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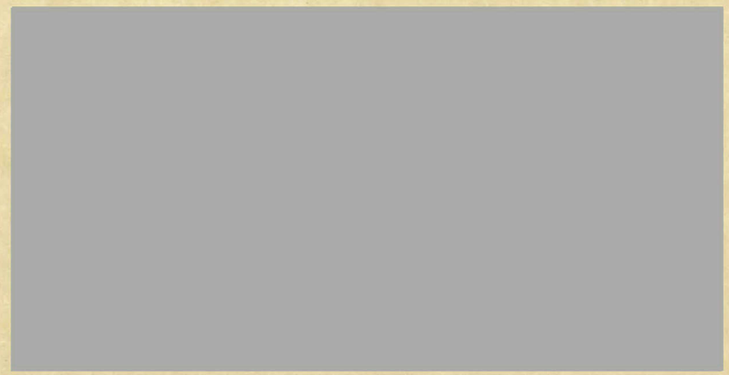
Power - Follow up

1974 (Jan)



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File Power Allowance

Your ref: PHP

January 23, 1974

Mr. Malcolm Prior
Deputy Chief Engineer
The South Wales Electricity Board
St. Hellens
Cardiff CF3 9XH
Wales
United Kingdom

Dear Malcolm:

Re: Investigation into Standards of Urban Electricity Distribution

Thank you for your letter of January 16, 1974, which arrived Monday with three copies of your report. Unfortunately, the previous ten copies which you sent on January 3, 1974, have not arrived and I think it is unlikely that they will now do so. Consequently I am hoping that you could send me another three or four copies.

We will let you know about our next move when we have had a chance to study the report.

Sincerely yours,

Thomas H. Berrie
Power Advisor
Public Utilities Department

cc: Messrs. Willoughby, Duckerley, Povrul, Howell, Friedmann

THBerrie:cdd

Control # 7417

JAN 24 1974

FORM NO. 75
(7–73)

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ROUTING SLIP	DATE January 22, 1974

NAME	ROOM NO.
Mr. Willoughby	G1050
Power Follow-up	

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	FOR ACTION		PER YOUR REQUEST
XX	INFORMATION		PREPARE REPLY
	INITIAL		RECOMMENDATION
	NOTE AND FILE		SIGNATURE

MARKS

Village Electrification Policy Paper
Institutional and Financial Aspects

I enclose a draft of the above paper, written by a consultant to the Bank, for your information.

FROM	ROOM NO.	EXTENSION
T. Berrie		

CHRIS L. SCHULTZ
8208 Kerry Road
Chevy Chase, Maryland 20015
Phone (301)-656-5132

January 18, 1974

Mr. T.W. Berrie
Power Advisor
Public Utilities Department
International Bank for Reconstruction
and Development
1818 H Street NW
Washington, D.C. 20433

Dear Mr. Berrie:

Re: Village Electrification Paper
Institutional and Financial Aspects

Enclosed is first draft dated January 18, 1974 of the two sections of the Policy Paper entitled "Institutional Aspects" and "Financial Aspects"

Inasmuch as this is a first draft of these sections there will probably be some revisions required in their content. After your review of the papers we can schedule a meeting to go over the comments of you and your staff and discuss any changes to be made in the content of the papers.

Sincerely,

Chris L. Schultz

Chris L. Schultz

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JAN 22 1974

Draft -- January 18, 1974
Chris L. Schultz

POLICY PAPER

LENDING FOR VILLAGE ELECTRIFICATION

INSTITUTIONAL ASPECTS

I. FACTORS CONTRIBUTING TO DEVELOPMENT OF VILLAGE ELECTRIFICATION.

a. Government attitude.

Village electrification in a developing country introduces a sector of economic development that is largely in an unexplored area. Problems and considerations are many and varied and are vastly different in many respects from those found in the usual utility project. For this reason certain criteria must be present when village electrification is being included in the development plan of a country. It is most important that the environment and attitude of the government officials must be properly analyzed because the key to a successful program lies in the sincere desire of the government to foster and support village electrification.

Governments in most developing countries have goals leading to improved social and economic conditions in their country. Often the officials of the developing countries are aware of programs that will be of benefit to the rural areas of their country but because of limited technical ability or experience they are not able to take the initiative. In addition, the social and political implications in rural development may prevent an effective implementation of a particular rural development plan. Furthermore, officials who administer programs of the government are operating under pressures and constraints which may limit their abilities to act effectively on certain type programs. It is likely, however, that a government interested in village electrification as an element in its rural development plan would be receptive to outside help in overcoming some of their policies that hinder development.

Another factor to be considered is the fact that the attitude of a government towards various sectors of the counntry's development programs will vary and change from time to time. The government attitude toward an individual program is influenced to a great extent by political as well as economic factors and while this attitude reflects situations within the government, it can be influenced to some degree by outside efforts.

An important consideration in a program of village electrification is the government attitude toward the subsidization of other programs having large social impact such as roads, schools, public health and

rural areas to bring about a concerted demand for electric service and the central government reacting to pressures from other areas or other sectors may, if not particularly interested, neglect the village electrification aspect of rural development. It is in the central government, however, where the importance of electricity in the development of the country as a whole and the rural areas in particular can be expected to be understood and factored into the planning for government sponsored programs.

In a number of developing countries there are state, regional and local governments that are quite knowledgeable and active in bringing electric service to the rural areas in their jurisdictions. In some cases they are to a great extent able to secure the financing needed to provide the necessary facilities for serving the customers. But in most cases the governments below the central government level are dependent upon the central government for budget support of socially oriented projects. Nevertheless, the lower level government agencies can have a great influence on the thinking in the central government when it comes to the planning and programming of the country's development activities.

If the central government policy if favorable toward the social development of the rural areas and is willing to cooperate in the development and provide budget support as well as other assistance, the programs could be handicapped by lower level government agencies that are not favorable to such programs. There have been instances where a central government policy has been carried out with good results in some areas of that country while in other areas those same programs made little progress, primarily because of the lack of interest on the part of the local agencies.

Since village electrification is to a great extent a social endeavor it is most important that the central and local governments be solidly behind the program. For whatever reason village electrification has not been given attention in the past, it is most important that the attitude of the involved government be appraised to assure that the government is now receptive to the programs and is ready to commit itself to a long range development program.

b. Economic status

Experience in developed countries indicates that there is a relationship between the consumption of electricity and income level. In areas of high average income it is usually found that those areas also have a high average consumption of electricity. Therefore, the degree of economic level of a village is a major factor when planning a program of electrification.

A village electrification program to be successful must fit into the rural economic development plan of the country. In addition there must be a potential for economic growth in the area being considered in order

to produce the economic benefits projected for such a program. The area must be in an economic position to utilize the electric facilities as fast as they are made available. Electric systems are high capital investment enterprises and must be utilized to their fullest to achieve their economic and social purposes. Unless this condition is realized the revenues will lag behind the projections and the project will not be successful.

Employment, income distribution and population growth are all vital issues which have a bearing on the appraisal of potential for use of electricity in the area. These factors must be considered because the purchasing power of the individual user is important for viability of the program. The economic status of the individual is of prime consideration since there will be the need for purchases of equipment, wiring of his property, and payment for the electricity he uses.

It must be recognized that in the typical developing country the low income and low user of electricity spends a greater share of his income for electricity than does his higher income neighbor. In a developing country where the income level is low it can be expected that the majority of users, particularly in the early periods of operation, will be users in the lower ranges of usage. Such a system wide low average consumption results in a high unit cost for serving each consumer. A high level of retail rates may not produce sufficient revenues to meet operation costs and retirement of debt because high retain rates may discourage the use of electricity and defeats the purpose of making electricity available. The alternative to increased retail rates is a subsidy of some sort from the government to offset these deficiencies in order to benefit the economic and social bearing of the country.

c. Cultural status.

In the developing countries there is development in both the industrial and social and cultural environments. As the cultural and social levels advance so do the requirements and needs of the people for those things that are a part of the cultural and social well being and which contribute to further improving them. As the people begin to reject the former way of life and begin to want improvements in food, shelter, clothing, health and education there will be the social and cultural developments necessary to allow them to achieve those ideals. The degree of economic development effects the desires or willingness of people to change their way of life in an effort to benefit themselves.

The success of any economic program in the final analysis depends on human resources. People must be receptive to new ideas and technical advances. Their make-up must allow them to take risks which comes as a part of economic development and to form viable working organizations.

The people must be prepared to adjust their values, attitudes and motivation to do what is required and expected of them to accomplish their purposes.

The cultural climate must be such that the people will voluntarily change their traditional ways of life. Wide differences exist in living style and needs of the villages and peoples in areas at a distance from industrial towns, schools, medical facilities and industry. Physical conditions in which the people live contribute to their way of life and the climate, typography and natural resources have a major bearing on the lives of those people. In addition the facilities for transportation and communication have a great influence in the habits of the people. Because of these variable the skills, levels of education, attitudes and values will be reflected in the people living in those areas.

A systematic analysis of cultural elements is important in a program of village electrification. The cultural elements have a crucial effect in the implementation of a program of rural and village electrification. The ethnic background, family relationships, leadership patterns, value systems and technological levels of the people are related to ways of making a living and being service by such facilities as health, education and communications. One of the most important factors in the overall development of a country or area is for the economic development and social development to advance at the same rate and that neither is allowed to get far ahead of the other. The higher the level of cultural development the higher is the possibility of village electrification being beneficial in furthering the rural and village development of the area.

d. Literacy level.

The literacy level of an area being electrified will have a large bearing on the type of institution best suited to provide electric service to the area. It can be expected that the rate of literacy will be low in many of the villages where electrification is being considered. Recognition of this fact will do much to alleviate problems which can develop as a result of low level of literacy. However, even where the literacy rate is high a program of training and education of the users is needed to obtain the maximum benefits from the use of electricity. Where the literacy level is high a program of education can be developed by distribution of printed literature implemented by demonstration. However, where the literacy level is low the education process must be dome by word of mouth and demonstration. Radio and TV can be used to good affect to educate users in all areas but they can be used to particularly good advantage in the areas of low literacy.

In a village electrification program the people need to work within

their immediate areas in the development and operation of the program. Where the people understand the purpose and benefits available to them from an electrification program they are more likely to associate themselves with the development program and do their part to make the program succeed. Here, also, if the literacy level is fairly high young people can be selected and trained for sub-professional jobs and then go on to work with their townspeople in explaining the program, its benefits and how each person con benefit the most.

e. History of individual initiative.

The success of a program of village electrifications depends upon the use made of the service. It is therefore imperative that the people take an active part in the development phases of the program. This requires initiative on the part of the people because village electrification is to a great extent local enterprises and much initiative is required to accomplish and achieve the desired purposes and benefits.

Since the village electrification program to be successful needs the support of the local people it follows that the people must be ready to assume responsibilities. Active involvement of the people in developing programs and carrying them out is most important. The more initiative the local people display the more active will be their involvement and the more attention they will receive from those wha can be of assistance to them. Self-help is a significant factor in rural electrification and the extent to which this can be useful will depend upon the initiative and motivation of the local people in wanting to help themselves to obtain the things they want.

In some areas the local people have had few or no occasions to exercise initiative. This has been the situation either through a lack of a need for change or where the government or others have made the decisions and carried out those programs that they felt warrented their attention. It is accepted that where the local organizations have been suppressed or discouraged there is little evidence of local spirit. Consequently the effectiveness of local organizations in the past is indicative of the initiative that can be expected in a new program such as village electrification.

The demonstrated initiative of the people and their insistence on having electricity in their village will have much influence in decision making by the officials who must be convinced that village electrification is good not only for the local people but for the country as a whole. The local people must inject their ideas and take the initiative in undertaking the groundwork needed to support their contentions that village electrification is wanted and needed.

While the demonstrated initiative or the people themselves is important

there is to be considered the history of the central government or country in allowing the peoples' initiative to develop or exert itself. Where the government has encouraged initiative on the part of its people to help themselves, there has been more success in local enterprises. Consequently, in those countries where the governments have encouraged the people to come forth with their ideas and has helped them to carry them out a program of village electrification can be expected to be successful.

f. Other programs.

The relationships of other sectors of rural development to village electrification is a phase of the development program that must not be neglected. Programs such as education, water supply, health, agro-industrial and commercial development are to a great extent dependent upon electricity and to each other for their success. It must be kept in mind, however, that electricity is not an end in itself but is a means to an end. Therefore, every effort should be made to coordinate the several sector programs in the rural area with village electrification so that they do not work at cross purposes. At the same time coordination of programs can result in each one being more successful.

Success in one sector must be considered in relation to its affect on other sectors. It is possible for a project to be technically and economically sound but its relation to other programs or conditions in the area may make its success problematic. In some cases there may be a conflict of purpose and results unless the programs have been planned and programmed together. An appraisal of the complimentary programs in the area and a serious effort to coordinate their several programs will result in a much more satisfactory project for each than if each sector goes its own way alone.

A guide to the effectiveness of the cooperation among sectors is the experience already had with on going sectors and programs in this area or in other comparable areas. If those programs have been coordinated successfully there is good likelihood that the electric program can be included in future efforts. However, if such coordination did not exist or lacked effectiveness, then an analysis should be made to find the cause and establish corrective procedures.

II. REQUIREMENTS OF INSTITUTIONS IN DEVELOPMENT OF VILLAGE ELECTRIFICATION

The institution that assumes responsibility for carrying out a program of rural or village electrification is confronted with many problems not usually found in utility projects.. Because of the problems peculiar to village electrification the institution must be dedicated to the proposition of village electrification for without that attitude the program will not be able to overcome the obstacles to its success. Village electrification has many facets which are not found in the urban and suburban utility. For the most part data and precedents needed for good planning are pradtically non-existent and must be developed. The need for a sympathetic attitude on the part of the officials requires that ideas and methods of program development used in the past must be discarded or revised to meet the requirements of this type of enterprise. The work is simplified if the people involved have experience and background in village electrification activities. Consequently when experienced expertise is not available in the institution or country, there must be effort made to secure people from the outside who do have that knowledge.

One of the problems encountered early in the planning of a village electrification program is that of estimating future market requirements for electricity. Where electricity is not available the potential user in many casis has had little or not experience in using electricity. Under those circumstances it is difficult to obtain a meaningful estimate of the potential use of electricity by these people. This is where the experience of the appraiser is a dominant factor in obtaining as realistic as possible an estimate of the future market for electricity in the village.

Since village electrification is in most cases a marginal operation every opportunity must be taken to reduce the cost of providing service to the ultimate user. The institution responsible for administering the program of village electrification must take the lead in developing ways and means for accomplishing this economy in construction. Such factors as using locally produced materials, developing standards of design and construction that will provide an acceptable degree of reliability and adequacy of service at the lowest cost for engineering and construction are of major importance. Enlisting the help of the local people in doing some of the unskilled labor requirements such as digging pole holes, clearing of rights-of-way and numerous undkilled jobs on the ground are some of the ways in which costs can be reduced to the benefit of the village users. The responsible intitution must be prepared to appraise the local situation and develop methods to fit the needs of the area being considered.

The policy of the central government sets the overall direction for the governmental agencies to follow. But within the guidelines of government policy it is incumbent upon the responsible institution to develop a program of electrification that will provide the most benefits

in the most economical way.

In addition to being able to foresee and handle problems of construction and operation, the responsible institution must also have the support and confidence of other agencies working toward the same goal of rural development. The responsible institution then can work with other agencies in related programs and sectors and effectively coordinate its work with the efforts of the other agencies. This concept of support extends also to public groups interested in rural development either on national, regional or local levels. The support of public groups goes a long way in convincing government officials of the importance of their programs.

Possibly one of the most important functions of the institution having responsiblity for the village electrification program is that of obtaining capital needed in the development and execution of the program. In practically all cases the villages to be served are not in a position either economically or by knowledge to raise the funds needed to carry out a program of village electrification. Consequently there must be an institution in a position to raise capital from government budgets and revenues, banks, or other lending institutions. Since the project will probably have a low rate of return the responsible institution must have the authority to assume responsibility for repayment of any loans for the project in the event of an unprofitable operation. This condition in itself places on the administering institution the burden of determining that the village electrification projects are not only implemented in an efficient and economic manner but is also operated after construction is completed in accordance with good utility practice.

The operating institution in village electrification often is a small entity that lacks experience in electric utility operation and is not likely to be in a position to finance during the early period of operation a balanced and competent staff. Consequently help in operating the system will be needed from the institution administering the program. The assistance needed will range from the development stages at the inception of the program through the engineering and construction phases into the development and training of an operating staff and a program of user education. This type of assistance is available to these small entities only from those experienced in utility operation. Consequently the responsible institution must recognize and accept the fact that it will have to provide those services. This overall responsibility is not to be taken lightly inasmuch as the success of village electrification depends upon a well coordinated and expertly administered program.

There is little likelihood of sufficient local ability to develop a program of electrification in conjunction with other sectors. It therefore falls upon a responsible institution to develop and coordinate the electrification program with other sectors. In addition to the actual development of a program after a decision has been made to proceed it is often necessary for the policy institutions of the central government to become involved in a program of local education

and appraisal in order to determine those areas best able to benefit from the development program and to instill in the local people the enthusiasm needed to made the program workable. This again requires a close working relationship with other government sector agencies.

Because the usual village electrification project is planned in an area where only low financial return can be expected it is most important that the planning of the programs be based on well developed studies which are substantiated to the fullest extent by field investigations so that they can be justified in the governments's program of development. This is not a cursory exercise but is a well thought out and supported presentation requiring capable staff people. The importance of their input into the planning cannot be over emphasized. This then makes it all the more incumbent upon the institution administering the program to have staff competent to carry out these activities.

A characteristic of a well oriented institution planning to undertake to administer a program of rural or village electrification is that of seeking and using advice in those areas where it recognizes deficiencies in it competency. Because of the limited experience in the field of village electrification it is expected that the usually well qualified and staffed institution will not have the necessary experience and competency in all phases of the program. A recognition of those areas of deficiency and obtaining assistance is of the utmost importance to the successful conduct of the village electrification program. An appraisal of the administering institution will bring deficiencies to light and it should be a requirement of the financing institution that those deficiencies be corrected either through additions to its staff or the use of qualified consultants from the outside.

III. TYPES OF INSTITUTIONS

a. Agencies of the central government

A program of village electrification is one that requires a different approach than has been used heretofore on the more conventional types of electric power generation, transmission and distribution projects. Where in the latter type projects there is extensive knowledge and experience in planning, developing programs, constructing and operating of those types of projects, such is not the case in village electrification. Consequently in village electrification a great amount of ground-work must be done prior to undertaking the implementation of such a program.

While it is natural to thnk first of the end result and begin work at the village level, this step should not be taken until there has been established a country policy for developing village electrification, a program has been developed for carrying out that policy, there is an assurance of funds to carry out the construction of electric facilities, a source of power has been determined to be available, wholesale and retail rate schedules arranged, advisory personnel are available either to implement the program or to assist other implementing agencies in that development, standards for construction established and a method of coordinating the electrification program with the program of other complimentary sectors.

It has been found that primary responsibility for village electrification must be assumed by the central government agencies. In many countries there are agencies set up for that purpose or they can assume those new activities as a part of their existing responsibilities. The administering agency must be in a position to monitor the program and to have the capability to supervise programs with the thought that technical assistance may be needed by the operating entity whether it is a private, state government or cooperative type of enterprise. Such a staff need not be particularly large but it must be composed of personnel having the knowledge and experience to handle this type of program with its many problems.

The concept of village electrification is vastly different from that of the usual distribution system af an urban or suburban area. The cost per user of providing the electric distribution facilities is relatively high, the revenue is low and quite often the economic level is not conducive to rapid economic growth needed to produce revenues large enough to meet normal operating costs. Consequently in many cases a subsidy of some sort is required such as low interest rates, government provision of advisory services, or reduced rates for wholesale power. In some cases support from the federal budget may be desireable.

Agencies at the central government level that are in a position to administer a program of village electrification will vary from one country to another. Typical agencies that could be involved in such a program are those concerned with planning, programming, economic

development, financial and of course those with utility responsibility. The degree to which any of those agencies are capable of or have the potential to administer a program of village electrifciation will depend upon the attiudes of the people within each agency, its purpose and relative position within the government structure and its ability to carry out on a continuing basis the functions which will be required of it in a program as extensive as village electrification.

Because of the wide spread implications of village electrification covering not only the economic and social as well as the political aspects, it follows that a number of agencies responsible for different functions of the central government could be actively involved. Foremost in the list of involved agencies is probably the one concerned with formulating policy at the central government level. Since the government policy toward village electrification is the directive followed by the other agencies in the government the policy so developed must be well defined to eliminate misunderstandings and to allow the policy to be implemented in the most efficient manner.

Definitely a major agency in the program will be the one concerned with planning. Most governments have an agency responsible for the planning and programming of its utility activities. Included in the planning is of course the programming of projects in accordance with the needs of the country and availability of funds for those purposes. This planning for village electrification has been accomplished in varying degrees of success in those countries where a rural or village electrification program has been undertaken. The attitude of the government involved and its background and history in planning and programming usually dictates the arrangement best suited to the situation in that country.

Funds for government use in utility projects and village electrification in particular can come from many sources. Within the country sources such as the central budget, revenues from utility taxes, revenues from utility operations and special taxes levied and designated for use in utility developments are common. Because of the high capital requirements in utility expansion the large amount of funds required are usually not available within the country and must be secured from outside financial institutions. Here the credit rating of the responsible institution will have a bearing on the route taken to obtain such outside financing. A likely agency is on encompassing all sectors in the overall economic development of the country.

Because of the utility nature of village electrification and its operational aspects their operations and particularly their retail rate structures are contolled by a regulatory agency normally responsible for that function in the country. This control usually extends to the supplier of wholesale power to a village system and can become a critical factor in the viability of the village system unless the regulatory body understands the nature of village electric system operations and makes its determinations accordingly.

Possibly no institution in the central government will be in a position to effectively handle all the details of a village electrification program. However, if an agency has the most essential qualifications of all those needed in that country, then its scope of activity could be expanded to include village electrification functions. It would then be in a position to plan, develop village electrification programs, coordinate with other agencies and implement the program with other government agencies providing to it those services which were beyond its capability.

The national power utility could logically be the institution to carry out this work. The national utility has the technical and managerial talent within its organization, has experience in planning and programming electric facilities, has experience in obtaining funds from foreign as well as local sources and usually operates facilities which could be used in training and developing village electric system personnel.

The selection of the agency to be responsible for administering a village electrification program can be made from a number of agencies of the central government depending upon the circumstances in each country. Careful appraisal of the possible alternatives is a must before proceeding with a loan.

b. Implementing institutions.

The implementation of a village electrification program at the village level must be considered a function separate and distinct from the administration level involving overall activities of policy, planning, programming and financing of the country program. Both oth these activities are important in their own right, but each has its distinct function. The implementing agency may or may not be the same as the one responsible for the electrification of the country, but it is more likely that the implementing agency will be a separate institution having local ownership and direction.

The implementing agencies at the village level fall into three broad groups: (1) Private, (2) Government, and (3) Cooperative.

The private utility exists in varying degrees in most countries. In some cases the private utility is confined to small operations in somewhat remote areas not yet reached by central station transmission lines. In other cases the private utility is in an industrially developed area and often is a major element in the electric system complex of the country.

The government or quasi-government agency is probably the most dominate in the developing countries. This type of agency takes on various forms depending upon its charter and purpose. In general they can be considered as federal, mixed economy, regional, state and municipal. In some places there is an intermingling of the several types of agencies resulting in control by a major stockholder.

The third category of implementing agencies is the electric cooperative which has a special place in rural development. A cooperative is basically an entity owned by its members who are users of its services. A true cooperative is independent of outside control but often depends on the assistance and budgetary support that the central government can provide because of the overall marginal operations peculiar to the areas in which they operate.

Each of the implementing agencies has a place in the program of village electrification and where there is an option for selecting the type of implementing agency an opportunity is given to pick the institution best adapted to the situation. In any event a method should be selected that is best adapted to the local conditions and will be flexible enough to meet the needs and capabilities of the people to be served.

IV. DISCUSSION OF TYPES OF INSTITUTIONS

a. Agencies at the central government level.

When first considering the implementation of village electrification there is a tendency to think of the end result of electrifying the rural or village areas.However, the key to the successful development of the rural areas is a sound organization at the central government level to be responsible for and to administer the program. While this approach is not uncommon in the usual type of utility development and expansion, there is an even more necessity in the village electric utility.

In the usual utility program the implementing agency has extensive knowledge in planning, developing of programs, financing, engineering, construction and operation of their systems. Such is not the case in village electrification projects. To compensate for this lack of knowledge and experience a great amount of ground work must be done, particularly at the central government level prior to undertaking such a program.

While it is not unusual for the end goals to be given the most attention in the planning stages of village electrification, it has been found that this hinders rather than helps rapid development. Through lack of experience the promoters of the program either do not understand the complex nature of the program or do not realize the immense task involved in developing rural and village electrification. Because of this lack of understanding provisions are not made to meet the problems in an orderly manner so as to achieve the projected goals without undue delays.

Because of the political as well as the social and economic aspects of this type of program it is imperative that a well developed and accepted policy be made at the central government level. This approach then makes it mandatory that an agency of the central government be responsible for administering this program. The typical central government agency has organizational and managerial competency already available in its staff and that talent can be used in connection with the administrative and technical aspects of the projects and their subsequent operations.

Central government agencies are established to carry out the policies of the government in their respective disciplines and consequently they are representative of their governments attitudes toward the programs they administer. Certainly each agency is concerned about accomplishments in its own sector and does its utmost to carry out its designated responsibilities. The attitude taken by a particular institution at the central government level toward the individual programs within its jurisdiction will depend to a great extent upon the emphasis that its officials take toward that particular program. Political considerations aside, as a practical matter the agencies are usually bound by budgetary limitations in their desires to further programs of development to benefit rural areas.

The central government agency having responsibility for administering a village electrification program will usually reflect the emphasis on ongoing programs of that particular country. In one country the national bank may be given the responsibility because of the financial aspects of the program, in another country the federal power agency may be given the responsibility because of the utility aspect, in another country the rural development agency may have responsibility because of the need for coordination of all rural development programs. The degree to which any of those agencies are capable of or have the potential to administer a program of village electrification will depend on the background of the people in the agency and their desire to undertake the task before them.

Before embarking on a program of village electrification there must first be a comprehensive government policy toward the program because of its social aspects which will require extensive government support. Without a clear central government policy there is no way in which the involved agencies can coordinate their own activities or to plan the use of resources to advance the village electrification program.

While the electric demand of a village electric system is relatively small when compared to the overall demand on the country's electric system, nevertheless there is a need for planning and programming so that the village electric system becomes a component in developing the electric system of the country. In this way the village electric program will have more assurance of obtaining the funds needed to construct its facilities. Planning of electric facilities is usually done by the operating entities and in conjunction with the federal agencies responsible for the overall planning functions of the country. Through this manner of planning and programming there is also assured the coordination of the electric sector with the other rural development sectors such as water supply, education, health, agro-industrial, and communications.

Funds for capital additions to serve village electric systems must be obtained by the agency responsible for administering the program. This requires the agency to have the capability to secure funds from various sources including the ability to borrow on the money markets. Budgeting of funds will be affected by the overall government policy with respect to the use of government funds in the country's budget. Regardless of the type of implementing agency whether private, government, or cooperative the capital needs will be great and consequently it is incumbent upon the administering institution to be able to negotiate foreign loan or help. Foreign assistance is needed since seldom are local funds available in sufficient amount to meet all the needs of utility expansion. The administering institution will act as banker to the implementing entity. In that position it will be required to develop loan contracts between it and the implementing institutions, establishing terms of the loan such as interest rate, period of loan, repayment schedule, guarantee provisions and covenants which may be required under the existing conditions.

Availability of funds and extensive planning are to no avail unless the administering agency has the capability of implementing the program at the banker's level. Here has been one of the major deficiencies in the rural and village electrification programs to date in the developing countries. To properly administer a program of this type it is incumbent upon the agency to have staff personnel familiar with utility enterprises and particularly the type to be established in the sparsely settled areas of the country. Technical capability can usually be found in the country but the the problem arises in adapting that capability to the realism of the problems found in village electrification. If the administering institution does not have within its framework of operation a group which will devote its efforts to the development of a village electrification type of program then it must establish one early in the planning stages.

A phase of utility operation that must not be neglected in the developing countries is that of education of the new users in the benefits of electricity. This phase of the program should be started early in the implementation of a project because such an activity requires well trained and experienced people to perform those duties. Often it is found that an organization will be well established administratively and have sound programs for carrying out its objectives but it lacks an adequate and competent staff. Technical assistance is needed to train and develop local people for management and operation of the village electric systems.

Technical assistance can be given at all levels but must be provided by competent people such as is found in the larger operating agencies or on the staff of top sector agencies of the government. Training can be done in a number of ways such as on-the-job, vocational schools, on the systems of the operating utilities and visits and training periods on electric systems in other countries. Training in the schools enlists the help of the education sector and could well be a step in the coordination of the two programs. Education of the new user can be shared by all the involved agencies but it will fall on the administering agency to provide the training programs and staff to carry them out.

The central government agency is the key to the success of a village electrification program. It is therefore highly important that before any consideration be given to loaning funds for village electrification that the administrating agency be appraised to determine that it is in a position to properly administer the program or will take steps to establish that position. Technical assistance from outside sources can be available and its use should be a requiremnt of the loan in order to assure the purposes of the loan will be carried out in the most efficient manner. Bearing in mind that the central government agency will be required to act in full capacity of procurer of funds, lender of funds, supervise and monitor use of funds and follow up on operations of the systems after construction is finished, an immense responsibility is being placed on that agency.

b. Private institutions.

The private utility found in the developing country is quite varied in make-up, scope of operations and purpose. In some cases the utility is of major size and quite important in the power scheme of the country. In other cases the utility is small and encompasses only the immediate town or village in which it is located. Operation of the small utility gives more often than not unreliable service, usually during the evening hours and is seldom on quality that would be conducive to expansion and development of commercial enterprises. In places the private utility is owned by an individual with limited resources and has few if any plans for expansion or providing the quality service expected in a growing environment.

The larger private utilities have usually been organized and developed by foreign interests. The management and operation of those utilities follow the pattern set out by their parent companies and their attitude to service follows the same general trend. Because of the nature of the enterprise which is owned by stockholders expecting a return on their investments, the private utility is quite concerned about the viability of its system and the fact that a reasonable rate of return must be realized in order to satisfy its stockholders. Consequently extensions of service or development of new areas is first predicated on the fact that there will be an adequate rate of return. In the sparsely settled areas of underdeveloped countries and the villages in those areas the electric systems expect marginal operation conditions and the private utility is therefore reluctant to venture into those areas. Private companies are not usually recipients of subsidies and would not be likely to accept them if offered. Without assistance to overcome the handicap of deficit operations the practice of the usual private utility is to operate in its franchized area, connect customers at rates approved by regulatory bodies and achieve the best possible operating margins under the circumstances.

Private power companies raise additional capital either by borrowing or selling stock under conditions and terms that exist in the capital markets to which it has access. The utility must convince its creditors of its ability to meet obligations or it will not obtain the needed financing. The larger private power utility whose capital comes primarily from a foreign entity has an advantage when the raising of capital is considered. Such a utility in the developing country has the backing of its parent company and is in a position to raise capital in ways not available to the small private utility. However, unstable political and economic situations have caused private utilities to defer or even not program extensive investments in electric plant in the developing country whether the capital will come from local or foreign investors. The larger private utility, particularly the ones with foreign contacts have the possibility of calling upon their parent companies for technical and managerial assistance. It is unlikely that the large private utility will take a major role in rural development except through its role as a generator of power and having transmission lines through the area being developed.

The small private utility is usually in the position of having started on a small scale with probably antiquated equipment which is maintained only through the expertise of the owner. Revenues are usually sufficient to support just the owner and does not provide funds for expansion or,in many cases,proper maintenace of the generating and distribution facilities. Being at a disadvantage in obtaining financing the small private utility cannot expect to do the job which its larger counterparts can do. For this reason the small private utility is limited in its scope of operation and canot be expected to do more than it is doing at the present time. Under the circumstances it cannot be an asset to the rural development in the area without substantial support from the government.

c. Government and quasi-government institutions.

Government or quasi-government power agencies are by far the most common type utility in the developing countries. Depending upon the size of the country there is a wide variation in the make-up of those agencies or utilities. On the federal level it is common to have a power agency whaich was chartered to take over all power activities in the country including planning, programming and distribution of power. This intent was accomplished in many cases through the taking over of existing facilities and their operation. In many countries where foreign capital has established a power complex, those facilities ahve been taken over by the government and in many cases they have beoome the nucleus of the federal power system.

In many countries it has been found through experience that the federal agency as it assumes more and more of its responsibilities finds that it is desireable to become a planning and programming agency rather than an operating agency. Some such federal agencies retain the power generation and transmission aspects of the utility scheme in the country leaving the distribution aspects to the entities at the local level.

In the larger countries there may be regional and state levels of agencies which have the responsibility for the planning, programming and distribution of power within their areas. Although working within the overall plans and policies of the federal government some of those agencies have the ability to obtain financing through sources outside of the federal and state budgets. Some of the larger and more experienced regional and state agencies have developed into systems having much influence not only in their own affairs but in the utility industry in their countries.

Another type of agency or utility found in some developing countries is the so called mixed economy type of organization. In this type of utility the individual ownership is minimal with the majority ownership through stockholdings of the federal, regional, state and municipal governments. While this type of organization is autonomous and not a true government agency, nevertheless the control rests with the government stockholders and its operations follow the policies of those government agencies.

The municipal utility is limited in scope of operations and is usually found in the position of providing electric service within its own boundries. The size of the municipals varies from the small village to the larger metropolitan towns. The influence of each municipal will vary within each country and upon the character of the municipal organization itself. Some municipals have become quite self suffieient while others are marginal in their operations. The amount of support a municipal obtains from the federal government will vary from small to substantial amounts.

Within the scopes of their charters the government utilities tend to follow the practice of providing electric service wherever a favorable rate of return is indicated or if the government assures continuing subsidies to offset deficiencies in operations. The extent to which this intent can be carried out depends upon the ability of the utility to obtain funds which are not limited by covenant to be used only in areas of relatively high rate of return.

Government budgets whether from tax revenues or other sources are a major factor in how far a government utility can go in its desire to electrify marginal areas. The government utility usually has the advantage of being able to obtain government subsidies for marginal areas if the federal policy is to develop as much as possible the rural areas of the country. Government owned power enterprises face the same problem as private utilities in convincing creditors of their ability to meet obligations but they have administrative devices such as budget allocation, special financing privileges, etc. to overcome some of those handicaps. The central government agencies may sell securities underunder more favorable conditions than can another borrower faced with the usual conditions of supply and demand in the financial markets. In capital short countries one government agency vies with another for capital and the condition is created where each agency is in a competitive financial market within its own country.

The attitude of a government agency toward village electrification is generally favorable because of their position in the economy of the country. This is an advantage because the government agency has acess to funding and subsidies which are not available to the private sector. Because of the size of the government agencies there is more opportunity to develop capable staffs and retain competent personnel to carry out the overall program of rural development and village electrification in particular.

A disadvantage of a government agency is the slowness in making decisions which is inherent in most government agencies. This is difficult if not impossible to overcome and is more pronounced in some countries than in others. Another disadvantage of the government agency and particularly when the higher level government agency is the distributor of power is the fact that the users look upon the agency as "the government" and feel that payment of electric bills is not essential. Under those

conditions the operating agency is in the position of risking criticsm for insisting upon payment of bills and in some areas this is a major political consideration. The government agency in many cases is reluctant and often does not force its position because of the political reactions. In the smaller government utility there is opportunity for local control to fall into the hands of those whose operating policies are not always consistent with the best utility practices.

c. Cooperative.

The cooperative as an institution is established by the members to provide a service to themselves which they cannot get from others or at a reasonable cost. The true cooperative is formed by the people who desire service which the cooperative will provide and through their efforts the organization is operated on a cost of service basis. The cooperative principle has been applied to rural and village electrification projects in several developing countries and has met with varying success as cooperative operations. The cooperative is organized in such a way that the organisation is directed by a board of directors elected by the membership of the cooperative. This board in turn hires a manager, establishes policy which the management follows in the conduct of the business, and conducts the high level affairs of the enterprise.

The cooperative approach to village electrification places the responsibility as well as the incentive to develop a well run and efficient system on the ultimate user so that he and his neighbors can have the benefits of electricity. In the cooperative the people who are involved in their own development are put in places of action where they have a part in their development process. Cooperative enterprises encourages the development of democracy at the community level and possibly for the first time many of the people will have an opportunity to acquire equity in a valuable property and have a voice in its operation.

An advantage of an electric cooperative is the fact that the users and members know that the utility serving them is their own organization. Community spirit is much more pronounced when the electric cooperative is active and supports community enterprises.

The electric cooperative is in a position to enlist the help of its members in the construction of its facilities through such self-help activities as member sign-up, clearing of rights-of-way, digging pole holes and other unskilled work. Through such self-help activities the cooperative can construct at a much less cost the electric facilities making up its system.

The electric cooperative can play a big part in the development of community spirit. The cooperative will usually be a focal point for other community activities and will often lead the way in the development of other programs which will be of benefit to the village and surrounding areas. In many cases the cooperative headquarters building is the only

building in the area that has facilities for recreation and a meeting room large enough to accomodate community affairs. Many of the members of the cooperative will also be those who benefit from other rural development programs. Often is is found that the leaders in the electric cooperative because of their community spirit will many times be the leaders in developing and carrying out other programs in the area.

The disadvantages of electric cooperatives are the ones that are inherent in any operation which depends upon local initiative and direction. Quite often competent people are not available to direct the operations of an electric cooperative and the benefits of cooperative ownership are lost. Usually the cooperative is relatively small and therefore is in a weak position when attempting to staff its organization with trained and experienced people.

The cooperative that is small is at a disadvantage when it attempts to obtain funds for construction of its facilities. Lacking a period of satisfactory operating experience it cannot provide the assurance of security needed to satisfy financial instiutions' requirements for loans. Nevertheless, the cooperative enterprise usually has the backing and support of those agencies having interests in rural development activities and can have the advantages of government financing and advisory services and at the same time retain local control, ownership and direction.

A problem inherent in the cooperative system develops when a cooperative enterprise is attempted in an area where the population is predominantly illiterate. Since the people in the local area are the ones to be responsible for operation their system it is necessary that the members be capable of understanding the meaning and purpose of the cooperative. When such a condition exists it may be better to provide electric service through another type of institution in the interest of more effective administration and progress in keeping with the projections for the project.

The cooperative enterprise can be an effective instrument in bringing electricity to a village earlier than a government agency may be in a position to do so. Often because of the remote location of a village the administrative expense of operating its electric facilities will cause a government agency to defer construction of the facilities. In such a case a cooperative group could be formed and with some advice and assistance from the proper government agencies establish and operate a successful enterprise.

Because of the social aspects of both a cooperative enterprise and village electrification the electric cooperative may well expect and get financial and advisory help from the government. Where the central government is agreeable to such an arrangement the electric cooperative may well be the type of institution to carry out the program at the village level.

V. EXAMPLES OF VILLAGE AND RURAL ELECTRIFICATION BY VARIOUS TYPES OF INSTITUTIONS.

A substantial amount of rural and village electrification has been done in the developing countries. In some instances it has been done without outside help or financial assistance. In other cases a substantial part of the electrification has been done through the assistance of foreign financial institutions. An incomplete list of the countries where rural and village electrification has been undertaken follows with an indication of the major type of institution or institutions responsible for the effort.

Brazil -- regional and state governments
Chile -- cooperative, state government
Colombia -- regional government, cooperative
Costa Rica -- cooperative
Ecuador -- cooperative, private, municipal
El Salvador -- federal government
Honduras -- feneral government
India -- state government, cooperative
Mexico -- federal and state governments
Nicaragua -- cooperative
Peru -- cooperative
Philippines -- private, cooperative
Taiwan -- private
Venezuela -- federal government

VI. CONCLUSIONS

Village electrification in a developing country has many and varied problems which are not present in the usual urban and suburban projects. However the problems are not insurmountable if the program has the sincere support of those who are in a position to realize the benefits of electricity in helping to develop the country and can furnish the impetus needed to put the sector of village electrification into the government development program.

Before a village electrification program can succeed the central government must be ready to fostor and support the program both with financial help and with technical assistance. If the country's government understands the potential benefits of village elctrification it will include the program in its planning and programming of development projects. Unfortunately many governments are not able to take the initiative in developing this program because of limited technical ability and experience.

Village electrification is to a great extent a social endeavor and requires the full support of both the central and local governments. Once the proper officials have been convinced of the value of the program and commitments have been made for funding the program then there should be no reason to delay implementation of the projects.

Because of the many possible approaches to the supply and distribution of power in the villages, it is essential that every method be studied and selection be made of the one best adapted to the local conditions and be flexible enough to fit the needs, plans and capabilities of the people to be served.

Regardless of the type of organization providing service to the village, whether private, government, or cooperative, the capital needs are extensive. Seldom is all the capital needs available in the country and foreign loans are needed to supply most of the initial requirements. Since the central government agencies are in a better position to negotiate foreign loans it is incumbent upon a central government agency to take the responsibility for developing and carrying out the program of village electrification.

The selection of the type of institution to be the implementing entity in the village will depend on many factors. Unless careful consideration is given to the economic character of the area and its people, the cultural background of the people, their ways of living and their customs, the literacy level of the people, the initiative of the people and their desire to change their way of life to better themselves the wrong type of institution would not bring about the hoped for benefits. With the proper analysis and appraisal of the areas being considered for village electrification programs the best type of institution will be selected.

Draft -- January 18, 1974
Chris L. Schultz

POLICY PAPER

LENDING FOR VILLAGE ELECTRIFICATION

FINANCIAL ASPECTS

I. FINANCIAL CONSIDERATIONS

a. Long term versus short term analysis.

Village electrification in common with other types of utility projects requires high capital investment but in addition is located in areas of low economic development where for a number of years after initial operation the revenues are expected to be low. Because of the marginal operation condition a short term financial analysis of a village electric system will not show feasibility in most instances. It will not be until the area has had an opportunity to grow economically that a village electrification project will begin to show some financial feasibility.

The financial analysis performed in the case of a village electric system follows the standard practice in the utility industry. However, factors peculiar to village electric systems in general require some considerations and explanations not needed in the urban and suburban electric system. Low average consumption of electricity will be the situation for a period of years after the entity begins operation and unprofitable conditions will be experienced during that period.

The undesireable financial position is caused to a great extent because village electrification is usually undertaken in areas that do not have an economic environment conducive to rapid growth of the utility. Furthermore, a profitable operation will probably not be realized until the area has had the opportunity to benefit from development programs and grow economically. However, experience has shown that once electricity is available to a developing area there will be a growth in commercial and industrial activities and the demand for electricity will increase. The average domestic user cannot be expected to provide his share of the needed revenues because of his low economic position. Experience has shown also that new users have only a moderate demand for a few years until they begin to find more uses for electricity and to discover its benefits. The accompanying social and economic development of the area will bring about further increases in the use of electricity and provide increased revenues and a better financial position.

It is imperative that a short term analysis of the financial position

of a village electric system be considered only in the context of the period in the entity's development since only a long term analysis can give anything near a tru financial projection of the success or failure of such a system. Experience in developing countries indicate that periods of development extending over eight to ten years will be needed before the village electrification projects will reach a stage where their financial position will be favorable.

A not uncommon belief is that high retail rates will provide the revenues to make a profitable operation. While retail rates are a factor in the financial viability of an entity, they must not be used entirely to project revenues needed to show profitability. High retail rates will discourage the use of electricity and slow or prevent the growth in usage needed to produce the additional revenues. Low retail rates on the other hand may not produce revenues needed to meet expenses while at the same time foing little to promote the use of electricity. It has been found that the relatively high investment for appliances and equipment has more adverse effect on the acquisition of such items than does the low electric rate an incentive to purchase and use them.

The initial financing of rural and village electrification projects is one of the most difficult problems to overcome. Because local funds usually are not adequate to cover all costs,foreign loans are required. The source of financing and the terms under which it is provided are exceedingly important to both the lender and the borrower. In this situation the government is in the best position to handle the foreign loan.

Financially poor situations existing in a village electrification project can be overcome through government guarantees and subsidies or concessions to the village entity in the interest of social development or to encourage commercial and industrial development. However, if unprofitable operations are indicated in early year financial projections then the starting or continuation of the program must be justified to the satisfaction of the lenders. This latter involves demonstration that the government bedgetary appropriations over a period of years can be expected to be stable and that the budgetary process will allow such disbursements.

Funding for rural and village electrification projects will usually require both local and foreign funding. In the case of local funds there must be assurance relative to availability of the needed amounts, the sources and a scheduling of the contributions. It is important that a disbursement schedule be established and determined to be valid. The scheduling of disbursements of foreign funds are usually tied into the availability of local funds and unless the local funds are available as scheduled the progress of the electrification project will suffer.

II. RESOURCES MOBILIZATION

a. Local materials

One of the main factors to be considered in bringing electricity to rural areas is the cost of the electric facilities. A utility system to be viable and successful must be built on a sound basis and with substantial materials and equipment. It is uneconomic to construct a system with inferior and undersized equipment and materials in order to meet an arbitrary budget. The rural and village systems operate on a close margin of profit and cannot afford to replace inferior and undersized equipment within a short time after they are placed in use.

one way in which costs of construction can be reduced is through the use of locally produced materials. Utility design utilizes standardization to a high level in order to benefit from reduced costs because of mass production of materials. In most every case the typical designs of utility property have items which can be substituted with others of similar characteristics. Consequently, a locally manufactured item may be used provided its quality will not less than the standard item of foreign manufacture. In some instances the standard design may need to be modified to use a piece of locally manufactured material but this can usually done without difficulty. The locally made materials not only cost less than the foreign-made parts but will provide employment in local industries. Poles and hardware items are examples of materials that can be considered as available from local sources.

b. Self-help

Another means of reducing cost is through the device of self-help where the user furnishes his services as a part of his contribution to the project. While this means is more commonly used in the cooperative type of enterprise, it can be adapted to use in other kinds of organizations.It must be noted,.however, that self-help as the term indicates will cause local people to contribute more in the way of labor, materials, and financial contributions to an organization they own than they will to a national agency or private utility.

Self-help must of course be limited to those services which are within the capablilities of the local people to perform. For instance it is not uncommon in projects of this type to have the local people perform such activities as clearing of rights-of-ways, digging pole holes, working on sign-up of users and other unskilled jobs.

III. SUBSIDIES, GRANTS, LOANS TO UTILITY OR INSTITUTION

It is evident in analyzing the financial requirements of village electrification projects that local sources of financing are not adequate and financial assistance from outside sources will be required. This financial assistance is needed to obtain initial capital for new electric facilities and to improve existing facilities. From the viewpoint of the operating utility the source and terms of funding are major factors in reaching financial viability. At the same time a lending institution may have problems in obtaining from the utility the security needed to permit it to make a loan.

Several devices are available and have been used to permit the development of electricity in rural areas. Within the country itself the federal government can provide grant funds to an organization in order for it to begin operation without facing a repayment of debt schedule. This method is best used where social development is upper most in the government's plan for the area and the economic situation is such that the repayment of a loan is so remote that no consideration is given to a loan.

The village utility being a revenue producing entity should be considered as being in a position to operate as a conventional utility and be able to pay debt service requirements. With this concept in mind the preferred method of financing village electrification projects is through a loan to an implementing agency. The first attempts at this method should be on the terms consistent with those experienced by the utility industry in that country. In some cases the loan may be repayable with the usually accepted terms of repayment. However, the likelihood in village electrification is that the loan cannot be justified on a financial basis and guarantees of some sort are needed to provide security to the investors or financial organizations. In such cases the federal government may elect to provide a government guarantee to the lender and in turn provide some concession to the operating entity as a social contribution to the country's economy. In some cases the subsidy could take the form of a grant of funds to begin operation, concessions on the cost of power from a federal power agency or a concession in the levying of taxes. One of the most used devices for assisting in helping solve the financial problem is that of allowing a deferment on the payment of principal until the entity can put into service its facilities and have revenues coming in.

The matter of whether to provide subsidies, self-liquidating loans with favorable credit terms, grants or some combination of them is a decision for the government involved to make. From the lender's viewpoint security of financing is to be considered not only as it concerns the loan for village electrification but also the effect it will have on other loans to this government if the government is going to assume financial responsibility for repayment of the loan for village electrification.

IV. SUBSIDIES, GRANTS, LOANS TO CUSTOMERS

A major concern in the success of a village electrification project is the ability of the customer to acquire equipment needed to utilize the electric power being made available to him. This is brought about because in many cases the customer's annual income does not permit him to make large expenditures for such things as housewiring, electrical appliances and equipment because of the high investment required.

In many successful rural electrification projects this factor has been solved through financial assistance to the new customer. Assistance has been given through such devices as furnishing light bulbs, providing long term low interest loans for the purchase of minor electrical appliances and housewiring. Such loans are repaid in small monthly installments as a part of the electric bill. The repayment so received by the entity is placed in a revolving account and relent to other customers for similar purchases.

In some areas where the dealers in appliances and equipment are reluctant to maintain sufficient stocks or sell on credit, the local entity may want to consider entering the business of supplying and maintaining these kinds of appliances and equipment. The local entity could be provided capital at favorable terms to establish its inventory.

In some countries where credit unions have been established and are accepted in the community these credit unions have assisted its members in financing equipment and appliances on favorable terms.

INTERNATIONAL DEVELOPMENT ASSOCIATION | INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT | INTERNATIONAL FINANCE CORPORATION

OFFICE MEMORANDUM

File.

TO: Mr. Yves Rovani, Director, Public Utilities **DATE:** January 10, 1974

FROM: C. R. Willoughby, Director, Operations Evaluation AI

SUBJECT: Follow-up Report to Recommendations on Public Utilities in Evaluation Reports Z-17 and Z-18

1. As you know, we have in the coming months to prepare Follow-up Reports to the Board and Management systematically reviewing the fate of all the recommendations contained in the two Evaluation Reports that were sent to them in the middle of 1972 (on Bank Operations in Colombia and in the Electric Power Sectors). You also know that it has been our intention to base the Electric Power follow-up report and the public utility sections of the Colombia equivalent on a memorandum from you assessing the progress that it has actually been possible to make along the lines indicated in your original response, of December 1972, to the evaluations' recommendations and indicating your expectations for further development. I would suggest that your comments might at this stage most usefully relate primarily to the "action" sections of your December 1972 memo. In several cases your statements will concern the progress of research and preparation of guidelines by your own Department, but in some they will need to deal with implementation, and I hope that in the latter case you will be able to present the necessary information about work done by Regional projects departments in the interim.

2. I know that you are presently under considerable pressure, principally due to the current instability of the world energy situation, but I hope that you may still be able to keep to the target date of January 31, 1974 (with possible extension to February 15) for provision of this memorandum, as we tentatively agreed in discussion on Friday December 14. Mr. Ettori, the author of the Power Evaluation Report, as well as myself, will be most anxious to cooperate with you on any questions that arise in the meantime.

CRW:ch

cc: Mr. A. Israel
Mr. F. Ettori

Mr. Willoughby:

Your letter only arrived January 9, 1974.

AI

See Power Network.

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INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT

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INTERNATIONAL DEVELOPMENT ASSOCIATION

PUBLIC UTILITIES DEPARTMENT

GUIDELINES SERIES

GUIDELINES FOR ESTIMATING COSTS OF TUNNEL CONSTRUCTION

January 17, 1974

Central Projects Staff
Public Utilities Department

This paper is one of a series issued by the Public Utilities Department for the information and guidance of Bank staff working in the power, water and wastes, and telecommunications sectors. It may not be published or quoted as representing the views of the Bank Group, and the Bank Group does not accept responsibility for its accuracy or completeness.

GUIDELINES
FOR
ESTIMATING COSTS OF TUNNEL CONSTRUCTION

A B S T R A C T

This paper deals with the problems of estimating costs to execute underground works where uncertainties may be great. It suggests areas to which special attention should be given, and advocates the routine collection of data on costs as experience is gained so that the basis for judging estimates may be broadened.

Prepared by:
Ralph Bloor (Consultant)
and F. H. Howell

January 17, 1974

GUIDELINES
FOR
ESTIMATING COSTS OF TUNNEL CONSTRUCTION

Introduction

1. The Bank frequently finances projects in the agriculture, public utility, and transportation sectors which include tunnels or similar underground works carried out under conditions of uncertainty. From time to time execution of these structures has proven to be much more costly than anticipated, giving rise to financial problems on the part of the owner enterprise, and casting doubt over the economic merits of having embarked upon the project in the first instance. The Bank has ready-to-hand reliable cost information on only a relatively few tunnels because tunnels are usually only elements of projects and costs are generally not reported on separately.[1/] These data, while sparse, do tend to show that tunnelling costs are likely to be underestimated.

2. The purpose of these Guidelines is to reiterate the need for special care in estimating costs (paragraph 4); to remind Bank staff that special skills may be required (paragraph 5); and to suggest that generous allowances for contingencies be provided in line with the degree of uncertainty involved (paragraph 6). The need for sensitivity analyses (paragraph 7) and broadening the Bank's data base (paragraph 9) are mentioned.

3. A tunnel, as considered in this paper, is in practice any large underground structure. The following list is typical, but not necessarily all-inclusive:

(i) Conveyance tunnels for irrigation, hydroelectric, and water supply projects;

(ii) underground powerhouses with penstocks and tailrace tunnels;

(iii) railway and highway tunnels; and

(iv) diversion tunnels for various river projects.

The Magnitude of the Problem and Need for Special Skills

4. As is the case with all heavy civil works construction, the problem of cost estimating for tunnels is proportional to the degree of ignorance of the natural conditions to be encountered; and tunnels, by their nature are the most difficult structures for which an accurate prediction of these conditions can be made. The comparative level of difficulty of making cost estimates for the various kinds of structures covered by the

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1/ For example, where the diversion scheme for a hydroelectric development includes a tunnel, although it may be a major construction activity, it may nevertheless be executed under a general civil works contract as regards reporting of costs.

above definition of "tunnels" cannot be categorically stated, but in general the more extensive the structure is and the deeper it lies underground, the higher the level of difficulty. The difficulty is influenced by the nature of the rock being penetrated, the ground water conditions, the presence of gas, and in volcanic areas by heat. The basic problem of cost estimating is finding out what these conditions are. Thus, diversion tunnels, some short highway and railway tunnels, and underground powerhouses are among the least difficult underground structures to estimate since a reasonable number of borings and adits can be carried out economically and which can give fairly accurate information of the natural conditions. It may, therefore, be concluded that long (over a few kilometers) tunnels under deep cover (more than 150 meters) offer the greatest estimating problems because thorough direct examination of the natural conditions by borings and adits becomes impractical due to the excessive costs involved. Conveyance tunnels make up the majority of the projects in this category, but there may be some railway and highway tunnels, and occasionally some other types. In all cases the degree of uncertainty is influenced by the complexity of the geological conditions and the amount of factual material which may be available from previous operations in the vicinity.

5. The two most important classes of personnel needed for adequate tunnel estimating are engineering geologists and engineers with extensive experience in actual tunnel construction. The Bank customarily requires the employment of consulting firms with these classes of personnel on their rosters. Greater pains should be taken to assure that the personnel is the best available, and if not, to require the firm to employ other, more qualified individuals. Furthermore, if available, there should be some personnel involved with experience in the area in which the project is located, who can provide more intimate knowledge of local conditions.

(i) The basic duty of the engineering geologist is to examine the underground conditions by the most direct means which are practical to employ and to estimate these conditions on the basis of general geologic knowledge when direct means cannot be used. The engineering geologist (or geologists) should visit the site of the project, explore the ground surface for rock outcrops and signs of faults, examine all relevant existing data, and specify additional data to be obtained including aerial photography where drilling or adits are not practical. On the basis of all information available he should prepare geological sections along the principal axis (axes) of the structure and predict the type, quality, and probable behavior of the various types of rock involved based on his previous knowledge and the examination of the nearest local exposures of the types involved. Especially if high heat or gas may be expected to be present, a few deep drill holes may have to be put down to check. Ground water levels should be

established by examining springs, wells, or by drilling if the type of rock promises to have serious water problems. Its behavior with water flowing out of it must be predicted.

(ii) The basic duty of the engineer is to develop a construction plan which meets the underground conditions predicted by the geologist, and to estimate the cost of the work. The engineer should consider the schedule of operations including drilling, shooting, mucking, and hauling out depending on the length of tunnel, number of points of access, and applicable haulage equipment; or alternatively, the use of mining machines or moles. (Since the latter type of equipment is scarce, difficult to bring to a site, not suited to all types of rock, and is not labor-intensive, it should not always be specified as an alternative which contractors must consider in formulating offers.) Upon the advice of the geologist, the engineer should consider the need and size of pumps, ventilating equipment, and gas surveillance arrangements, and the practicability of the use of shotcrete, wire mesh, and rock bolting to stabilize the tunnel, as well as of the more expensive ring beams, steel plates and dry packing in some parts of the structure. He will need to judge the ability of local labor to acquire the necessary skills and especially to perform as parts of a highly organized and carefully timed operation. The engineer should have the ability to judge the probable cost based on his conclusions of the above-mentioned considerations as compared with his experience elsewhere.

Appropriate Contingency Allowances

6. In spite of every reasonable precaution there will be cases, expecially in connection with long, deep tunnels in complicated geology with doubtful rock quality, where there will be considerable uncertainty about underground conditions and where a cost estimate cannot be expected to be accurate within customary limits. In such cases the best procedure appears to be to add liberal contingency allowances to the estimated direct costs. Specific tunnel contingencies should be added to the cost of the tunnel itself. The Bank's experience suggests that such provisions should be not less than 25% of the direct estimated cost, and where uncertainties are unusually large, it is possible that they may have to be as high as 50%. Normal contingencies would be used on other parts of the project. Where such provisions would have a substantial impact on the overall project cost -- and hence the proposed Bank Group financing -- the situation should be discussed in detail with the proposed borrower. Excessive contingency allowances have a cost in terms of commitment charges, but it is generally more desirable to incur these than accept a large risk that funding will prove inadequate.

7. In projects where high contingency allowances are deemed necessary because of uncertainty, sensitivity analyses should also be made systematically. In the event the analysis indicates inclusion of generous allowances under conditions of uncertainty would throw doubt on the project's justification, it probably should be redesigned or the alternative schemes reexamined to select the most acceptable.

Collection of Data

8. It would be desirable to broaden the Bank's data base with respect to tunnel costs. Over time, it might then be possible to suggest more precisely what levels of contingency allowances would be appropriate under different circumstances. Moreover, identification of factors tending to produce inaccurate estimates might be possible, and means of taking them into account developed.

9. Where it can conveniently be done, supervision and appraisal missions should collect relevant data on tunnelling costs. It would be particularly helpful in cases where actual costs incurred have substantially exceeded estimates to know the cause (i.e., inadequate subsurface exploration, unusually bad geologic conditions, poorly prepared estimates, etc.). In addition to whatever use is made of this information in project monitoring, it should be made available as well to the Public Utilities Department. It will be collected on a global basis as experience is gained with a view towards improving these Guidelines.

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INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT

INTERNATIONAL DEVELOPMENT ASSOCIATION

PUBLIC UTILITIES DEPARTMENT

RESEARCH WORKING PAPER SERIES

ECONOMIC ANALYSIS OF ELECTRICITY PRICING POLICIES:

AN INTRODUCTION

January 9, 1974

Central Projects Staff
Public Utilities Department

This paper is one of a series issued by the Public Utilities Department for the information and guidance of Bank staff working in the power, water and wastes, and telecommunications sectors. It may not be published or quoted as representing the views of the Bank Group, and the Bank Group does not accept responsibility for its accuracy or completeness.

ECONOMIC ANALYSIS OF ELECTRICITY

PRICING POLICIES: AN INTRODUCTION

ABSTRACT

Electricity pricing policies have been dominated by financial questions; in particular by the need to maintain tariffs at levels that will help finance the large capital requirements of continually expanding systems; and also by a questionable accounting approach to the design of tariff structures. But how fast should expansion be? How should output be distributed between homes and industry and between rich and poor? Can capital be utilized more fully? These neglected questions of economics and equity also need to be worked into pricing policy. A balanced approach is needed: finance to spur expansion; economics and equity to contain and direct it. This paper discusses how pricing policies can be formulated which are efficient while satisfying the constraints of finance and equity. Additional constraints set by the need for simple tariffs, risk, ignorance about consumer reactions and by the costs and technical difficulties of accurate metering are also discussed. The paper is an introduction to a series of case studies, research papers and guidelines designed to help Bank staff, utilities and their consultants adopt a new point of view and start solving the difficult but worthwhile problems of implementation that it poses.

These papers, prepared primarily by Messrs. Anderson and Turvey (Consultant), will eventually be published as a Handbook.

Prepared by: Dennis Anderson and Ralph Turvey (Consultant)

ECONOMIC ANALYSIS OF ELECTRICITY PRICING POLICIES:

AN INTRODUCTION

1. This paper introduces a series of research papers on the economic analysis of electricity pricing, initiated as a result of the Bank's Sector Working Paper on Electric Power. The papers are to deal with:

- case studies in selected countries;
- studies of specific problems, including tariffs with simple metering, indivisibilities, risk and hydro storage;
- guidelines on how to study tariffs.

At present the research papers deal largely with electricity pricing; efforts on pricing for water and telecommunications are just beginning. Together the papers are to be published as a Handbook on tariff studies.

2. The pricing policies of most countries are largely determined by financial criteria. The Bank's position too, on pricing policy, has always been predominantly a financial one and concerned with tariff levels, rather than structure. This is on account of the high rates of expansion of Public Utilities in developing countries, their large capital needs and the need for strong institutions, capable of managing large and quickly expanding systems.

3. Other objectives, however, also need to be incorporated into pricing policy, to respond, for example, to the following kinds of questions. How fast should expansion be? how should output be divided, say, between industry and homes? and how can capacity be more fully utilized? It is to these kinds of questions that the economic approach is addressed. Capacity expansion to meet expanding demands is desirable, and good financial policies are a spur to this. But expansion should not be to excess and capacity should be efficiently used, and good economic pricing policies can attend to this.

4. A balance between the financial and economic approaches is thus needed, the financial approach to spur expansion, the economic approach to contain and direct it. In this paper therefore, as in the research, a basic aim is to discuss what is involved in economically efficient pricing policies which satisfy the requirements of finance. Other constraints are also discussed, including those set by considerations of equity.

5. Section I of this paper outlines the traditional approach to pricing and discusses its shortcomings from equity and economic viewpoints. Section II then outlines a more general approach to pricing which meets economic efficiency aims, while satisfying constraints set by finance, equity and other matters.

I. Limitations of the Traditional Approach to Pricing

1. Pricing and investment decisions in electricity supply, as in other industries, have to be made within the context of many factors: uncertainty; limited information and sometimes ignorance on some matters; distortions in the pricing system; what is technically feasible; imperfect institutions; unsophisticated consumers; and generally a number of restrictions stemming from politics and from financial and equity objectives. The economist, in deciding which prices and investments are efficient, no less than the engineers and financial analysts, has to work with such factors in mind if his recommendations are to be useful.

2. Such factors rarely receive balanced attention, and the financial approach concentrates heavily only on one or two of them. Economic analysis of Public Utility Pricing policies has, in fact, still to gain a foothold in many countries. Hence it might be worthwhile to begin by showing why economic analysis is needed. This we do by considering what are the shortcomings of the very widely held view that electricity tariffs are, and should be, determined purely by accounting criteria.

3. Britain, France and Sweden are three countries where a modern economist's approach to tariff-making has begun to be applied in recent years. Economists are aware of at least some of the earlier post-war French theoretical contributions, but these developments are generally not well documented. There are still many engineering consultants, financial consultants and administrators who are unaware of them. This is particularly understandable in the United States, where the system of regulation of public utilities positively requires an approach to tariffs which has nothing to do with efficient resource allocation. Unfortunately, a narrow concentration on accounting data (which are relevant to resource allocation only as a poor substitute for unobtainable engineering cost estimates) still typifies some of the tariff advice given to countries which are sufficiently poor to need to worry about efficient resource allocation. It may therefore be useful to describe the typical traditional accounting approach and point to its shortcomings.

4. This traditional approach usually begins with a comprehensive stock-taking and evaluation of all assets, old and new, from which, by the application of certain depreciation rules, the annual "capacity (or KW) related" costs are derived. Then there is an evaluation of various running, fuel and other "energy (or KWh) related" costs. Some costs, such as maintenance costs, have fixed and variable components, and are accordingly allocated to capacity-and energy-related costs respectively. Finally there are some costs, such as those for metering and billing, which are "customer-related" and which are not correlated with either capacity or energy demands. The procedure is then to allocate these as "equitably" as possible between consumers via the tariff structure, where the notion of equity is that consumers should be responsible for covering those accounting costs which they are regarded as imposing on the enterprise. With

load research the more advanced enterprises are able to find out how much each consumer class is contributing to the peak and thus to the capacity-related accounting costs. Energy and customer-related costs are then added in and a "cost-based" tariff is formulated for each consumer class. Typically a consumer may have one, two or some combination of three elements in his bill:

- a fixed or minimum charge (to recover customer costs);
- a KW charge related to his contribution to capacity costs;
- a KWh charge.

Simplifications are often sought, some resting on complicated analysis which nevertheless leads to a simpler tariff and which meets the general aims of the traditional approach. For example, it is often found that consumers who take more KWh take relatively less KW at the time of peak demand. When peak KW and KWh consumption are empirically related in this way it is possible to simplify the tariffs, eliminating the KW charges by incorporating them in the KWh charges. Consumers (even very large consumers) are then given declining-block KWh tariffs, because their total capacity requirements per KWh consumed decrease with the number of KWh consumed. In addition, the fixed or minimum charge may be added onto the first block, leading to a very simple tariff related to KWh consumption alone. Provided the empirical relationships used to derive this simplified tariff hold, the simplified tariff will certainly meet the equity principle that customers should pay for the accounting costs which they have been allocated.

5. This is, albeit simplified, the basis of an ideal accounting approach. An enormous amount of information is collected and manipulated, and enterprises which pay consultants to do this sort of thing find it a very expensive and time consuming exercise. Divergences from these ideal tariffs often creep in of course, sometimes very substantial ones; but let us discuss the ideal accounting tariff in general terms.

6. The first defect to note about this approach is that, except by chance, pro-rated accounting costs are quite different from the costs relevant for resource allocation. One reason for this is that the accountant is concerned with recovering sunk costs whereas, for efficient resource allocation, it is the actual resources used or saved by consumer decisions which are important. Prices are the amounts paid for increments of consumption and they should, therefore, be related to the increments of cost incurred in meeting such increments of consumption. If new consumers are connected to the system, or if existing ones increase their consumption, e.g.,during peak, additions to generating and network capacity may be required, and it is important therefore that prices should signal to consumers the costs of such changes in their consumption. The argument works the other way round, too: if consumers reduce consumption, e.g.,during peak, such costs are avoided, and if price reflects these costs, the savings on their bills will equal the resource savings. Hence prices should be related to the value of resources used or saved, and the valuation of these resources, the estimation of costs, requires a forward-looking estimate. The backward-looking estimate of the accounting approach creates the illusion that resources which can be used or saved are as cheap or as expensive as in the past; that is that resources are as abundant or as restricted as in the past. On the one hand this may cause overinvestment and waste;and on the other, underinvestment and

unnecessary scarcity. If, in addition, the past holds a number of poor projects, the sunk costs of mistakes will exaggerate the costs of future expansion and this is not efficient.

7. Another reason why pro-rated accounting costs differ from those relevant for resource allocation is that the tariff schedules and the various simplifications thereof are derived by spreading out total accounting costs among consumers. Broadly speaking, this gives tariffs which relate to average rather than to marginal costs. But for efficient resource allocation, prices should be related to the resource costs of changes in consumption; that is we need marginal, not average cost pricing. The addition of a new consumer or an increase in the consumption of an existing consumer will impose additional costs upon the enterprise, while a reduction in consumption will save costs, so it is these alterations in costs which need to be reflected in tariffs. The change in the cost to a consumer of altering his electrical behaviour will then mirror the change in the cost to the enterprise.

8. This brings us to the second defect of the accounting approach. Fairness or equity in the approach is couched in the rather narrow terms that consumers should pay for the share of accounting costs allocated to them. Apart from the fact that, as just explained, these may very well differ from the costs which consumers are causing the enterprise to incur, it is evident that though such cost allocation involves (often arbitrary) judgements, it cannot properly be judged either fair or unfair. Fairness is surely an attribute of tariffs in relation to consumers, not of costs considered in isolation. It depends for example whether a consumer is rich or poor and deserves special concessions. As we shall make clear later on in this chapter, we do indeed fully accept that questions of equity are relevant for tariff making. Because of the huge capital requirements of the power sector we also accept the point that electricity tariffs should often yield revenues sufficient to cover accounting costs and in addition make a substantial contribution to the self-finance of future system growth, with possible exceptions for electrification projects in poor areas. But fairness, revenue requirements, and cost analysis require separate analysis in tariff making. First we must analyse costs. Then we consider revenue requirements and bring in views of what is fair. Compromise may be necessary, but clear thinking makes it absolutely necessary to start off with a purely objective analysis of costs.

9. The third defect of the accounting approach stems from its neglect of the incentive effects of tariffs. Even if it happened that allocated accounting costs were equal to marginal resource costs, and that equity issues were unimportant, this would still be a serious defect. The reason is that tariffs often, if not always, have to be simpler than the cost structure which they represent. Billing can generally be done only monthly at most; there are restrictions on how much prices can be varied in response to random changes in demand and supply conditions; elaborate metering is too costly for all but the largest consumers; elaborate metering may also bewilder many consumers, and can thus be counter-productive; and so on. Simplification is therefore a central part of tariff and metering policy formulation. But how do we simplify without nullifying the aims of the tariffs? We have found that the answer, not surprisingly perhaps, depends on the aims of the tariffs; and that simplified tariffs designed with only accounting aims in mind may differ enormously from those suggested by economic analysis. It is easier to show this through a concrete example.

10. Consider, for example, the problem of charging for capacity costs induced by a consumer's demand at the time of the system peak. The traditional approach may resort to any one of several devices to make sure that consumers pay for the costs they have incurred. There may be a fixed charge related to the consumer's demand at the time of the system's peak demand; or, as discussed above, capacity charges may be incorporated into the energy charges, based on an empirical (but not a causal) relationship between consumers' energy consumptions and their demands for capacity; or there may be an empirical relationship between the size of consumers' houses (measured in terms of floor area) and their demands for capacity, so that capacity charges may be related to floor area. These are only three examples. Very simple single or two-part tariffs, with the "variable" part having a declining-block pattern, can be developed on such bases. It is evident that, while such devices may satisfy the accountant's equity principles, only the first one --the KW charge related to his consumption during peak--is likely to have the effect of signalling to the consumer the costs of his consumption during the system peak and thus provide him with the incentive to economise; and this is, of course, on the proviso that he knows what he is being charged for and that he also knows, to a reasonable accuracy, when the peak is occuring.

11. What is required from an economic viewpoint is that tariff simplifications are designed so as to retain the incentive effects as far as possible. The entire design of the tariff and metering policy turns on this aim (the reader will see this in our case studies to be issued shortly). Consumers should know, as far as possible, when consumption is expensive and when it is cheap. Declining-block tariffs won't tell consumers that peak hour consumption is expensive, however ingeniously concocted; nor will KW charges related to (e.g.) the floor area of the consumer's house. Time-of-day metering will; and so will peak load limiters if they are properly adjusted; and so, under certain circumstances, will KW charges related to a consumer's demand during peak. The essential condition which declining block and floor area tariffs fail to meet is that of making an increase in his peak-period consumption more expensive for the consumer than an increase in his off-peak consumption.

12. An entirely different tariff and metering policy may thus follow when incentive effects are considered. We have found that in most countries financial questions and accounting rules dominate the level, structure and types of tariffs. Incentive effects are sometimes considered of course, but generally only as an afterthought or out of the necessity of holding back a very rapidly growing peak demand (often as high as 20% per year or more in developing countries). What is needed, in our view, is the opposite philosophy. Incentive effects should be considered first and foremost when choosing tariff types and meters. Financial targets can still be met and deserving consumers can be given concessions, but this should be done in such a way as to have the least damaging effect on incentives.

13. We can now state in general terms what our own approach is. We accept the importance of financial targets; and we accept the importance of equity -- though we disagree with the traditional approach as to what is meant by equity. But we stress the importance of resource allocation too. The best way of meeting the three aims of finance, equity and resource allocation is to begin with resource allocation by analysing cost-structure and the incentive effects of the various simplified tariff and metering policies open to the enterprise. Next, if asked, we bring in questions of equity to allow, for example, for the problems of low

income groups. Finally we bring financial targets into the picture by confining any increases necessary to meet them to certain elements of the tariffs so as to do the least damage to equity and resource allocation.

14. In the following discussion we elaborate on various aspects of this approach.

II. A Broader Approach to Pricing Policy

1. From what we have just said, it is natural that we proceed with our discussion in the following sequence:

- costs for pricing;
- tariff simplification and incentives;
- dealing with cost distortions (shadow prices, second-best);
- equity and finance.

There is, however, one technical matter to clear up first, and this is on the interactions of pricing and investment.

Interactions of Pricing and Investment

2. The approach to investment planning usually begins with a forecast of demand, and this is followed by a search for a least-cost investment policy using one or another of the various cost-minimising techniques of the types outlined in a previous paper. 1/ Once the least-cost investment policy has been decided upon, the cost structure relevant for pricing can be derived (sometimes directly from the output of the cost-minimising technique). At this stage it might be argued that new prices set on the basis of these costs will alter the demand forecasts so that the investment program should be revised accordingly, giving a new cost structure, and so on. But this iterative procedure may be an unnecessary refinement, since:

- prices can only be adjusted slowly in practice, often with a considerable time-lag for debate and approval;
- prices also take a long time to act since the demand for electricity is largely linked with the stock of electrical appliances, machines, etc.

By the time price revisions have been made and have begun to have their effects the time will have arrived for revised forecasts and programs anyway. The effects of prices on demand should be then felt in the trends in the revised forecasts. Thus while the feedback of prices on forecasts and the investment program is important, it can often be allowed for by waiting for the effects and adjusting accordingly (in much the same manner as automatic control systems work).

3. This process of gradual adjustment and of slow response to prices is fortunate in one sense, since it means that we don't need to bother with the value of price elasticities (which are notoriously difficult to estimate reliably). In another sense, however, it is unfortunate, since if prices are out of line with costs it may take a long time to put things right. This raises a dilemma for project justification. A project may show poor economic returns on current prices because the prices are too low at the time when the project is operating. But if price adjustments have to be gradual and price response is slow, we may still have to accept the project rather than making matters worse and accepting physical rationing. Until reforms to prices have had their effect,

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1/ "Models for Determining Least-Cost Investments in Electricity Supply." D.Anderson, 1972. World Bank Reprint No.2.

one may therefore have to accept projects with apparently poor economic rates of return, a dilemma which is not particularly welcome.

Costs for Pricing

4. We begin with a theoretical issue, that of short-run versus long-run marginal cost pricing. It is now many years since their equivalence under conditions of certainty was demonstrated by Boiteux and other French authors. We have extended this (in a separate note) to the analysis of pricing with uncertain (stochastic) demand and plant availability. The important point is that there are definite limitations on the possibilities of using prices to ration out available capacity when demand and supply conditions turn out differently from what was expected when prices were set. Thursday's prices can't be raised because some turbines would not start up on Thursday morning, and January's prices can't be raised when it has become apparent that January is colder than usual--if only because meters are read once a month or because consumers get irritated with sudden price increases. Physical rationing (load-shedding) is consequently sometimes unavoidable. So in the cost function we also include a term representing the expected social costs of load shedding, including losses of industrial output and the costs and nuisance of consumers having to use candles, batteries, oil-heaters, etc. or of having to do without. 1/ Thus an increase of the level of (the probability distribution of) demand in the short-run, that is to say when capacity adjustments are not possible, will increase both the expected levels of the demands that are met and the expected levels of those which are not met. Both the expected costs of outages and expected fuel and other variable costs rise. So the relevant cost for short-run pricing is accordingly a probability-weighted average of the marginal costs of not meeting demand and the marginal variable costs of meeting it. (Capacity costs do not change in the short-run.)

5. In the long-run, capacity adjustments can be made to keep the probability of interruptions down to an acceptable level. The long-run marginal cost of supply is the marginal cost of extra capacity plus the expected costs of extra output. (There is also a rule to define the optimal level of extra capacity and implicitly the desirable level of continuity and quality of supply; it is that the marginal costs of extra capacity should equal the expected social savings from marginal reductions of supply interruptions.)

6. However, once short-run conditions become different from what they were expected to be when long-run decisions about capacity were made, one might as well optimise for the short-run one is actually in. This point derives its force from the length of time it takes to plan and instal new generating plants - six years is a typical time. If, in the event, demand has

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1/ Some countries have attempted to estimate these costs, or at least to determine appropriate levels of reserve capacity by thinking in these terms. See,e.g. The Madrid and Cannes Congresses (1967,1970 respectively) of the International Union of Producers and Distributers of Electricity, Working Groups on the "Quality of Service in Generation and Transmission," presented by Boiteux in 1967, and by Stasi and Janin in 1970.

grown faster than was anticipated, it will take a long time before the rate of growth of capacity can be accelerated. Meanwhile it may be preferable to raise the price of electricity at the peak rather than to accept an increased probability of power cuts.

7. Accepting this in principle, we have found that there are situations where it is not very helpful. The argument assumes that the tariff structure is such that there are appropriate peak KWh prices or KW charges which can be raised. But this is not always the case. The tariff structure may contain no such elements. The problem is then one of suggesting a new structure, not one of altering some of the elements of existing tariffs. In addition, information is generally not available on the expected costs of load shedding and this, too, adds to the difficulties of applying the short-run rule.

8. This is more or less the problem we faced in our case studies. Here we analysed the cost structure and tentatively suggested some new tariffs for consideration. It was impossibly difficult to calculate or even to guess the appropriate level of peak charges in short-run terms of what would bring peak demand to a level in relation to capacity which would keep the risk of supply failure acceptably low. (Even in countries which carry out a great deal of market research on electricity, very little is known about price elasticities and time-lags in demand.) Consequently, we had to rely on the cost analysis not only for suggesting the structure of possible tariffs, but also for suggesting the approximate levels of their various elements. Long-run marginal cost simply has to be used in such circumstances; there is no practical alternative.

9. This lack of information about consumer response is a great drawback. Theory constantly assumes things to be known when they are not, and when they cannot even be guessed, only measured. For this reason, we admire the idea of obtaining information by tariff experiments along the lines pioneered by the Electricity Council in Britain, and suggested in a study by Boggis and Westfield on electricity pricing in Pakistan.

Simplifications and Incentives

10. The long-run marginal costs of supply can be stated very simply for most systems, though in practice a lot of work is needed to estimate them for the various voltage levels of service. Most writers derive marginal cost rules for public enterprises having non-storable inputs (or where storage is costless), so these rules apply only to predominantly thermal systems; they have two elements:

- marginal energy (fuel) and running costs, plus, during peak times:
- marginal capacity costs.

We have adjusted these rules to allow for indivisibilities in capacity expansion. Briefly, it is best to consider the marginal capacity costs as being the present worth of the costs of bringing forward capacity expansion plans, averaged over the interval between investments. To a good approximation this is in many cases the average of incremental costs of expansion. We have also derived the

rules for hydro-thermal systems, that is where storage is important. In the simpler cases, marginal energy costs are zero in the wet or filling-up seasons, while in the dry or discharge seasons they rise to:

- the costs of adding to storage capacity (long-run rule); or
- the rationing price needed to keep the dry season energy demand down to the point where the probability of interruptions is at an acceptable level (short-run rule); or
- the fuel costs of thermal plant, if this is used to provide for extra output, less net capacity savings (over hydro) if extra thermal plant is needed (again, this is a long-run rule).

There are more complicated rules than this of course for some systems, particularly, as will be evident from our study in Sudan (to be issued shortly), where there are constraints on when to store and discharge resulting from silting or irrigation and flood control. But this is roughly the form which marginal costs may take.

11. If marginal costs can be stated so simply, why are they so difficult, technically speaking, to reflect accurately in tariffs? We have touched on the answers earlier and they basically boil down to the high variability and unpredictability of demand; and the cost and bother of metering. For many large industrial, agricultural and commercial consumers, even quite sophisticated metering may cost less than 0.1% of their bills, so that only the first of these problems is important. Meter reading can be done monthly so that seasonal variations in prices are possible. The main problem is to determine the times of day when demand is pressing on available capacity and how to meter and charge for it. There is a fair range of choice. Interruptible supplies can be offered at a lower price to those consumers for whom occasional interruptions are not too troublesome. Other consumers may be willing-to-pay for the high costs of supply during peak, and for these we may use either maximum demand meters, switched on during the peak hours of the month, with a charge related to maximum recorded demand (in this system, KWh's are metered separately and related to fuel and running costs of supply); or time of day meters with high KWh rates during peak hours. Telemetry control can be used to make timing of the metering more flexible and accurate. Broadly, we have found that the choice between metering maximum demand and metering KWh consumption during peak depends on the demand conditions (the case study in Tunisia, to be issued shortly, brings out this point). If the peak demands are persistent over many hours, in the form of hillocky plateau, it is worth spreading the net widely so to speak, by applying uniform KWh charges over all peak KWh during the month; off-peak KWh are recorded separately. If, however, the peak demand is spiky, a wide net is too restrictive while a narrow one may miss it or cause it to move elsewhere; a charge related to observed maximum KW demand during potential peak hours of the month, with a separate meter for KWh consumption, is then more appropriate.

12. Turning to small, mainly domestic, consumers, both the cost of metering and billing, and the lesser sophistication of the consumer necessitate simple tariffs. A time-of-day meter, for example, may cost about $50, and is therefore only worthwhile for domestic consumers whose consumption approaches levels typical of Europe and N.America. But tariffs generally have to be

simpler than this. It follows that they can reflect only one or two features of the cost structure. As there are quite a few features in the cost structure, this raises the problem of choosing which of them to reflect in the tariff and which to average out. A theoretical paper and our case studies elaborate on these problems more fully. Briefly, seasonal tariffs can still be applied if billing is monthly (anything less than monthly or bimonthly may be insufficient unless there are only two seasons (wet and dry seasons) within the year). The problem arises with charging for peak/off-peak differentials within the day. At the simplest level a flat KWh rate may be charged, pitched somewhat below the marginal costs of peak demand so as not to discourage off-peak consumption unduly, and somewhat above the marginal costs of off-peak demand so as not to encourage peak consumption unduly. At a slightly more advanced level, a load-limiter tariff can be introduced, where consumers subscribe to a certain maximum demand and are automatically and temporarily disconnected by a small circuit-breaker (in the house) if they exceed it; in addition they pay a flat KWh rate. Finally, for the larger domestic consumers it may indeed be worth-while to have a time-of-day tariff.

13. This does not exhaust the options open for economic tariff and metering policies--telecontrol in particular may offer useful new options--but at the current state of the art, these seem to us among the most important ones.

14. It might be useful to close by mentioning some common institutional problems which can have an important bearing on the choice of tariffs and meters. Monthly meter reading, for example, which we have assumed above, naturally costs more and one might expect it to be more usual in developing countries because being a labour-intensive activity, the extra cost is less where labour is cheap. Such countries often find great difficulty in recruiting and managing reliable meter readers, however, and the main reason for monthly billing seems to be that consumers default less on twelve monthly bills than they do on fewer and larger bills.

15. Reliability, whether of meters or of meter readers, is not only a matter of training and maintenance effort and of cheapness reflecting low quality. Consumers can cheat, either by tampering with their meters or by suborning the meter readers. Indeed consumers in some countries are adept at stealing electricity, at some personal risk. Furthermore, billing systems can degenerate so that bills arrive late, are inaccurate or fail to arrive at all. Collection may go wrong too.

16. Finally it is evident that consumers must have an understanding of what it is they are being charged for. The purpose of tariff structure is to provide consumers with incentives. A high rate both provides a message that special economy is called for and an encouragement to do something about it. But consumers themselves may not understand the message and may not know how to do anything about it. They need help, and it is part of the job of the electricity undertaking to provide it. Tariff-making very much needs to be supplemented by technical advice. For large consumers, the advice of commercial engineers is needed; for small consumers, individual advice is not practicable, and, though tariffs are already simple, a certain amount of advertising may still be required. By helping consumers adapt to the tariff structure, electricity companies will be helping themselves.

Dealing with Cost Distortions

17. One reason why a tariff structure which fully reflects the enterprise's cost structure may not lead to efficient resource allocation is what is known by economists as the "second best" problem. Consumers' choices may be influenced not only by the price structure of electricity but also by the prices of other fuels. Again, the prices paid by the electricity industry may not reflect the value to the economy of the resources it uses. Only if all such prices are right in some sense have we the "first best" situation where cost reflecting tariffs will lead to an efficient allocation of resources.

18. One answer to this problem, an answer which may be institutionally necessary though intellectually unsatisfying, is to ignore it. A practical reason for this is simply that it may not be in one's terms of reference. The electricity enterprise has been given the job of supplying electricity, not of running the whole economy, and may have to work within the existing framework. If, for example, it thinks that the tax on oil makes oil prices too high, it may nevertheless have to mind its own business. Another practical reason for ignoring the problem is that distortions elsewhere in the economy should be tackled directly.

19. The other answer is, of course, to try to make some adjustments for the distortions. Such adjustments may be called for not only in setting tariffs but also in making investment decisions. It is in this latter context in particular that much has been written about the use of shadow prices as a way of making the adjustments in developing countries. Directives are often provided by governments to public electricity companies to use appropriate shadow prices for capital, labour, foreign exchange and material inputs when comparing projects, and this, at least, facilitates the institutional problems of deciding on an efficient investment program.

20. Shadow prices can readily be used for analysing least-cost investment programs; but conflicts may arise when attempting to use them for setting tariffs. For example, in power systems with fuel-oil plant, taxes on fuel-oil, which are generally heavy, may rightly be neglected when fuel-oil power plants are being compared with, say, hydro, since taxes are not costs, but the government's share in profits. However, the government will still expect its taxes to be paid, so that they must be raised somehow. What this means for tariffs is that:

- their structure should reflect resource costs (computed using shadow prices) as far as possible;
- the revenue which this structure would generate should be computed; then,
- if this is too low, it should be amended to achieve the desired financial objective by increasing some elements of the tariffs in such a way as to do least damage to the efficiency and equity objectives.

21. This last point brings us to the concluding part of our discussion, which is on the equity and financial aspects of tariffs.

Finance and Equity

22. We have already noted that equity and financial considerations as well as resource allocation considerations are relevant to tariffs. Our view is that it is best to design a cost-reflecting tariff, subject to any second-best considerations, and then to modify if the revenue it promises is inadequate or if it seems unfair. This procedure, which keeps resource-allocation, equity and finance separate in the earlier stages, avoids the confusion of thought which afflicts the traditional approach.

23. We have only two general remarks to make on the financial side. The first is that to require an electricity enterprise to earn a certain minimum rate of return so calculated that it covers its accounting costs and possibly obtains in addition sufficient revenue to provide finance for a certain proportion of future capital expenditure, is something which is often welcome to the management of the enterprise. It helps to support financial responsibility, mobilise financial resources for expansion, and may enable management to obtain considerable autonomy in running the enterprise, a valuable spur to innovation and efficiency. Enterprises which rely on having their deficits met by government are usually, though not inevitably, in difficulties, and the capacity to innovate is sometimes noticeably stymied. It is, we admit, true that very high profits may have a debilitating effect too, but this is a much less common phenomenon.

24. Our second point is that to put tariffs at a level above that called for by pure cost reflection is equivalent to taxing the supply of electricity. It is true that the yield of the "tax" may finance the enterprise's capital expenditure rather than flow into the country's Exchequer. But if the Exchequer would otherwise finance part of the enterprise's capital expenditure, the difference is a book-keeping one, apart from any effect on the enterprise's independence of the sort of just noted. What concerns us here is a second-best resource allocation point. Something or other does have to be taxed and there is no general presumption against taxing electricity. Indeed if other kinds of energy are taxed there is a positive case for taxing electricity as well, so that relative prices including tax reflect relative cost before tax. More generally, in countries where the tax base is limited and the tax system is inefficient, electricity is a good candidate for taxation even if the tax takes the implicit form of a high proportion of self-finance. Hence although there may be substantial institutional difficulties in raising financial targets, it is nevertheless something to be encouraged and worth striving for.

25. Moreover, it is the case that tariffs which reflect resource costs would often lead to considerable financial surpluses in the electric utilities of developing countries (fuel oil taxes notwithstanding). The reason is that electric utilities are among the heaviest and most intensive users of capital and foreign exchange, both of which may have high shadow prices.

26. Fairness in tariff structure is a more contentious topic. We have already made it clear that there is nothing intrinsically fair in the financial view that tariffs should be set so that revenues from each consumer class cover its allocated share of accounting costs. For the same reason, there is nothing intrinsically unfair in revenues not covering accounting costs--as happens in the village electrification programs of many countries. Certainly a tolerant attitude on tariffs to poor consumers can be defended in such cases where it is true that the more appealing methods of redistribution through fiscal policy are not be administratively feasible. Having said this however, we can only state our general belief that distortions in the use of economic resources stemming from inequities in the economic system, like those stemming from distortions in the pricing system, are best dealt with directly. Countering inequities through cross-subsidisation within services like electricity is a poor second best.

27. Returning to less controversial matters, we have noticed that what interests electricity enterprises and governments is often not the fairness of tariff levels in relation to costs but the political acceptability of tariff changes. Since no-one ever objects to a reduction in tariffs, our observation boils down to the remark that if a new tariff would noticeably increase the bills of a group of consumers who would create a big fuss, that tariff will be looked at again. A large part of the work done on a new tariff consists of comparing it with the existing tariff for a sample of consumers in order to estimate the effect on their bills. Thus in practice, the "fairness" constraint on new tariffs often takes the implicit form that no consumer shall suffer an increase in his bill of more than so much percent within a certain period. The economist who is advising on tariffs has to take account of this kind of thing, even if only by recommending a gradual rather than a sudden transition to a new tariff. The people who run electricity enterprises naturally value a quiet life.

file
Follow-up:
Power

CHRIS L. SCHULTZ
8208 KERRY ROAD
CHEVY CHASE, MARYLAND ~~20015~~
January 2, 1974

Mr. T. W. Berrie
Power Advisor
Public Utilities Department
International Bank for Reconstruction
and Development
1818 H Street, NW
Washington D.C. 20433

Dear Mr. Berrie:

Re: Village Electrification Paper
Institutional and Financial Aspect's

In accordance with the schedule for submission of parts of the referenced sections of the village electrification paper I am enclosing the revised outlines for the Institutional Aspects and the Financial Aspects.

The revised draft of Institutional Aspects includes the points raised at the meeting in your office on December 27, 1973 and consists mainly of rearranging of the sections and consolidation of three of the original sections on Discussion into one section.

As soon as you have reviewed the enclosed revised outlines I shall be glad to discuss them with you at your convenience.

Sincerely,

Chris L. Schultz

DRAFT -- January 2, 1974
Chris L. Schultz

POLICY PAPER

LENDING FOR VILLAGE ELECTRIFICATION

Outline: INSTITUTIONAL ASPECTS

I. FACTORS CONTRIBUTING TO DEVELOPMENT OF VILLAGE ELECTRIFICATION

a. Government attitude
   1. Federal government
   2. State and local governments

b. Economic status
   1. Country
   2. Regional
   3. Local
   4. People

c. Cultural status

d. Literacy level

e. History of, or lack of, individual initiative
   1. Government encouragement
   2. Opportunity to exert initiative

f. Ongoing or planned complimentary programs in other sectors of village or rural development

g. Effectiveness of coordination of efforts in all sectors of village or rural development programs

II. REQUIREMENTS OF INSTITUTIONS IN DEVELOPMENT OF VILLAGE ELECTRIFICATION

a. Attitude
b. Knowledge of problems and their solutions in village electrification
c. Support of assisting institutions such as budget, planning and programing, allied sectors and public groups
d. Ability to raise capital
e. Capabilities for implementing or advising others in the development of village electrification
f. Capabilities for implementing or advising others in the operation of village electric systems
g. Capabilities for developing and establishing policy for village electrification program of development
h. Capabilities to educate village users of electricity
i. Effective coordination of efforts with other sectors in village or rural development programs
j. Where capabilities are deficient has desire to obtain competent advice in those areas

DRAFT -- January 2, 1974
Outline: Institutional Aspects
Chris L. Schultz

III. TYPES OF INSTITUTIONS

a. Agencies of Central Government Level
   1. Policy making
   2. Planning
   3. Budgeting
   4. Financial, management and technical sources
   5. Regulation and control
   6. Coordination of related government programs
   7. Implementation
   8. Supervision of programs
   9. Production and distribution

b. Implementing Institutions
   1. Private
   2. Government and quasi-government
      i. Federal
      ii. Mixed economy
      iii. Regional
      iv. State
      v. Municipality
   3. Cooperative

IV. DISCUSSIONS OF INSTITUTIONS

a. Agencies of Central Government Level
   1. Attitude toward village electrification
   2. Functions in village electrification
   3. Need for this type agency

b. Private
   1. General description of typical organization
   2. General attitude toward village electrification
   3. Advantages of Private institution
   4. Disadvantages of Private institution
   5. Circumstances conducive to Private institution

c. Government
   1. General description of institutions and purpose
      i. Central government
      ii. Regional
      iii. State
      iv. Municipal
   2. General attitude toward village electrification
   3. Advantages of government institutions
   4. Disadvantages of government institutions
   5. Circumstances conducive to government institutions

DRAFT -- January 2, 1974
Outline: Institutional Aspects
Chris L. Schultz

IV. DISCUSSIONS OF INSTITUTIONS (Continued)

d. Cooperative

1. General description of organization and purpose
2. General attitude toward village electrification
3. Advantage of cooperatives
4. Disadvantages of cooperatives
5. Circumstances conducive to cooperatives

V. EXAMPLES OF VILLAGE AND RURAL ELECTRIFICATION BY VARIOUS TYPES OF INSTITUTIONS

a. Nicaragua -- cooperative
b. El Salvador -- federal government
c. Costa Rica -- cooperative
d. Ecuador -- cooperative, private, municipal, federal
e. Colombia -- regional government, cooperative
f. Chile -- cooperative, government
g. Mexico -- federal government
h. Venezuela -- federal government
i. Brazil -- regional and state governments
j. Peru -- cooperative
k. Bolivia -- private, cooperative, government
l. Honduras -- government
m. India -- cooperatives, state
n. Philippines -- private, cooperative
o. Taiwan -- private

VI. CONCLUSIONS

a. Pros and cons summary.
b. Why one institution may work where another may not
c. Selection on basis of merits in each situation

DRAFT -- January 2, 1974
Chris L. Schultz

POLICY PAPER

LENDING FOR VILLAGE ELECTRIFICATION

Outline: FINANCIAL ASPECTS

I. TYPICAL FINANCIAL RETURNS

a. Long versus short-term
b. Social benefit to country's economy

II. RESOURCES MOBILIZATION

a. Local materials
b. Self-help

III. SUBSIDIES, GRANTS, LOANS TO UTILITY OR INSTITUTION

IV. SUBSIDIES, GRANTS, LOANS TO CUSTOMERS

In 69-73 most notable shift in sectoral composition were sharp increase in proportion of Ops. in Ag & relative decline in basic infrastructure. This trend is expected to continue at about same rate over 74-78. Are ops of loans expected to decrease in real terms.

In constant Fy 74 $

	64-68	69-73	74-78
Prov	$ 2188	3070	3100
no	29% (56 / 22%)	18% (72 / 11%)	12% (90 / 8%)
	$	$	$
Total	7674 (263)	17,130 (645)	25,002 (1095)

basic infrastructure Ops have greater weight in Lending to countries w. higher per cap $ levels.

CHAPTER VII - CONCLUSIONS AND FINDINGS

7.01 The Bank has been much the most important single institutional source of loan financing for power expansion in the developing countries, and the sheer volume of its lending for power has been so large relative to that from other sources that it is hard to see how equivalent amounts of financing might have been provided and hence equivalent expansion accomplished had the Bank not existed. On a world-wide basis, the principal elastic types of foreign credit for developing countries over the last years have been supplier credits from industrialized countries and loans from private financial institutions. These would presumably have been the main practical alternatives to loans from the Bank, but their harder terms (mainly with respect to amortization period) and limited availability (especially for other than equipment contracts) would probably have meant that the developing countries as a whole would simply not have been able to undertake such large expansion of electricity production as has actually occurred. This would seem to apply particularly to the ten companies reviewed, production of all of which (except for EPM) has grown faster than the 11% per annum world-wide average for electrical utilities in developing countries.

7.02 Bank loans fully or nearly fully disbursed to these ten companies account for somewhat over $1 billion of disbursements. The projects -- mainly in generation but also in transmission and distribution -- against which these funds have been disbursed have generally been effectively executed. Some of the projects, particularly of those in Colombia, Mexico and Ethiopia, have suffered substantial overruns in construction cost and/or construction period, but most of these overruns were due to construction problems, especially of a geological nature, which seem to have been hard to foresee. The ultimate costs, even for these plants, were not generally so high as to raise doubt about the economic validity of the projects selected as the best way to meet the load which eventuated, except for one case in Colombia and possibly some in Mexico. Hence it must be concluded that the physical objectives of the Bank's loans have to a very large extent been successfully met.

7.03 The load forecasts underlying the Bank's decisions to support the projects have shown a fairly wide dispersion from the actual and some systematic tendency to overestimate future peak demand, and such attempts as have been made to improve the accuracy of these forecasts have not proven very successful. However overestimates of future peak load have tended to be offset by underestimates of the time required to complete plant additions, perhaps partly because similar factors slowed project execution in power and industry alike. As a result most of the investment programs have ultimately

proved reasonably well balanced, in the sense that new capacity came on line at about the time it was required to meet the growth of demand. Reserve generating capacity has in fact normally tended to fall a little short of expectations. But there have been some exceptions to this -- particularly in Mexico in the mid-1960s and in Ethiopia and Singapore currently, where capacity is being completed ahead of the time it would be required, indicating some temporary overinvestment. The overinvestment (which is not directly financed by the Bank in the case of Singapore) appears to result primarily from faulty planning.

7.04 Most of the companies have fallen short of their financial covenants with the Bank on at least one occasion. More importantly, however, virtually all the companies have shown improving trends of financial performance, especially over the last five years. All but CVC/Chidral (and VRA, a special case) have now attained what is normally considered a reasonable rate of return (8 - 9%) on assets employed, revalued where appropriate in light of inflation; and all but CFE have been financing an increasing proportion of investment out of retained earnings. The Bank has steadily pursued, since the middle 1950s, the levying of tariffs sufficient to produce such returns, and it is quite likely that its efforts are partly reflected in the common pattern of improvement. Without Bank financing, of course, tariffs would quite likely, though not necessarily, have been even higher (and service worse) not only because the large economical plants that were possible to build with the assistance of Bank funds might not always have been possible in the absence of this particular source of financing, but also because a larger proportion of investment would probably have had to be financed internally. (Rates of return on revalued assets were, for instance, generally higher in PUB in Singapore and EEEB and EPM in Colombia before the Bank's involvement than after.) But once the Bank's financing was available the Bank's tariff covenants and urging of tariff increases probably did contribute to attainment of the financial performance actually reached. This improved financial performance has been a factor in enabling some of the companies, sometimes with Bank assistance, to raise increasing amounts of foreign financing from sources other than the Bank. After the initial pilot phase the Bank's Joint Financing schemes have yielded substantial amounts of export credit financing, although they still suffer from administrative complexity.

7.05 The improvements of financial performance must be considered principally achievements of the companies themselves, but it would seem that a useful supporting role has been played by the Bank's financial analyses and covenants, which have themselves shown marked improvement over time. Typically the Bank's earliest power loans had financial covenants relating mainly to a maximum debt/equity ratio and to debt service coverage and therefore affecting tariffs only quite indirectly; much emphasis in negotiations preceding loan commitment was placed on securing additional equity

contributions or other appropriations from Government to fill out the financial plan. But in somecases projects ran into serious problems during construction because of lack of cash flow to the borrowing enterprise, and because promised equity contributions or loans from other parties were delayed for one reason or another. Distribution works sometimes suffered. Hence more attention was soon given to company tariffs, and a tariff increase or the promise of one shortly after loan commitment were exacted before commitment of the loan. But this too proved inadequate because the promises were not always fulfilled or because inflation in the interim rendered them nugatory. Tariff covenants of various sorts began to be introduced, but they were often vague. Then, in the late 1950s, the regular practice was introduced of agreeing, before loan commitment, on a certain internal self-financing rate, which was then incorporated in a supplementary letter to the loan agreement. Gradually this was made more precise, by specifying not only the share of new investment which was to be financed out of retained earnings but also the particular multi-year period over which the targeted share was to be accomplished. This proved cumbersome, too, for it could never be seen until the end of the period -- by which time it was anyway too late -- whether the specified self-financing rate had been accomplished or not. So, in some countries early in the 1960s and in others by the middle 1960s, the change was made to an agreed minimum annual rate of return on average net fixed assets in operation as the principal criterion of financial viability in most cases. In countries subject to severe inflation this was introduced along with some provision to ensure revaluation of assets to current prices for purposes of the computation. Covenants providing for either an agreed self-financing rate or a minimum rate of return (and mainly the latter in recent years) have been applied to all companies covered in this review except for the special case of VRA, and they have been met in most years; the effectiveness of the modern covenants is to some extent illustrated by the exceptional case of CVC, which received loans only through 1963, with rather vague tariff commitments, and which has shown comparatively poor financial performance.

7.06 Closely related to financial performance have been the institution-building objectives which have been associated with Bank lending for power from the earliest days. All ten companies have executed the Bank-financed projects successfully and reasonably efficiently, and those outside Latin America have done this while at the same time converting from considerable dependence on expatriate staff at the higher levels to virtually total reliance on their own nationals. Effective project execution is important and it is not irrelevant to the role of the Bank insofar as most of the companies studied were either created or considerably reorganized within the period, with the Bank contributing to a greater or lesser extent to the formulation of their basic constitutions. Nonetheless institutional development means a good deal more than capacity to implement construction projects: effective maintenance, operations, planning, especially.

7.07 In regard to institutional development more broadly defined there is clearly one basic area where many of the companies have made considerable progress and where the Bank's impact, especially in some cases, seems to have been quite significant: system integration, whether physical or organizational, both at the local level of a particular city or urban area and, more importantly, at the national or regional level. The Bank has placed major emphasis on this, especially in the cases of Brazil, Colombia and Mexico and, to some extent, Argentina; and its efforts seem to have been attended with a good deal of success, although naturally depending importantly on the receptivity of the authorities in the country. As power systems develop, integration can contribute substantially to reducing the costs of power supply and making it more widely available. In several instances an outside institution such as the Bank, taking a national economic point of view, seems to have been able to contribute significantly to overcoming local and regional rivalries and jealousies: this is particularly clear in the case of Colombia, where, in the early 1950s, the Bank made institutional amalgamation of distribution and generation a precondition to lending for several cities, and, in the early and middle 1960s, it took a series of actions expediting physical integration of the main power markets in the center of the country.

7.08 The Bank has also played a useful role in some instances in connection with the internal organization of individual companies and their capabilities for maintenance and operation. This has mainly been a development of the last ten years, and especially in the last five years. Changes in organization and procedures have been introduced, partly at the instance of the Bank or as a result of recommendations in consultant studies suggested by the Bank. This has been of some importance in the case of CFE and of particular importance for PUB. Both have strengthened and improved efficiency considerably, and this detailed work has almost certainly contributed. Here, the Bank's assistance seems to have been effective not so much because certain basic concepts were persistently pursued -- as in the case of system integration, for example, or the principle of revaluation of assets -- but more because the Bank was responsive to changing particular needs of the companies for institutional improvement and because it helped to identify the specific problems which needed attention at any one time.

7.09 There are two companies among those reviewed which are clearly much less success stories than the others -- CVC/Chidral in Colombia and SEGBA in Argentina. They have not been able to offer a very satisfactory or adequate power supply and their unit costs are comparatively high for the type of service they provide, mainly bulk energy in the case of CVC/Chidral and retail energy in the case of SEGBA. It is striking that, among the companies reviewed (and leaving aside the large bulk suppliers, Furnas and VRA, whose situations are rather different), these are the only

two which have incomplete jurisdiction over utility power supplies i their respective service areas: SEGBA sharing responsibility mainly with IAE, and CVC/Chidral with EMCali. Both are also involved in rather diffi ult political situations, which have effectively limited their autonomy. The Bank, while emphasizing the latter problem, has not been able to do much about it, despite legal commitments and, in the process, it has become embroiled in essentially internal political disputes. Very little success has been had in improving the institutional structure of power supply in Cali, CVC/Chidral's main service area; indeed, in some ways, Bank action may have added to the complications. As regards SEGBA it would appear that the Bank's most positive and effective contributions have been in work, which mainly began only in the middle 1960s, on various detailed and concrete problems relating to company efficiency, labor utilization, and working capital situation, for instance. Striking contrasts with the Bank's relatively unsuccessful handling of the SEGBA case with successive Argentine Governments are provided by PUB where, despite the Bank's dissatisfaction with the basic organization of the company's top management, considerable advances have been made by effort at the detailed level; and also by the manner in which the Bank has successfully supported the introduction of certain basic concepts in the power sector of Colombia even though the way these concepts were implemented did not always conform to the Bank's preconceptions, as for instance with establishment of the Utility Tariff Board within the Planning Department instead of as an independent body.

7.10 This evaluation reveals, then, a broad background of considerable accomplishment on the part of the companies supported by the Bank and of the Bank itself. But it also reveals some areas of relative weakness and some areas where the Bank seems to have contributed less than it might try to do today -- areas that stand out the more because of the success that the Bank has had in other respects. These aspects can yield useful lessons for the future, which it was part of the purpose of this study to discover. In the Preface distinction was drawn between evaluating the extent to which specific Bank objectives in connection with each loan had been accomplished and evaluating the contribution of these objectives and their accomplishment to development. The remainder of this Chapter, like the preceding part, draws upon both types of evaluation. But to the extent that there is a common theme to the lessons drawn, it is that the Bank should continue to move toward setting its objectives in the electric power field in a broader context. With some important exceptions the outlook of the past has been too often confined to the power utility itself and the approach to the utility limited to defining a certain projection into the future of the established demand for power and then trying to find the financially most efficient way to meet the projected growth. Among the means of minimizing financial requirements the Bank has emphasized international competitive bidding, contracting of loans on long terms, selection of the cheapest alternative (in present worth terms) among system expansion

projects prepared, structural changes in the power sector to enable scale economies, maintenance of cash flow to prevent delays in project works, and efficient construction and construction supervision. Each of these has been important and useful, and yet this approach has bypassed basic questions of development and of the role that electric power can play in development.

7.11 How quickly should power demand be allowed or encouraged to grow? How much effort should be devoted to expanding the coverage of the power system as opposed to improving reliability standards on the existing system? What are appropriate risks of load shedding to run under different economic conditions? How much expenditure should be allocated to electrification of villages or small towns presently unserved, and how should they be selected? How much can electricity supply induce development or improvements in efficiency in other sectors (eg. small industry and agriculture)? Under what circumstances is it worthwhile from the socio-economic viewpoint to provide power at less than cost to serve? The Bank cannot and should not attempt to dictate to its borrowers the answers to questions such as these. But they are all basic dilemmas, affecting fairly substantial expenditures. The discussions leading to preparation of this report suggest that borrowing companies and their Governments are seeking more systematic means of resolving them and would welcome advice. This, and the experience reviewed, leads to the conclusion that the Bank could contribute significantly to development by helping to develop appropriate methods of analysis for dealing with these questions and encouraging borrowers and their consultants to apply them in designing power expansion programs.

7.12 The following paragraphs discuss in turn the main lessons and suggestions that seem to emerge from the study undertaken. They also present the background to each suggestion from the experience studied. It should be borne in mind that these suggestions, like all the findings of the report, are based on the sample of Bank activity reviewed and that different conclusions might have been reached had a different sample been selected, as emphasized at the outset of the report.

7.13 System Extensions: Techniques need to be developed for analyzing the economic validity of extending public power supply to new areas, such as marginal zones of the cities, surrounding villages or small towns or larger regions presently unserved. Most of the entities studied in this report have accomplished at least a small amount of such extensions, which have contributed to the large increase in the proportion of population electrified, although immigration of people into the existing service area has accounted for the bulk of new connections in most cases; the most serious evident lags in distribution extension arise in the cases of EPM and SEGBA. As regards its own financing, the Bank has sometimes been reluctant to accept extension of public lighting (marginal zones) or electrification of neighboring rural areas -- probably wisely, in view of the lack of demonstration of its economic validity. But the Bank has also

directly assisted some of the borrowers in extension of service areas, including specified amounts in its loans for such purposes, most importantly and continuously in the case of CFE but also, to a much smaller extent, in various other cases, including EELPA and on certain occasions CVC/Chidral and EEEB. But the criterion of inclusion appears to have been mainly that the work proposed was within the limits of what the company could manage with its prospective cash flow and project executing capacity. Without an approach for analyzing the economics of distribution system extension under different conditions, it is hard to say now whether the major extensions which the Bank did assist were particularly worthwhile investments -- or whether those it discouraged would have been so. The Bank is already starting to work on this matter, but in view of its great importance it would seem worth considering accelerating it.

7.14 Reliability Standards: The Bank should help develop, and require of utilities and their consultants, more systematic procedures for rational determination of reliability standards appropriate to the conditions of different countries and regions, with a view to eventual presentation in appraisal reports of explicit justifications of standards selected, allowing for the cost of capital and foreign exchange in the country, the reliability of the load forecasts, the shape and composition of aggregate system demand, hydrological and maintenance considerations, and the economic value to major consumer classes of greater or lesser certainty of supply. Distribution and transmission standards would probably need consideration as well as generating capacity reserves. As regards generating capacity, fairly conservative reserve criteria have usually been used in the past in project planning, and reserves have often been somewhat less in practice, due to delays in plant completion. But there are clear signs of overinvestment in generating capacity on several of the systems studied -- Mexico in the middle 1960s, and Singapore (not directly financed by the Bank) and Ethiopia currently; and there are some signs of excessive distribution standards in Singapore and Bogota. A systematic study of the matter would seem to be useful also for the complex case of Malaysia. Since power supply is so capital intensive, the question of appropriate standards seems particularly important. Again this problem is difficult, and methodological development will be required to enable rational solutions, but some European utilities have made progress in the field. Plans have been made to initiate a research project on this subject.

7.15 Urban Context: It would seem useful for appraisal reports and sector reports about electric power, whenever appropriate, to give a little consideration to power, predominantly an urban service, in its urban context and to treat explicitly the question of balance between power and other services and facilities, in terms of the quantity and quality of their supply. In the single case that it was possible to study from this point of view -- Bogota -- there did seem to be some imbalance between the quality and quantity of electric service available and of other services and

facilities, and it was doubtful whether this imbalance corresponded to desires or needs. Other questions also arose in an urban context. For instance, it was found in Bogota that a fairly significant amount of investment, not all financed by the Power Company, was going into development of distribution networks in residential areas well ahead of the time that such areas might be heavily occupied, due to the attractive features of house lots in such areas as vehicle for private savings. In Medellin there was a different problem, but also urban in nature: the serious lag in distribution system extension over the last ten years has resulted in increasingly large stealing of electricity (over 15% of total generation) by dangerous pirate connections from marginal areas which the muncipal authorities refused to incorporate in the city limits; at length the problem seems to be on the way to solution, but the Bank might usefully have tried taking it up with the municipal planning authorities.

7.16 Tariff Structures: In the last few years more attention has begun to be given to electricity tariff structures and this work should be extended, with systematic examination of the relationship between cost and tariff structures. Analysis of this relationship in Bogota indicated that it was quite likely that excessive investment in power had resulted and it seemed clear that subsidies were not in fact going entirely in the direction originally intended. The Bank's objective should be to analyze wherever possible the extent to which tariffs are structured so that charges to different consumer groups reasonably reflect the incremental costs of supply to them. Then it would be possible to justify explicitly significant deviations from social marginal costs in terms of (a) effective means of taxation of inelastic consumers, (b) subsidies warranted to induce consumption of electricity because of resultant economic benefits or (c) price distortions elsewhere in the economy.

7.17 Central Power Institutions: The history reviewed suggests that there is much to be said, where circumstances in a country permit, for the Bank selecting as an explicit objective for itself the development of a strong central institution in the power sector (or possibly regional institutions in exceptionally large countries), through which it might later channel any lending in a sector program manner, as has become the habit with CFE. It is not so much potential economies in the Bank's staff time that seem to make this advantageous as the fact that existence of such an institution appears essential in order to develop (a) sound and well-coordinated investment planning, (b) balanced plan implementation (among regions) and (c) effective and economical use of the other sources of foreign financing such as supplier credits, that may become more important in the future. In retrospect, it seems unfortunate, on these various counts, that the Bank did not succeed in its effort in the early 1960s with Electraguas (ICEL), the national power holding company in Colombia, but perhaps the new institution, ISA, which the Bank has helped to create in the meantime, will come eventually to fill this gap.

7.18 Unified Jurisdiction of Local Power Companies: The experience reviewed suggests that the Bank has made a major contribution, in dealing with power companies responsible for an urban region, when it has insisted on unified control of generation, transmission and distribution. The diverse experiences of Buenos Aires, Cali, Cartagena, Manizales and Bucaramanga all tend to support this thesis: in some the Bank insisted on full unification, in others on partial unification and in others on no unification.

7.19 Utility Efficiency Indicators: Since most power utilities are (and need to be) in a monopoly position and their profitability is assured by minimum rate of return covenants with the Bank, if observed, there may be need to give more systematic and thorough attention than seems to have been the case in the past to other technical and financial indicators of efficiency. The protection afforded by minimum rate of return covenants will be partially offset by political pressures against tariff increases, but possibly not sufficiently -- especially in an inflationary situation. Some preliminary indication of trends in efficiency may be obtained from trends in cost per unit of energy sold, and here the various utilities studied display contrasts. In general terms, and over the long term (10 - 15 years) the utilities reviewed in Latin America have shown stable or even increasing unit costs (in real terms), despite very large increases in system sales (five- or six-fold) which should have enabled economies, while those in other areas have generally shown decreases, sometimes very substantial, as in the case of PUB in Singapore and, to a lesser extent, NEB. In the most recent years average unit costs of SEGBA and the Mexican power sector have shown a slight downward trend as a result of special efforts to improve efficiency, but EELPA's average costs have shown an upward trend, with system losses (as percent of generation) and sales/employee levelling off since 1964, when the Bank's first loan was made. It might be worth systematically including in appraisal reports simple standard summary tables of efficiency indicators, showing trends for the past ten years; small cost analyses could be presented if there were abnormal features; and, if there were serious problems, performance targets could be agreed in loan negotiations (along with specific steps or studies to attain them) and regularly checked by project supervision missions. The Bank has apparently recognized the need for greater use of efficiency indicators for some time and, since the subject is difficult to come to grips with satisfactorily, a research project to this end is planned for early initiation.

7.20 Utility and National Power Planning Units: The experience reviewed indicates that it is important to give attention in sector missions, appraisal missions and institution-building efforts to the adequacy of planning units as well as of plans and that attention to this in the past may sometimes have been rather uneven. One of the advantages of the sector lending to Mexico was that this subject received considerable attention there, and some attention was given in Medellin, Buenos Aires and

Brazil as well; on the other hand it seems to have received inadequate attention throughout the Bank's long association with the Cali power institutions and also in the early years of the Bank's work with PUB in Singapore. Had the matter received more study at the appropriate times the persistent power shortages and other problems in Cali and the current excessive investment in the Singapore power network might have been reduced. If the Bank were to encourage borrowers and their consultants to do more work on power planning problems such as those mentioned earlier -- the economics of system extension and system reliability -- then this would of course help too.

7.21 Training: The evaluation underlines the importance of giving systematic consideration in project appraisal and reviews of consultant terms of reference to training and opportunities for promoting and assisting it. Adequate training programs do depend heavily, it seems, on the enthusiasm of the utility's management. The evidence suggests that in the past more attention has sometimes been given by the Bank to training in those companies which were stronger (NEB, Furnas, for example) and less in those which were weaker and more in need (PUB, EELPA and some of the Colombian companies). However training received rather continuous attention in the case of CFE in the late 1950s and early 1960s and in VRA, and the deficiency with respect to most of the other companies mentioned seems to have been filled in more recent years.

7.22 Institution Building: The various cases reviewed seem suggestive of certain lessons about what might be called the techniques of assistance in institutional development, or the means for securing institutional changes sought by the Bank. Various of the points made earlier, about the need for persistence in support of major concepts, for leaving essentially political frameworks to borrowers, and for detailed assistance with internal institutional problems and efficiency, obviously relate. There seems little question but that where the Bank has helped achieve much in institutional development as, for instance, in Colombia, Brazil, Mexico and Singapore, continuity of the relationship between the Bank and the borrower has been important, whether the Bank's principal effort was on introduction of a few major concepts (Colombia and Brazil), detailed institutional improvement (Singapore) or both (Mexico). All the evidence naturally shows the importance, too, of precise identification of problems and precision in financial targets and covenants -- the latter well illustrated by the history of the Bank's main financial covenants briefly recounted earlier. Precision in terms of reference for consultants (with special attention to their training responsibilities) is another need underlined by the experience studied; it is noteworthy that most of the unsatisfactory experiences encountered with consultants in the cases studied have been with firms hired without Bank review of terms of reference. Finally there is the difficult question of how long it is worthwhile withholding a loan, in the

attempt to force institutional change. At least three aspects have to be taken into account in reviewing past experience from this point of view the retrospective importance of the change being sought by the Bank, the actual cost of the delay involved and the effectiveness of the Bank action in securing the change if and when eventually made. It is quite clear that there have been occasions when refusal to lend until certain conditions had been met played a vitally useful role, for instance in expediting creation of ISA in Colombia and in convincing the Argentine Government to apply the Concession Agreement with SEGBA (1964-65); in both these cases the objective sought by the Bank seems in retrospect to have been very important, the costs of delay were not in the event very great and the Bank action helped in eventual attainment of the objective sought. But there are other cases where it is more doubtful whether the delays were really worthwhile, partly due to their costs and partly due to doubt as to whether the objective sought was important enough to warrant this cost or as to how effective the Bank action was in causing the change that eventually came. For example, in the cases of EEEB and EPM in the late 1950s, considerable delays occurred awaiting changes in their constitutional status that now seem of doubtful importance to development, and these delays were partly responsible for the quite serious shortages of power in the early 1960s; equally the two-year delay in lending to PUB in 1964-66, though it was less costly (only causing temporary diversion of Government funds from other uses), was the result of pressure for solution to top management problems which largely remain unsolved but which have not prevented PUB from performing in many respects better than any other company covered here. In other cases the point which caused the Bank to delay lending seems in retrospect to have been important, but it is doubtful how far the delay contributed to eventual resolution of the problem: for instance, in the case of CFE in 1959, when the Bank refused an expected loan in the attempt to induce needed tariff increases. Tariffs were not increased, resort being had instead to supplier credits and other short-term foreign borrowing, which created a recurrent debt-service problem for later years. In 1962 tariffs were finally increased, but this seems to have been more the result of developments connected with the 1960 nationalization than the effect of Bank action, and it may be doubted whether the increase would have been less in amount or later in time had the Bank gone ahead with the planned 1959 loan. A somewhat similar case may be SEGBA in 1966-67 when the only outstanding power issue seems to have been the labor problem and the delay in the Bank's loan apparently resulted in sharp reduction in the distribution expansion program, in turn worsening the quality and quantity of the company's service and hence reducing earnings. Some action was finally taken on the labor problem in 1968, but its timing seems to have been more the result of internal Argentine political shifts than of the Bank's pressure; hence again the costs of the delay seem to have outweighed its benefits. In some of these instances reduction of the delay in lending would have required the Bank to accept departure from legal provisions previously agreed, in principle clearly undesirable but in the cases mentioned seemingly outweighed by the quite high costs involved in the delays. On the other hand there seem to be one or two cases where the Bank could probably have contributed more to development by being firmer -- principally with CVC/Chidral in the 1950s, as noted earlier -- even at the cost of greater delays. Hence it seems that the value of withholding loans has to be treated on a pragmatic case-by-case basis, bearing in mind costs and potential benefits of delays as foreseeable at the moment of decision.

7.23 Financial Recording and Planning: The accounting systems of all the companies reviewed seem to have improved over the years and in many cases the Bank has stimulated and assisted this development, but there appear to be some weaknesses remaining which may need additional emphasis. Classification of assets, by function and by lives, seems still rather weak in the Colombian companies, especially CVC/Chidral, and this makes sound financial planning more difficult than it would otherwise be. Recording of financial information, both on fixed assets and on financial obligations, still appears weak in the case of CFE and may be partly responsible for the poor financial planning and under-forecasting of debt-service obligations which has added to cash problems at times.

7.24 Construction Cost Estimates: Sometimes in recent years the Bank has employed specialized consultant firms to check project construction cost estimates, especially for major civil engineering works. The importance of this, and possibly the need to make it even more usual practice, seems to be underlined by the considerable cost overruns which have occurred on many of the projects reviewed in Colombia and Mexico, and in particular by experience of Calima for which the cost overrun was so great that, in combination with other factors of lesser importance, it raises some doubt now as to whether the project was the most economical means of meeting system load growth.

7.25 Shadow Prices: The importance of adjusting construction cost estimates and some other costs (eg. fuel) for purposes of economic analyses of project validity, as the Bank has increasingly come to do under appropriate circumstances, is also emphasized by one or two of the cases studied here. Even though 1961-62 was a time when the Bank was increasingly concerned about the over valuation of the Colombian Peso, it does not seem that this was taken into account in preparing the recommendation to EEEB to replace the Canoas hydroelectric project in its construction program with the Zipaquira 2 thermal unit, which in retrospect appears to have had even greater economic disadvantages than thought at the time. Sometimes it is suggested that shadow prices are not applicable in a market economy because they are not the effective prices which actually confront decision-makers, contractors, etc.; this would not seem to be relevant for a decision of the type described, entirely in the hands of a major public sector institution, which can moreover reflect shadow prices in its tariffs.

7.26 Fiscal Contribution of Power Companies: Examining the power company from the point of view of the contribution it can make to development, it might be useful to include regularly in appraisal reports a paragraph or two about fiscal aspects of the company's operations. The companies covered show great variation in the extent of their contributions to Government revenues, Furnas and SEGBA already making substantial contribution,

for instance, NEB and PUB beginning to make some, VRA about to start, and CFE and the Colombian companies not presently making any. Insofar as the Bank's urging of increased cash flow by higher tariffs seems generally to have been rather successful, there may be increasing need to look at this fiscal aspect in the interests of sound resource allocation and avoidance of overexpansion of power relative to other services, particularly as the normal pattern in power is for about half the costs of system expansion to be financed by foreign borrowing. To the extent that demand for power is inelastic, power prices may be an appropriate means of raising funds which can be used to bolster institutions responsible for other services and operations. The Bank appears to have made a useful suggestion to the Ethiopian Government that greater contribution to general revenues should be obtained from EELPA; equally ECG was encouraged to pay dividends to the Ghana Government. Another important fiscal aspect concerns duties on utility equipment imports. Most of the companies reviewed do not pay duties on their equipment imports and there is evidence in some cases that this may distort procurement patterns, especially where, as is sometimes the case, local manufacturers do have to pay substantial duties on imported materials and parts; it may also distort electricity tariff structures, especially where import taxes are an important element in the rationing of foreign exchange supply.

7.27 Sales of Participations in Bank loans: If a situation recurs such as that in 1967-68 when the Bank desired to use Joint Financing to make make up for shortages in the funds it could lend, in total or to particular countries, then serious consideration should be given to making arrangements with supplier countries whereby funds available for export financing might be used to buy participations in Bank loans in amounts directly related to contracts won by their nationals. Ideally such participations might be in the form of an equal strip, over all maturities of the Bank loan under which the contracts were won, but realistically they probably could not extend beyond about 15 years; in this case they would effectively have terms highly comparable to those on the export credits such agencies would otherwise provide, so that they should be acceptable in principle. Past Joint Financing schemes, involving separate loans/credits from all the agencies involved, have remained administratively rather complex, even though they have raised quite substantial sums. The procedure suggested, which would require standard arrangements first to be made with all major export credit agencies, would tap a new source of finance for a new type of participations and would eliminate the complexities, for borrowers and the Bank, of present Joint Financing arrangements.

7.28 World Trends in Power Financing: As an additional perspective on the role that it should play in power the Bank should consider deepening the review of capital requirements for power supply in the developing countries as a whole attempted in this report and developing overall figures

regarding prospects for financing from other sources. For, quite apart from the contribution it can make to institutional development or to helping realize previously neglected development potentials in power, another reason for Bank activity in the power field will probably remain the better financing terms that it can offer and the developing countries' need for such terms, from a debt burden point of view. With the likely rapid growth in power requirements in the developing countries, the desire of the Bank to diversify its lending increasingly and the growing availability of financing on good terms from producers of heavy electrical equipment (including new ones such as those in the Eastern European countries) as well as other factors, a more systematic review of these worldwide trends would be useful as a complement to country and sector considerations in planning power lending.

7.29 Follow-up Evaluation Studies: Two matters emerging from the present study would seem to merit consideration for further, more thorough evaluation work. First are some aspects of equipment procurement. It has not been possible to deal with procurement questions in any depth in this report. The Bank has in fact covered substantial amounts of local procurement out of all its loans to CFE and to SEGBA. It would seem worthwhile to have an evaluation study done focussing specifically on the contribution that the Bank has made to growth of efficient local electrical equipment industry through such financing. Analysis of the Bank's experience to date in this field might be useful for future policy. Second, a more thorough study than has been possible here might be worthwhile on the economic validity of the Volta River Project in Ghana, taking account of the arrangements with the aluminum company, the greater than expected growth of non-aluminum consumption of electricity, the health hazards and severe resettlement problems resulting from the project. In several respects this project seems to have turned out better than expected and in a few worse, but it was not possible to reach any definitive conclusions in the current review.