per 1000 lei fixed assets" to be coupled with a qualitative indicator which should be determined already from the designing stage and this, especially for the electric power installations in the countryside, in the exploitation of which a very low economic efficiency is being registered.

One of the main ways and with a big weight for ensuring the efficiency of the electric energy delivered in the country-side is the increase of the distributed quantity of electricity. The proportion of the quantity of electric energy delivered for the efficiency of the activity of distribution of electricity in the villages results from the calculation of the indicator "minimum volume of electric power to be distributed in a locality for the efficiency of distribution activity", the economic efficiency of the use of electric-power installations being determined by this indicator. The indicator can be calculated both in the stage of designing of the installations in the country-side and in the condition of the installations already built for each installation taken separately, on zone, on enterprise and even at the level of the electric power distribution sector.

Conventional data will be used for the exemplification of the calculation method of the qualitative indicator „the minimum volume of electricity to be distributed in a locality for the efficiency of distribution activity."

Thus, we consider that in a village the quantity of 33.3 MWh was sold, for which 15,000 lei were cashed, an average price of 450 lei/MWh being thus obtained. The total production expenses occasioned by the exploitation of the respective installations (the total value of which is of 100,000 lei) were of 18,000 lei of which 11,000 variable expenses (electric power in the system and technological fuel) and 7,000 lei constant conventional expenses (liquidation, wages, maintenance materials, etc.). Taking these figures into consideration, it results that the net loss — in 1970 — registered in the activity of electric power distribution in this zone was of 3,000 lei.

The indicator proposed for establishing the minimum volume of electricity distributed in the country-side (in a locality or per total) as a result of which the activity of distribution of electricity becomes profitable, may be calculated with the aid of five formulas of intermediate calculation (table 3).

So, in the given example, for the volume of cash obtained from the power distributed in a locality to be equal to the occasioned expenses, the quantity of sold electric power must increase from 33.3 MWh to 58 MWh, an increase which may take place at the expense of the increase in the number of consumers or of the power of the receivers used.

The calculus of indicator W in the designing stage.

To determine the indicator "the minimum volume of electric power to be distributed in a locality for the activity of distribution of electric power to start being profitable", a number of three elements I_c, I_r and D — the estimate value of the designed installations are necessary in the designing stage.

Table 2

Determination of the Indicator Resulting from the Succession of the Economic Phenomena Expressed in the Formulas and Results of the Application in a Conventional Case

Nr.	Formulas	Symbols	Results of the application of the formulas in a conventional case
1	Constant conventional expenses per 1000 lei fixed assets — I_c $I_c = \frac{C_c}{F} 1000$	C_c = constant conventional expenses- thousands lei F = the value of fixed assets thousands lei	C_c = 7,000 lei F = 100,000 lei $I_c = \frac{7,000}{100,000} \cdot 1000 =$ = 70 lei/1000 lei fixed assets
2	Variable expenses per MWh (sold) — I_v $I_v = \frac{C_v}{W}$	C_v = variable expenses- thousands lei W = sold electric power MWh	C_v = 11,000 lei W = 33.3 MWh $I_v = \frac{11,000}{33.3} = 330.0$ lei/MWh
3	The average selling price of electric power- I_p $I_p = \frac{M}{W}$	M = the value of electric power sold in the country-side- thousands lei	M = 15,000 lei $I_p = \frac{15,000}{33.3} = 450$ lei/MWh
4	Constant average expenses per MWh sold at a minimum level, from which the activity of distribution of electric power in the country-side becomes profitable I_r $I_r = I_p - I_v$	—	I_r = 450 — 330 = = 120 lei/MWh
5	The quantity of electric power which has to be distributed in a village or in a zone from the amount of which upwards the activity of distribution of electric power in the country-side becomes profitable — W_r $W_r = \frac{C_c}{I_r}$	—	$W_r = \frac{7000}{120} = 58.3$ MWh

The content of indicators I_c and I_r is given in table 3 and, the indicator symbolized with "D" represents the estimate value of the designed installations (an element corresponding to F in formula 1).

In this connection, the formulas:

$$C_c = \frac{I_c \times D}{1000} \text{ and } W_r = \frac{C_c}{I_r}$$

will be applied.

In order to establish a most real result from the formulas in table 3, the value of each term is to be calculated on the basis of data from each enterprise or per total sector in the previous year, this depending on the level from which the estimation of the economic process called "activity for the distribution of electric energy in the country-side" is to be made. We mention that the values of I_c and I_r remain conventionally constant for the organizational level which supplied the data.

In keeping with the general estimate, the electrification of a locality reaches the total value of 150,000 lei. In this case, for the activity of electric power distribution to start being profitable in the respective locality, the quantity of power distributed in the respective village must be that resulting from the correlations:

$$C_c = \frac{70 \times 150{,}000}{1{,}000} = 10{,}500 \text{ lei}$$

$$W_r = \frac{10{,}500}{120} = 87.5 \text{ MWh}$$

From the designer's point of view, only the calculations made above count, the five formulas showing the road covered for the establishment of two relatively constant elements, namely: I_c and I_r. The fact that these elements have the characteristic of a constant value (for the level supplying the calculus data) does not essentially influence the result, namely the content of the indicator designed in the building of electric-power installations in the rural localities.

The determination of an economic indicator in the very designing stage for the electric-power installations in the countryside from the point of view of the calculation occasioned by it is simple, as it does not imply the carrying out of a laborious consumption of work by the designer, in exchange, the advantages, for the working activity, of the anticipated knowing of the minimum level attained for the efficiency of the electric energy distribution activity are very great, because they would give a precise economic content to the exploitation of the respective installations.

Based on the determination of "the minimum volume of power to be distributed in a locality for the distribution activity to start becoming profitable" the minimum number of subscribers may also be inferred, if the

average power annually absorbed per consumer is taken into consideration, a power which may differ from one enterprise to another, but, the result does not change at all, if the achievements obtained in the basic or in a reference year, in a given enterprise, are being considered.

Most rural localities have already been connected to the national power system, so that the problem of the calculation of an indicator with an economic content in the designing stage of electric-power installations can be raised only in the case of the localities for which execution projects are to be worked out, but, this fact does not diminish at all the utility of such an indicator because it can be calculated for every condition.

The methodology of establishing the indicator "the minimum volume of power to be distributed through the electric-power installations in the villages for the distribution activity to become profitable" in the condition of installations existing in a rural settlement, in the condition of all rural localities served by an enterprise or of all rural localities in the country, is identical with that presented in the example given for "the designing stage", with the specification that "F" the value of the fixed assets within the previously applied formula appears instead of "D" the estimate value.

The method can also be applied in estimating the level of profitableness of the exploitation of the electric-power installations in all the localities which have already been electrified, a fact which would indicate the necessity of taking measures which should lead to the efficiency of the activity for the distribution of electric energy in the country-side.

As the problems linked with the distribution of power will be ever more complex in the future, taking into consideration the fact that they are linked to the general conception and strategy for the planning and development of a power system in which the problems of economy and reliability are major preoccupations, we consider that the method proposed represents a means for mobilizing the workers of the power enterprises and industrial centrals in the implementation of the provisions of the Directives of the Tenth Congress of the Romanian Communist Party on the sustained development of electrification of our villages — so that the electric power distribution expenses in the country-side should be as small as possible, in the end.

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UN INDICATEUR ECONOMIQUE CONCERNANT L'EFFICIENCE DE L'UTILISATION DES INSTALLATIONS ELECTRIQUES-ENERGETIQUES DE DISTRIBUTION DANS LE MILIEU RURAL

Les auteurs traitent de l'un des aspects du processus d'électrification des villages, processus comprenant beaucoup d'aspects et implications d'ordre social, économique et politique qui requièrent, naturellement, des études suivies.

A présent, dans l'économie énergétique il manque un indicateur qui puisse refléter en phase de projection, d'execution et d'exploitation, l'efficience économique du processus de distribution de l'énergie électrique dans les villages. Compte tenu de cette situation, on élabore dans cet article la méthodologie pour déterminer un tel indicateur sous la dénomination de „volume minime d'énergie électrique à distribuer dans une localité pour que l'activité de distribution soit payante.

L'introduction de cet indicateur est demandée aussi par la nouvelle conception abordée dans la politique d'électrification: la transformation de l'électrification à caractère extensif en électrification ayant un caractère intensif.

ЭКОНОМИЧЕСКИЙ ПОКАЗАТЕЛЬ ЭФФЕКТИВНОСТИ ИСПОЛЬЗОВАНИЯ РАСПРЕДЕЛИТЕЛЬНЫХ ЭЛЕКТРОЭНЕРГЕТИЧЕСКИХ УСТАНОВОК В СЕЛЬСКОЙ СРЕДЕ

Авторы рассматривают один из аспектов процесса электрификации сел, охватывающего много сторон и последствий социального, экономического и политического порядка, требующих, конечно, продолжения этого изучения.

Так, в настоящее время в энергетическом хозяйстве нет показателя, который отражал бы экономическую эффективность процесса распределения электроэнергии в сельской среде в стадиях проектирования, выполнения и эксплуатации. С учетом этого положения в статье разрабатывается методика определения подобного показателя под наименованием «наименьший объем электроэнергии, подлежащий распределению в данном населенном пункте, с тем, чтобы деятельность по распределению была рентабельной».

Необходимость внедрения этого показателя обусловлена и появлением новой концепции в политике электрификации, переходом от электрификации экстенсивного характера к электрификации интенсивного характера.