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SOME ASPECTS OF THE APPRAISAL

OF ELECTRIC POWER PROJECTS IN LESS DEVELOPED COUNTRIES

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INTRODUCTION

The purpose of this paper is to outline some of the problems encountered and lessons learned from the Bank's appraising of and lending for electric power projects in less developed countries.*

All through this paper the reader should bear in mind that the approach of the Bank to the appraisal of electric power projects differs in many respects from that of other lending institutions, because of its particular nature, purpose, and methods of financing.

Very broadly the main purpose of the Bank is i) to assist member countries in their economic development by facilitating the investment of capital for production purposes, and ii) to ~~provide~~ private foreign investment by means of guarantees or participations in loans, and when private capital is not available on reasonable terms, to supplement private investment on suitable conditions.

These provisions require the Bank both to be broader in its approach to the appraisal of projects than private investors, and to be more flexible in its criteria. Specifically, the Bank has interpreted the broad definition of its purpose to mean that it should not only be concerned with the capacity of the prospective guarantor to pay interest and principal, but that the projects should be technically and economically sound in the widest sense. Thus the Bank's appraisal of a project is directed to the following basic questions:

i) Does the project belong to a high priority sector of the economy, and has it high priority within that sector ?

ii) Is it properly planned in terms of type, size, and schedule ?

iii) Are the design, drafting of specifications and contracts, and supervision of construction in competent hands ?

iv) Are the methods and procedures for the placing of the equipment and construction contracts suitable ?

v) Are the arrangements and staff for the future operation and maintenance of the project adequate ?

vi) Is the financing plan satisfactory both in the sense that it would assure all the funds necessary for construction, that it would result in a satisfactory financial structure, and that it would yield an adequate return ?

In the experience of the Bank there are within these broad questions certain specific aspects, outlined below, which in the planning of electric power projects in less developed countries are often particularly difficult to deal with.

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* The views expressed are those of the writer and not necessarily of the International Bank.

I. FORECAST OF THE POWER MARKET

A forecast of the size and character of the power market, on which the planning of new power facilities has to be based in the first instance, is always more difficult to establish in an under-developed area than in a developed area.

For a public utility in a developed area the point of departure usually is an already high level of consumption, large existing facilities and detailed statistics. The future residential demand can usually be predicted for several years quite accurately on the basis of recent trends, and of analyses of such new developments as the use of electricity for air-conditioning, heating or cooking. Some utilities have actually established for their areas fairly reliable correlations between the growth of income per capita and the growth of electric power consumption per capita. Such data supplemented by a study of population trends and movements in or out of the area, together with a study of the trend in industrial development, usually provide an adequate basis for forecasting the power market. And in a sense a utility in a developed area can more easily "afford" an error in its forecasts, than one in an underdeveloped area, because in case it should find itself with a temporary shortage or excess, it can often correct this condition at least in part, by exchange arrangements with interconnected neighboring utilities.

The planners for under-developed areas usually find themselves in a very different position. Consumption of electric power is low, the existing facilities are small and rudimentary, and statistical data are often incomplete or otherwise unsuitable for forecasting. Sometimes there is a substantial unsatisfied backlog of demand due to shortage of capacity which is difficult to determine exactly (especially if, as a consequence, industrial consumers have built their own plants that may or may not be continued in operation when more reliable public power becomes available).

In such situations the planners are often tempted to resort to shortcuts, such as using recent rates of growth of total demand or average consumption per capita of "comparable areas". The fallacy of the first technique is that the different sectors of consumers invariably have different rates of growth, and the fallacy of the latter is, of course, that there are no comparable areas. Such market forecasts can be very far off the mark in either direction.

There are no general solutions to this question, or even general trends. For each area the market analysis has to be adapted to the characteristics of that area and the forecast has to be built up from the forecasts of the peak load and of the consumption of each major sector of consumers. In cases where the basic data are so uncertain that the forecasts have a large inherent margin of error, it is preferable to establish upper and lower limits for both the future peakload and the consumption, and to plan the size, type and timing of new generating facilities accordingly.

The following briefly covers the residential and industrial sector which as a rule make up the bulk of the market.

A. The Residential Sector

The forecast for the residential sector has often at least a starting point based on some statistical data. If there is a backlog of unsatisfied demand, the pending applications for new connections might give a clue, but its total amount is almost always a rough guess. The projection of the growth of demand is the most difficult part. In some countries the residential use is still definitely limited because the income of many households has not yet reached a level where they can afford an electric power connection. The subsequent growth of consumption of a household will also depend on the growth of its income. One way to arrive at a forecast of the market, or at least to check existing forecasts, is, therefore, to establish i) the level of income above which a family can afford the initial installation (and the size of that initial installation); ii) the number of families that are already above that level and that will reach that level every year, and iii) the correlation between growth of family income and growth of electric power consumption per family. Some of these data may have to be rather roughly estimated, and may have rather large margins of error, but at least the approach is rational.

B. The Industrial Sector

The forecast for the industrial sector is usually much more difficult and has to be based even more on the particular circumstances. In some cases there are firm power contracts or definite industrial programs, but in others there is not much more than an expectation that "plenty of cheap power" will in itself become such a magnet that rapid industrialization is bound to follow. This is a very misleading generalization, because the cost of power has very little to do with the rate of industrialization except for power-intensive industries. Power-intensive industries can, however, only be attracted through special long-term contracts, which means that for all practical purposes the power and industrial aspects have to be planned jointly. For all other industries the cost of power represents only 1 to 2% of total production costs and is thus only a minor factor in determining its location, as compared for instance to the cost and availability of labor and raw materials, the availability of power, the size and distance of the markets, transport facilities, etc., and last but by no means least the availability of capital.

The forecast of power demand of the industrial sector has to be based, therefore, in the first instance on a forecast of the industrial development of the area that takes all the above factors into account.

II. SIZE, TYPE AND TIMING OF NEW PLANT

Apart from the forecasts of load and consumption, proper planning also requires adequate engineering data such as stream flow for reasonable periods of time, subsoil explorations and geological studies, comparison of alternative designs of dams and power houses, up-to-date information on the cost of equipment on different types of plants, wage rates, prices of materials, the source, price and transportation cost of fuels, and many others. These aspects of planning are covered in detail in textbooks and technical and publications.

This paper deals only with one aspect of planning, namely the study of alternatives to determine the most economical size, type and timing of the new plant. In the experience of the Bank, studies of this type are not being made often enough in the programming of electric power facilities in under-developed areas. A utility always has some choice of expanding its facilities through new plants or new units of either different size, type or timing. What is the most economical solution can as a rule only be determined by a series of comparisons of long-range programs of installations that would supply the same power market with the same dependability and reserve capacity. All too often the planning consists of "justifying" a particular project instead of determining first the needs in terms of the power market, and then the most economical solution for meeting that need, by comparing various alternatives.

The first question to be resolved in such comparative studies is the basis on which to compare the various solutions. Different planners prefer quite different bases such as the cost per kw installed, or the cost per kwh sold, or the return on the additional investment of say a hydro project compared to a thermal project. None of these is, however, completely satisfactory, because each compares different plants or programs only at one given point in time, such as at the start of operation of say the first unit or the first plant, and does not take into account the fact that the first step in an expansion program as a rule affects very much the following steps. For instance a first plant on a river may involve reservoir capacity for a number of further plants below, and thereby reduce their costs, which should somehow be taken into account in the comparisons. In other words the above yardsticks do not take into account the costs of investment plus operation of one program as compared to another <u>over a period of time</u>.

A yardstick which does take this into account is the "present worth" of the <u>total</u> cost of meeting the system load, i.e. the cost of investment <u>plus</u> operation over a period of time. (The "present worth" or "discounted worth" of an investment or expense to be made say x years hence, is the amount which, if invested at the present date and at a given interest rate, would at the end of the x years accrue to the amount of that investment or expense). This technique is increasingly used by large industrial concerns in comparing alternative investment opportunities.

In practice the application of this "present worth" yardstick has its problems and limitations because the basic data are often difficult to establish.

The most serious problem usually is to make the programs truly comparable in terms of dependability and reserve capacity. This applies particularly to comparisons of hydro and thermal projects where the streamflow of the hydro project is subject to great variations. In such cases the amount of dependable capacity that the hydro project furnishes in extreme low-water periods is important and very much subject to individual judgment. This particular problem becomes all the more difficult where the available streamflow data cover only a few years and where it is, therefore, impossible to estimate the frequency, quantity and duration of extremely low flows.

The second most difficult problem is to prepare estimates of the capital investment and operating costs for each alternative program. There is general agreement that the basis should always be present-day wages and price levels (although some adjustment may have to be made for foreign exchange costs). The problem is mostly one of: i) determining the proper amount of construction contingency funds, which is especially important in the case of hydro projects and should be commensurate to the accuracy of the basic engineering data and the stage of the engineering and design; and ii) estimating the trends of the efficiency of successive thermal plants.

The third problem is to choose the period of comparison. It should always be long enough to bring out the relative useful lives of the plants being compared. Projections of load and investment over such long periods become somewhat speculative, but in practice this is not too serious a problem, because at the rather high rates of interest applicable in underdeveloped countries the present worth factors drop off quite rapidly and an error in judgment as to the development ten or twenty years hence will affect the total present worth only slightly.

The last major problem is to choose the interest rate at which to calculate the present worth. There is general agreement that it should be the cost of money for this type of project in the country concerned (which is not necessarily the cost of money to the enterprise). Individual views on that figure may, however, differ by several percent, which considerably affects the total present worth. The higher the interest the more the thermal alternative is favored, because hydro projects always require a larger initial investment.

The result of these "present worth" comparisons should, of course, always be interpreted with a good deal of care. Above all one has to keep in mind the margin of error of the assumptions and consequently of the present worths. Where the total present worths are reasonably close, other considerations will decide the final choice of the program, such as for instance the amount of the initial investment, the construction schedule, operating characteristics of the various plants, possible changes in load factor etc. Furthermore, such studies do not settle the problem "once and for all" but have to be reviewed before the next step in a program is decided upon.

Despite all the difficulties and limitations described above, the method of comparing present worth is a very valuable tool of analysis. It is the only method which recognizes the time value of money and which correctly accounts for different amounts of investments made at different times. An additional benefit is that this process of comparison makes the planners cost conscious, and that it focuses their attention on many technical and financial aspects of a project or a program that would otherwise be overlooked.

III. A FEW PROBLEMS OF EXECUTION AND OPERATION OF PLANTS

Certain problems regarding the execution and operation of electric power plants, again not necessarily peculiar to less developed areas, also frequently cause concern in Bank financed projects.

A. Engineering and Supervision

The first of these is in the adequacy of the engineering and supervision of construction. Often these are inadequate for two principal reasons. One is that sometimes officials in charge are not fully aware of the mistakes that can be made in engineering and supervision, and how costly the consequences are, and thus they do not appreciate the risks that they are taking with inexperienced staff. The other cause is that all the under-developed countries are short of engineers, and that proper planning and engineering, therefore, means obtaining these services from abroad. This is sometimes objected to out of short-sighted feeling of national pride, but always, of course, because of the high cost. Experience is, however, gradually convincing these officials that such costs are always repaid several times over by economies and gains in quality and time.

Many under-developed countries could, however, get much more out of the services of foreign consultants by exercising more care in the basis and manner of their selection, and in the use made of them. The first step towards employing consultants should always be a very complete description of the functions that the consultant is expected to perform, and of his responsibilities. If there are engineers or engineering firms available in the country the ideal solution is for the foreign consultant to join forces with them, in order to train them and at the same time minimize foreign currency expenditures. The second step should be careful selection as regards competence for the particular job, not only by full inquiry into the experience and references of the firms, but also of the particular individuals that would be assigned to the job. Through a process of elimination this should lead to a list of maybe three to five firms from which the final choice is to be made. But all too often that final choice is still made on the basis of some sort of bidding on a total fixed cost. This is misleading because neither in cost nor quality can the bids ever be comparable, as evidenced by the fact that these "bids" by equally reputable firms often differ in proportion of one to four or more. In the experience of the Bank

a more suitable basis for awarding consultant contracts is in most cases the "cost plus fixed fee" basis. The fee and the other cost elements of the few firms to which the choice has been narrowed will of course have to be compared, but the emphasis in the final choice should always be on the competence of the firm.

Quite often it is either not possible or not desirable to delegate all responsibilities to the consultant. In these cases it is equally important for the owner to appoint a competent organization and staff of his own, and to give to its different levels clearly defined authority for making promptly the many necessary decisions.

B. Award of Contracts for Construction and Equipment

In most member countries of the Bank, the civil works are carried out, and certainly the mechanical and electrical equipment supplied, under contract with construction firms and manufacturers.

There are widely different viewpoints among agencies in charge of construction as to which type of contract is best suited for a given service or purchase, and as to which basis of award (bidding vs. negotiation) serves best the interests of the executing agency. Most of these questions again do not lend themselves to general answers, and for lack of space it is impossible to treat in this paper the many different circumstances and solutions. But there are a few almost elementary rules that would in the experience of the Bank result in better contracts and greatly reduce the related controversy.

As regards the type of contract, especially for the civil works, the most important point again is that the executing agency maintain either its own staff or retain consultants that are thoroughly experienced in the different types, and understand the construction and legal practices of the country concerned, so that they can draw up the necessary specifications and documents that best suit the particular job and local circumstances. Whether it is the fixed-unit-price, the cost-plus-fixed-fee or the turn-key type, the drafting of the contract and its administration are as important as the choice of the type. Whenever wages and prices are reasonably stable and the conditions and designs of a project well defined, the fixed unit price contract is, however, on balance the most suitable.

As regards the basis of award, international competitive bidding still is the most suitable. This is especially true because in the last few years the trends in the cost of equipment and construction have changed and because new manufacturers and contractors have entered the field. Award of large contracts by negotiation, no matter how skillful the negotiator, always leaves a serious doubt whether the final terms and prices are the best that could have been obtained. In addition negotiation has the serious disadvantage that it often leaves a doubt in the mind of the public, whose interests are always directly or indirectly at stake in the award of contracts by a public utility, whether there had not been any

improprieties. Doubts of this kind needlessly impair the public trust in the executing agency and in the supervisory apparatus of the Government.

The two drawbacks most often mentioned by critics of competitive bidding, namely that it is time consuming and that it tends to give the award to the lowest bidder regardless of qualification, can quite easily be avoided. The time required need not handicap the progress of work if the executing agency invites the bids at the proper time; and the second drawback can often be eliminated by a careful pre-qualification of the firms to be invited, plus the requirement that the agency in charge of the award take all aspects, including price, into account. If the agency in charge can establish a tradition of honesty and good judgment in this regard, its decisions will be accepted with much less controversy.

More recently many executing agencies have requested the bidders to submit with the bids an offer for financing. In the experience of the Bank this procedure is hardly ever in the best interest of the executing agency, not only because such suppliers' credits are not sound financing on account of their usually short terms, but also because this procedure drastically limits the number of bids and eliminates many which might very well be attractive on all other counts. Second, it makes it very difficult to compare offers because of the variety of the financing terms. Third, this procedure often results in expensive financing. This may not be obvious because the stated interest rate is low, but the supplier may well include in his base price a substantial amount for financing costs and risks.

C. Operation and Maintenance

The problems of operation and maintenance of power plants in under-developed countries are not much different from those in the developed ones. But the responsible officials are sometimes not aware that, as their systems grow, it becomes more and more important to review the operating rules of reservoirs and plants, the systems of load dispatching, the programs of inspection and overhaul and many other aspects that are essential for proper operation and maintenance. As many utilities in less developed areas lack experienced staff to do so, this can only be remedied by outside advice in both the methods and procedures of operation and maintenance, and by adequate training programs for local personnel.

Much of the efficiency and of the steady, well-planned growth of the public utilities in developed countries can be attributed to the continuity of its top staff. However, the efficiency of operation and maintenance of many Government-owned public utilities in under-developed countries often suffer under an additional handicap, namely frequent replacement of the top personnel because of political changes or inadequate salaries. No other measures would contribute more to the competence of the management of these utilities than i) removing them from politics; ii) paying them adequately; and iii) establishing a tradition of public service.

IV. FINANCIAL ASPECTS

A. Background

The financing of electric power expansion is particularly challenging in the first instance because of the relentlessness of the growth in its demand, and because of the fact that there is no alternative for a country but to meet this growth if the economy itself is to grow at a balanced and healthy pace. This characteristic, plus the fact that it is a monopoly, sets the electric power sector apart from most other industrial sectors and makes it basically a public service rather than an industry.

The other outstanding aspect in financing electric power is the rate of growth of its demand, and what it means in terms of new capital required. In the more industrialized countries, with the exception of Russia, the rate of increase in demand has in recent years been 6% to 8%. In Russia and the less developed countries the rate of increase has been greater, reaching averages of 10% to 15% for several years and even more for shorter periods. A cumulative growth at the rate of 7% means doubling of the installed capacity roughly every ten years.

According to statistics published by the United Nations the total generating capacity installed in public utilities (excluding industry-owned generating facilities) in Latin America was in 1958 about 12 million kilowatts, of which about 6.5 million was in thermal plants and 5.5 million in hydro plants. The cost of reproduction of these facilities at 1958 prices has been estimated at some US$3,500 to 4,000 million. Including the cost of transmission and distribution the total investment in the electric power sector amounted at that date to about twice as much. An amount of the same order of magnitude has to be invested again in the next seven to ten years, if the growth of demand during that period is to be adequately met.

The overwhelming problem is to mobilize these amounts of capital in addition to all the other needs of an economy. The methods for providing capital ~~them~~ differ widely from country to country, depending on their political and economic systems and the level of their economic development. The mechanisms and standards of financing in developed countries are also not necessarily applicable to less developed countries. This paper could not possibly cover the entire field of power financing and is, therefore, limited to the conditions of Latin America. Even so it cannot be more than a summary of the Bank's experience in this regard, and a statement of a few broad guide lines in a situation that is still in flux.

The countries of Latin America have, as have other areas, entrusted their power supply to either one or the other or both of the following basic types of institutions: i) Government-owned agencies, in most cases semi-autonomous, and in some others a department of the national Government or local administration; and ii) privately-owned corporations operating on the basis of a concession and under the jurisdiction of a national or local regulating agency.

Because of their different natures the two types of institutions have different problems when it comes to financing their expansion programs. But there is more similarity in their financing problem than one would expect on first thought, for the simple reason that both have to cope with the same handicap, namely the lack of a local capital market, or, if there is a market, its insufficiency to satisfy the needs of the electric power industry plus all other capital requirements. And it is not surprising that as a consequence the solution to this problem is about the same for both types of institutions, namely to have tariffs high enough to produce a surplus of cash from operations that will finance a substantial share of the cost of new plants. The following sections explore further the particular financing problems of these two types of institutions. Historically, the privately-owned corporation was the first on the scene, and it is, therefore, instructive to cover it first, although today it is definitely second in importance.

B. The Problems of the Privately-Owned Utility

Nearly all privately-owned electric power utilities of Latin America were founded shortly before or after the first world war by foreign financing houses in the expectation of a good return on their investment. Two basic conditions encouraged this, namely: i) complete freedom in the flow of capital to and from the under-developed countries; and ii) the lack of tariff regulations (or, if there were any, their liberal drafting and implementation). These two conditions have gradually disappeared in most Latin American countries, and the remaining privately-owned utilities find themselves under severe restrictions as regards transfer of interest and capital, and often with very inadequate earnings. As a consequence they find it enormously difficult if not impossible to finance the expansion programs that are needed to keep up with the increase in demand of their areas.

What are the sources of capital of a privately-owned utility? Basically they are: i) new share capital, ii) new borrowings, and iii) depreciation reserves and retained earnings. (As a matter of interest in the United States in recent years about 15% to 20% of the new capital expenditures of privately-owned power companies have come from new share capital, about 45% to 50% from new long-term borrowing, and about 35% from depreciation reserves and retained earnings.)

In the final analysis a privately-owned utility can only successfully draw on these various sources to finance its expansion programs, if its revenues are sufficient to produce adequate net earnings per share and adequate debt-service coverage.

There is no easy general answer to the question of what net earnings and debt-service coverages are adequate to achieve this result. As regards earnings it is in the first instance a matter of definition (the "net" means the earnings after deduction of the obvious expenses such as operating, maintenance and administrative expenses, taxes and interest,

and after adequate depreciation, where opinions can differ widely as to what is adequate), and secondly it is a matter of the actual amount or percentage, were again the answer depends on the particular case.

The retained earnings should always, together with the depreciation allowance, meet a substantial portion of the cost of the new investments. The debt-service coverage should be such that the utility can borrow from domestic and foreign lending institutions at reasonable terms. And finally, because internal generation of cash plus new borrowings cannot indefinitely cover all the needs of new investments, the amount of the earnings and the amount which is paid out in the form of dividends, has to be such that the utility can compete in the national and foreign financial markets for new share capital. A number of Bank loan agreements with privately-owned utilities include tariff covenants covering one or more of these points.

The above questions about adequacy of return and of debt-service coverage can be analyzed and treated in the abstract only up to a point. The final proof of the analysis is in a utility's success or failure in issuing new shares or bonds. Maybe the most effective way to illustrate this further is, therefore, to look at the example of an important privately-owned utility in Latin America which has recently obtained substantial new funds in the world financial market as described in Annex I.

It should be pointed out, however, that the possibility of raising funds in the world market is not just a matter of an "adequate" net earning and debt-service coverage at the time the financing is needed. Even more important is the attitude and tradition of a country or its responsible regulating agency towards the privately-owned utilities in general, and the record in case of the particular utility in question. Unless there is a favorable atmosphere and prospect not only of fair treatment but encouragement of private capital investment, backed up by long experience with adequate tariffs, private capital will go to other more attractive sectors.

C. The Problems of the Government-Owned Utility

Most of the Government-owned public utilities of Latin America were created because the privately-owned utilities, which were founded first, were unable, mostly for the reasons given in the previous chapter, to finance the expansion of facilities which the economic growth demanded. In some cases an additional reason was the pressing need for rural electrification which could not pay for itself in a commercial sense. Finally there was the political pressure on many Governments to enter the public utility sector because of the belief that they could fulfill these functions more efficiently and economically.

The principal source of finance of these Government-owned utilities are appropriations from the national budget and the proceeds from special taxes. These utilities usually do not pay any interest or dividend on these funds. In addition they have, of course, new borrowings,

depreciation reserves and retained earnings available as sources of financing new investment, just as do the privately-owned utilities. New borrowings are as a rule more easily obtainable by the Government-owned utilities than by those privately-owned, because the former can usually borrow with Government guarantee.

Many of the Government-owned utilities have by now grown to impressive size. In some countries they have a monopoly on power generation, and in others privately-owned utilities continue to co-exist with them.

These Government-owned utilities face, however, in large degree the same difficulties in financing their expansion as those which are privately-owned, because: i) the capital needs of these programs are far greater than the amount of appropriations that the budgets can allocate to this purpose, and ii) the capacity to borrow locally and abroad is also limited even with Government guarantee, on account of the size of the debt-service and the Government's own creditworthiness.

There is again in the final analysis only one way for the Government-owned utilities to finance their expansion programs, and that is for the revenues to be sufficient to: i) cover all operating, maintenance and administrative expenses, taxes, interest and adequate depreciation; and ii) create a surplus that will provide for the repayment of loans to the extent that it is not covered by depreciation, and in addition provide for a reasonable part of the cost of new investments. A number of Bank loan agreements with Government-owned utilities include tariff covenants to that effect.

Just as in the case of the privately-owned utilities it is difficult to give a general answer as to what is the level of net earnings that will permit the utility to obtain funds in the world market, it is equally difficult in the case of Government-owned utilities to say what is a "reasonable" part of the cost of future expansion. With the Government's total revenues always far short of the total demand for them, the choice often reduces itself to either curtailing Government outlays in other sectors or financing more of the electric power programs from internal generation of cash (the only other alternative being to finance by inflationary means which is no real solution). It is interesting to note in this connection how large a portion of this investment is financed from internal sources by public utilities owned by the national or local governments in developed countries, where credits are more easily available. In the United States the Department of Water and Power of the City of Los Angeles and the Puerto Rico Water Resources Board, and in England the Electricity Council are already providing through depreciation and retained earnings some 40% to 50% of their new capital expenditures, and are planning to continue to do so.

Annex II shows the application and source of funds of several large Government-owned public utilities in Latin America which have recently obtained large loans in the world financial market. These situations are not to be taken as ideal, but they give an indication of actual order of magnitude of amounts involved and especially certain ratios of sources of funds.

In conclusion a word about the mechanism by which the tariffs of Government-owned utilities are set and adjusted. In a number of countries the Tariff Commission still has jurisdiction in this regard, just as for the privately-owned public utilities. As both the utilities and the commission are Government agencies, this is really quite unnecessary and usually only complicates and delays tariff adjustments. From the viewpoint of promptness of adjustments and ability to incur new debt, it is much more desirable to make the Government-owned public utilities entirely autonomous in the matter of tariffs, as they are in most developed countries.

D. Some General Comments and Conclusions

From the preceding chapters two conclusions stand out above all others, namely that: i) the amount of capital required annually for the expansion of electric power facilities will continue to be very large and become increasingly larger during the coming years, and ii) the most effective and often the only basis for financing these expansions, regardless as to whether the utility is publicly or privately-owned, is to produce a cash surplus from operations that will cover a substantial part of the new investments.

Some under-developed countries in Latin America and elsewhere have come to these same conclusions in recent years and have passed legislation that spells out in considerable detail what the tariffs should cover, and that provides also for automatic or at least annual adjustment. In the light of past experience with the slowness of action by the Tariff Commissions, this procedural provision of making the tariff adjustments automatic or periodical, subject to subsequent review (and revision if need be) by the Tariff Commissions, is almost as important as spelling out what the tariffs should cover.

The consequence of adopting the above concepts means, of course, in many instances higher tariffs and the arguments are often made that this will prohibit industrialization and is socially undesirable.

The first argument is incorrect altogether. As stated before, the cost of electric energy represents in most industries only 1% to 2%, and whether an industry will establish itself in a certain location depends much more on a number of other factors, previously listed. And if it is a question whether a power-intensive industry such as say aluminum will establish itself in a certain location or not, the industrial and the power development usually have to be planned and appraised jointly, and the economics established for the combined undertaking.

The social consequences, i.e. the effect on the cost of living of the small household, is often much exaggerated. In the last few years the cost of power for the residential user has in most countries increased less than almost anything else, and is a small fraction only of the total cost of living. Furthermore, the residential consumption represents in Latin American countries as a rule only a relatively small portion of the

total consumption, so that there is always the possibility of increasing residential rates less than others and still producing substantial additional revenues.

To repeat in conclusion what has been said earlier, the emphasis in all considerations regarding tariffs and financing of electric power should be on plentiful electric power rather than cheap power. The saying is quite true that for any economy the most expensive electric power is the power which it does not have.

CASE - A [1]
(In millions of US $)

Years as of December 31	ACTUAL 1955	1956	1957	1958	1959	FORECAST 1960	1961	1962	1963	1964
I - FINANCIAL RESULTS										
Net Income Before Interest	2.910	3.336	3.731	3.178	3.938	4.757	4.914	5.539	5.814	6.789
Interest Payable	.854	.879	.798	1.021	1.386	1.721	2.218	2.625	2.875	2.985
Interest Charged to Construction (Credit)	-	-	-	.182	.269	.527	1.046	1.314	1.600	1.008
Financial Expenses	-	-	.225	.140	.219	.282	.271	.250	.257	.193
Taxes	.996	.404	.197	. 97	.125	.157	.168	.193	.207	.221
Total Income Deductions	1.850	1.283	1.220	1.076	1.461	1.639	1.611	1.754	1.739	2.331
Net Profit	1.060	2.053	2.511	2.102	2.477	3.118	3.303	3.785	4.075	4.458
Less: Cash Dividends [2]	.904	1.371	1.673	1.499	1.772	2.117	2.200	2.500	2.707	2.914
Retained Surplus	.100	.614	.757	.432	.630	.925	1.017	1.200	1.282	1.453
Directors Bonuses	. 56	. 68	. 81	.171	. 75	. 76	. 86	. 85	. 86	. 91
Amount of Net Earnings per Share (in $)	. 8	. 12	. 14	. 10	. 9	. 10	. 12	. 12	. 11	. 14

						Total 1955	Total 1959					Total 1960	Total 1964
II - EXPANSION FINANCING													
A - Expansion Program	2.685	3.394	4.617	5.630	7.370	23.696	100%	11.900	11.960	11.580	6.910	5.380	47.730	100%
B - Sources of Funds:													
Internal Cash Generation [3]	1.732	1.908	.823	1.428	1.482	7.373	31	1.190	.970	.790	.480	1.240	4.670	9
New Share Capital: Ordinary	2.263		2.300	.600		5.163	22	1.180			2.320		3.500	7
Preferred [4]								6.000					6.000	13
Debentures [5]			6.000	6.000		12.000	51	3.000	3.000			1.500	7.500	16
Long-Term Foreign Loans [6]		.606				.606	2	1.900	9.070	5.210	4.140	3.680	24.000	50
Other Contribution [7]								1.560				.470	2.030	4
Cumulative Balance	1.310	.430	4.936	7.334	1.446	(1.446)	(6)	4.376	5.456	(.124)	(. 94)	1.416	. 30	1
						23.696	100%						47.730	100%

1/ This case relates to a private company which had an installed capacity of 184 MW at the end of 1959.
2/ The transfer of the dividends is guaranteed by the electricity law.
3/ This item represents total amount of net income before interest plus depreciation less total debt service.
4/ These shares are denominated in US$ and have a net dividend of 8%.
5/ The funded debt includes: 1957 - 7% series A debentures redeemable on or before July 1, 1972,
1958 - 7% series B debentures redeemable on or before November 1, 1973,
1960, 1961 and 1964 proposed series of debentures have been assumed to have similar terms.
6/ A $24 million loan for a term of 25 years and an interest rate of 6% after 1959.
7/ This item includes suppliers' credits ($.76 million) and the contributions ($1.27 million) to be made by an associated company.

CASE - B [1]
(in millions of US$)

Years as of December 31	ACTUAL 1955	1956	1957	1958	1959	FORECAST 1960	1961	1962	1963	1964
1.- FINANCIAL RESULTS										
Net Income Before Interest	. 72	.379	.329	.400	.253	.465	.805	1.194	1.372	1.511
Interest Paid	-	-	. 47	.78	.199	.435	.519	.560	.624	.683
Interest Charged to Construction (Credit)	-	-	. 47	.78	.180	.205	.298	. 64	.151	.234
Less: Interest Charged to Operations	-	-	-	-	. 19	.230	.221	.496	.473	.449
Net Profit	. 72	.379	.329	.400	.234	.235	.584	.698	.899	1.062
Reserves	. 3	. 22	.130	. 26	. 12	. 12	. 29	. 35	. 45	. 53
Dividends [2]	. 69	.357	.299	.374	.222	.223	.555	.663	.854	1.009

						Total 1955	1959						Total 1960	1964
II - EXPANSION FINANCING														
A - Expansion Program	.207	.494	1.390	1.973	7.254	11.318	100%	7.314	1.944	1.634	2.567	1.158	14.617	100%
B - Sources of Funds:														
Internal Cash Generation [3]	.181	.716	.625	.704	.474	2.700	24	.238	.629	-	. 93	.240	1.200	8
Payments of Subscribed Capital		.726	.726		.722	2.174	19	1.522					1.522	10
New Share Capital								2.056	1.508				3.564	25
Long-Term Foreign Loans [4]			.309	1.575	4.372	6.256	55	3.584	.160	1.264	2.286	1.234	8.528	58
Local Borrowing					.828	.828	7							
Cumulative Balance	(. 26)	.922	1.192	1.498	.640	(.640)	(5)	.726	1.079	.709	.521	.837	(.197)	(1)
						11.318	100%						14.617	100%

1/ This case relates to an autonomous corporation, the capital of which is owned by public entities such as: state pension funds, municipalities, etc... The company started operating in the second half of the year 1955. Its installed capacity was 23 MW at the end of 1959.

2/ Dividends cannot be cashed before 1962. During the period 1955-1962 they are blocked in a special account. After 1962 a dividend of 7% is supposed to be paid to shareholders.

3/ This item represents total amount of net income before interest, plus depreciation and less debt service.

4/ Foreign borrowing includes several loans with terms of 20-25 years and rates of interest of 4-3/4% and 5-3/4%.

CASE - C[1]
(in millions of US$)

Years as of December 31	ACTUAL 1955	1956	1957	1958	1959	FORECAST 1960	1961	1962	1963	1964
I - FINANCIAL RESULTS										
Net Income Before Interest	(.52)	.83	(.386)	.144	.423	.787	1.112	1.707	2.380	2.801
Interest Paid	.177	.249	.305	.426	.528	.371	.652	.933	1.039	1.058
Interest Charged to Construction (Credit)	.133	.208	.267	.283	.260	.211	.535	.877	.509	.256
Less: Net Interest Charged to Operations	. 44	. 41	. 38	.143	.268	.160	.117	. 56	.530	.802
Net Profit	(. 96)	. 42	(.424)	. 1	.155	.627	.995	1.651	1.850	1.999

						Total 1955 - 1959							Total 1960 - 1964	
II - EXPANSION FINANCING														
A - Expansion Program	4.345	6.030	3.641	3.302	1.116	18.434	100%	1.943	8.307	6.897	3.009	7.077	27.233	100%
B - Sources of Funds:														
Internal Cash Generation[2]	-	. 20	-	-	-	. 20	-	.131	.258	.974	.626	2.492	4.481	16
Government Contribution[3]	2.186	3.523	1.954	1.797	.920	10.380	56	1.084	1.069	1.069	1.069	1.069	5.360	20
Long-Term Borrowing:														
Local Bonds[4]	3.113	.671	. 54			3.838	21							
Local Bank Loans[5]			1.043	1.532	1.066	3.641	20	1.069	1.069				2.138	8
Foreign Bank Loans[6]									5.802	4.798	1.572	3.490	15.662	58
Suppliers' Credits	1.279	.215	.212			1.706	9							
Cumulative Balance	2.233	.632	.254	.281	1.151	(1.151)	(6)	1.492	1.724	1.900	2.334	2.742	(.408)	(2)
						18.434	100%						27.233	100%

1/ This case relates to a wholly publicly owned company; installed capacity of the company was 48 MW at the end of 1959.
2/ This item represents total net income before interest plus depreciation and less debt service.
3/ Government contributions are not repayable and do not receive any interest.
4/ Local bonds have a term of 11 years and a rate of interest of 4%.
5/ Local Bank loan with a 19 year term and a rate of interest of 7%.
6/ The foreign Bank loans represent after 1959 several loans with terms of 25 years and a rate of interest of 5-3/4%.

ANNEXE II

C A S E - D [1]
(millions of US$)

Years as of December 31	1955	1956	1957	1958	1959
I. Financial Results					
Net operating income before interest	.169	.824	1.404	1.432	1.755
Non-operating revenues	.362	.692	.414	.291	.346
Gross income	.531	1.516	1.818	1.723	2.101
Interest payable	.186	.671	1.018	.918	.836
Interest charged to construction (credit)	.703	.701	.963	.859	.351
Other income deductions	. 23	.304	.224	.132	.123
Net profit	1.025	1.242	1.539	1.532	1.493
Reserves	.130	. 47	. 90	.189	. 99
Dividends [2]	.791	1.183	1.199	1.126	1.336
Surplus	.104	.112	.250	.217	. 58

						Total 1955 - 1959	
II. Expansion Financing							
A. Expansion program	9.360	12.990	11.370	6.590	5.570	45.880	100%
B. Sources of funds:							
Internal cash generation [3]	-	.236	-	.323	.958	**1.517**	3
Increases of capital	3.907	7.863	6.146	4.664	3.970	26.550	58
Long-term local loans [4]	2.739	1.828	2.541	1.877	1.023	10.008	22
Long-term foreign loans [5]	2.625	.614	2.311	1.434	.249	7.233	16
Suppliers' credits	.335				.468	.803	1
Cumulative balance	.246	(2.203)	(2.575)	(.867)	.231	(.231)	-
						45.880	100%

1/ This case "D" relates to a mixed company in which capital belonged for 95% to the state and 5% to private interests as of December 1959. The company had an installed capacity of 165 MW at the end of the period studied.
2/ Dividends are reinvested in the company, except for the small percentage paid to private interests.
3/ This item represents total amount of net income before interest plus depreciation and less debt service.
4/ Long-term local borrowing includes several loans, the repayment of which ranges from 8 to 20 years.
5/ Long-term foreign borrowing includes two loans with terms of 17 and 20 years and a rate of interest of 5%.