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INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT
INTERNATIONAL DEVELOPMENT ASSOCIATION

CURRENT ECONOMIC POSITION
AND PROSPECTS
OF BRAZIL

Volume III
Electric Power

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Western Hemisphere Department

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FLOATING RATE

Quotation:

June 1964	US \$1 = 1,200 Cruzeiros
April 1, 1965	US \$1 = 1,840 Cruzeiros

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MAP

SUMMARY

- i. The electric power supply in Brazil while not fully satisfactory at the present time is fairly adequate. In the south central region the expansion of the distribution systems has been suspended for several years due to lack of funds for expansion. This will lead to a serious imbalance between generating capacity and distribution capacity if the situation is not corrected. In addition, in this region, rationing of power was necessary in 1963 and 1964 because of a water shortage, due to inadequate storage facilities and reserve capacity. This interfered to a degree with the supply of power to industry, particularly new industry. Nevertheless, the electricity supply has at least kept pace with other sectors of the economy and has not retarded industrial growth.
- ii. Plans are generally in hand for the expansion of the electricity supply. In the industrialized south central area their scope is on a very large scale and the effect should be to provide adequate power for anticipated growth, and for appropriate reserve capacity, by 1969/70. The plans for the area involve substantial expansion of distribution as well as generating and transmission facilities. In other parts of the country there are general plans for expansion in keeping with prospective needs. In the northeast region and in the State of Rio Grande do Sul it would be advisable to have the utility operations studied with respect to organization, financial administration and planning to ensure sound development.
- iii. The electric power utility program envisages an annual investment on new facilities involving disbursements of the equivalent of about US\$ 400 million annually for the five years beginning 1965. In 1965 and 1966 the figures are estimated at 715 and 810 billion cruzeiros at current prices corresponding to 412 and 403 millions US\$ equivalent. Foreign financing averaging about \$90 million per year in 1965 and 1966 is estimated of which about \$60 million has already been committed. It is expected that the utilities themselves will generate an average of about 15% of the investment funds required, on the basis of the utility revenues anticipated as a result of the new tariff regulations. There will be wide differences in the proportion of investment financed through internal cash generation among the different companies.
- iv. The tariff regulations recently put in effect should result in a substantial improvement in utility earnings. It will be advisable for the regulatory body, the Waters Division of the Ministry of Mines and Energy, to watch the developing situation to ensure that within the framework of the regulations tariffs are set to provide revenues sufficient to give satisfactory earnings and a reasonable amount of funds for expansion and, on the other hand, that they do not become excessive, discriminating against the consumer, and generating unduly large and unrealistic revenues.
- v. It is advisable that certain problems arising from the Federal Government's jurisdiction of the industry should be reviewed. These include the problems resulting from perhaps unduly centralized Government jurisdiction over tariffs and the raising of funds by taxes

on electricity consumption and forced consumer loans. In addition problems arise, and serious potential problems can be foreseen, from the fact that Eletrobras, a Federal agency, exercises several functions, namely that of a holding company of federal utilities, planning agency for (expansion of) the utility industry and administrator and disbursing of public funds to the industry.

vi. The industry itself, possibly with the help of Government bodies, should consider means of improving the financial administration of utilities by educational or training programs. It should consider, as well, the possibility of establishing an organization to act as a forum for the exchange and discussion of information affecting it. The Government in collaboration with the industry should provide a regular series of utility statistics.

vii. The Federal Government in cooperation with State Governments and the industry should exercise careful supervision over plans for expansion during the forthcoming five year period. This is particularly important as with changing conditions in Brazil growth may be accelerated, or slowed down, requiring commensurate changes in the rate of expansion.

VOLUME III

ELECTRIC POWER

I. INTRODUCTION

1. This section of the report of the Economic Mission is devoted to the electric power utility industry. It discusses historical background, the present status of the industry, load growth and the expansion program that is envisaged. There follows a discussion of the estimated investment program and the means of financing thereof - internal, federal and state contributions, and foreign lending and assistance. The economic justification of the program is then discussed. The summary at the front of this report gives the principal conclusions.

2. Annexes are appended which give factual and descriptive information and future estimates.

II. HISTORICAL

3. Brazil is a country of great hydroelectric resources, a large part of which are located within or near the industrialized and more developed areas in the south central. Much of this potential exists on rivers rising on the high escarpment along the coast of the Atlantic Ocean, several hundred miles each side of Rio de Janeiro, which flow inland to reach the ocean far to the south and north. There is a lack of hydroelectric potential in the huge Amazon basin, a relatively underdeveloped area. Fossil fuels are scarce in Brazil. In the south in the States of Rio Grande do Sul and Santa Caterina there are deposits of low grade coal of which some is used in the metallurgical industry and in small thermal plants in the area. Studies are under way to determine the economics of using this coal in substantial amounts for future power production but major developments in this respect are difficult to foresee. Of the approximately 7 million kw of installed capacity in the country at the present time there is less than 1 million kw of thermal capacity. The main development for many years will most likely be hydroelectric with the occasional construction of thermal plant to firm up hydro energy. Large hydro sites await development in the areas which will require the greatest amount of power in the foreseeable future; they are generally low cost and, in fact, some are among the lowest cost in the world. It cannot be foreseen that nuclear power will be competitive for some years, at least until the best of these sites are developed.

4. The origin of the electric utility industry goes back to the turn of the century and its development parallels to some extent that in other areas of the world. As in the case of many Latin American countries foreign capital was an important factor. The main development occurred, as might be expected, in the south central area which is the most highly developed part of the country, containing the most important cities, the bulk of industry, and a large part of the agricultural and other natural resources.

5. During the first three decades of the century the industry was predominantly investor-owned and was allowed to develop freely. With the new Constitution of 1934 certain principles were set forth, the intent of which seems to have been to put electric utility development and ownership in the public domain. A federal law governing utility regulation was enacted as the Waters Code of July 1934. Electric utility development since then has been shaped by a number of influences; the advent and growth of publicly-owned utilities, inflation, the political affairs of the country and the regulation of the utilities in the context of these factors.

6. Federal and State owned public utilities experienced their main growth after World War II and have now attained an annual energy production greater than that of investor-owned utilities. Since the latter were first on the scene they built and supplied the distribution systems in the main cities and most developed areas of the country. As a result, until recently, they continued to own the bulk of the distribution systems, in contrast with the publicly-owned utilities which mainly sold power at the wholesale level. This condition has been changed as a result of the acquisition of the American and Foreign Power Company properties by Eletrobras, an agency of the Federal Government. The subsidiaries of the Brazilian Traction Company, Sao Paulo Light and Rio Light, which are responsible for the distribution of almost 50% of the energy in Brazil, are the only remaining large investor-owned electric utilities.

7. The inflation of the past 10 - 15 years has had a great impact on the development of electric utilities, especially those in the private sector. The erosion of the rate base by inflation was compensated for in part by special rate increases to offset specific increases in costs which resulted from inflation; moreover regular (as distinct from special) rate increases were sometimes allowed, providing some relief. However, regular increases to the investor-owned companies were virtually non-existent because of the Federal Government's attitude. As a result, the private companies were unable to generate money for expansion internally or generally raise it externally, with the exception of borrowing from international agencies, because of lack of investor confidence. As a result, their expansion in recent years was virtually arrested. The distribution systems in the cities of Rio de Janeiro and Sao Paulo and other large cities, owned by subsidiaries of the Brazilian Traction Company and the former American and Foreign Power Company suffered in particular. Because of the lack of improvement and expansion in recent years they are now loaded to maximum capacity and an immediate and continuing program of expansion is urgent.

8. On the other hand, while the publicly-owned utilities likewise suffered from the erosion of the currency and were not able to show a significant return on investment, they were given rate increases from time to time in accordance with the provisions of the regulatory system, even though there was nothing systematic about this and political considerations were sometimes a factor in their being granted.

Probably of more importance was the fact that they had access to and were the recipient of public funds, both federal and state, for expansion purposes. Consequently, in recent years, notwithstanding inflation, there has been a substantial expansion of the publicly-owned companies; this is reflected in the construction program of generation and transmission capacity recently completed and now in progress. At the present time there is a decided imbalance between the program of expansion of generation-transmission facilities being carried out by the publicly owned utilities, and the program of expansion required to put the distribution systems in shape to distribute the additional power which will become available. As noted hereafter, as the result of the policies of the Castello Branco Government, as reflected in tariff regulations and other matters, it now appears that the investor-owned companies will be enabled to initiate substantial expansion of their distribution systems.

9. During 1963-4 rationing of power was necessary at times to the extent of up to 10% in the Rio de Janeiro and Sao Paulo metropolitan areas because of a shortage of energy due to unusually poor rainfall conditions in the watersheds of the region. The lack of storage capacity resulted in there being an inadequate energy reserve to meet this condition. In general, however, and with due recognition of the rationing of power and the state of the distribution systems, it must be said that the electric power sector in Brazil is in reasonably good condition. Looking to the future it is evident that with the present state of the industry as the base for future development, and with proper organization of the contemplated program of expansion of generation, transmission and distribution facilities, and adequate financing, there is every reason to believe that the electric power supply should be adequate to meet future domestic, commercial and industrial requirements.

III. ELECTRIC POWER USAGE

10. From the electric utility standpoint, Brazil may be considered in two parts. The south central area comprising the states of Guanabara, Minas Gerais, Sao Paulo and Rio de Janeiro and part of the State of Parana and of other adjacent territories is, as noted previously, the main industrial area of the country and has a highly developed electric utility industry not unlike that in other industrial countries. The remainder of the country varies in characteristics from place to place with parts in the south and elsewhere well developed and, at the other extreme, other areas in a primitive state with electric utility operations characteristic of developing countries. A map of Brazil is included at the end of the report for reference.

11. Annex 1 of this volume gives the statistics of electric power production in 1955-62 for electric power usage in the entire country, the south central area and the remainder of Brazil, and the corresponding per capita usage. The rate of growth in this period

has been about the same in the area outside the south central region as within it. The per capita usage which increased 60% in this period in each case, continues to be three times as much in the south central region as, on the average, in the remainder of the country, reflecting the conditions noted in the previous paragraph. All of Brazil had a per capita usage in 1960 of about 320 kwh. This contrasted, at that time, with a usage in excess of 4500 kwh in the United States, 1200 in France and 550 in the Argentine. However in 1960 the south central region used about 550 kwh per capita and in particular, the states of Sao Paulo and Guanabara (which contains the city of Rio de Janeiro) each had a usage of about 800 kwh. In 1962, the last year for which completed statistics are available, total electric production was almost 28 billion kwh. The average growth rate of the country during 1955-62 was between 10-11%.

IV. INDUSTRY ORGANIZATION

12. The Federal Government, as distinct from State Governments, exercises jurisdiction over electric power utilities under the 1934 Constitution. It regulates tariffs and, in this connection, raises revenue by the imposition of taxes and other levies on electric power consumers. Equally important it has jurisdiction over (granting of) the rights to develop hydroelectric sites on all rivers. In this connection it has organized autonomous federal agencies for the development of some rivers and has granted concessions to develop sites in other instances to State utilities and, in the past, to investor-owned utilities. Individual states, for their part, have organized state owned or controlled utilities predominantly concerned with generation and transmission, on the basis of development concessions granted by the Federal Government. While much of the investment in the industry is owned or controlled by the federal companies, state and private companies own the bulk.

13. The industry is regulated under the provisions of the Waters Code, a legislative act going back to the new Constitution in 1934. Amendments have been made to the Code from time to time but the detailed regulating decree, which would have enabled certain of the provisions of the Code to be applied, was not enacted until 1957. There was, accordingly, a long period during which the industry was regulated on something of an 'ad hoc' basis. Since 1957, when the decree was published, rates have been governed, in theory, by the provisions of the decree. In fact, rate increases, even since then, were granted at the discretion of the Government. The responsibility for application of the Waters Code was for many years that of the Waters Division of the Ministry of Agriculture. The newly created Ministry of Mines and Energy assumed this responsibility in 1961. Under the Castello Branco Government, which took power in March 1963, the organization of the industry is being given some study.

14. Centrais Eletricas Brasileiras S/A (Eletrobras) is an autonomous agency established by the Federal Government in 1961 to carry out

studies, finance and construct electric power projects, and operate electric power plant and lines. It is generally agreed that it had as a goal the ultimate placing of the industry under the control and ownership of the Federal Government. Under the Castello Branco Government, and with a new administration in charge of Eletrobras, there is no longer emphasis on socializing the industry and, in fact, there is some trend toward a reversion to private control. Eletrobras now has two main functions. First, as a holding company which owns the major interest in, and controls the operation of, the federally owned/controlled power utilities; in this connection one of its most important responsibilities is the financing of expansion. Secondly, it administers and allocates public funds to expand the federal power companies, to assist in the expansion of other public (state and municipal) utilities in need of financing, and to develop or assist in developing electric power facilities in some of the poorer areas of the country, in which the Federal Government or its agencies assume the major development role. Annex 2 of this volume is a statement prepared by Eletrobras concerning its organization, activities and resources. It includes an assessment of the sources and amount of public funds which will be available in 1965 for development of electric utility facilities. It is noted that the resources available to Eletrobras are obtained from a tax imposed on utility accounts, from compulsory subscriptions by consumers to an "Internal Loan" applied to such accounts and from a share of the proceeds of excise taxes and customs assessments levied by the Federal Government. Fifty percent of the tax on electric utility accounts is returned to the respective states and ten percent to the municipalities; Eletrobras receives 40% of the tax.

15. Annex 2 of this volume also gives the total public resources available to the sector, disbursed by the Federal and State Governments and Eletrobras. Direct federal allotments are provided for in the budget and disbursed by federal agencies, particularly those concerned or charged with the responsibility for the development of certain (underdeveloped) areas of the country. State resources are obtained in part from the 50% remission of the tax on accounts, from a share of (state) sales or other taxes and from the general budgetary resources. Disbursements by the state are made directly to the State electric power agency (agencies). As noted in Annex 2 of this volume it is difficult for a number of reasons to forecast the amount of public funds which will be available for the electric power sector.

16. The industrialized and richer states have a stake in power development commensurate in size and importance with that of the Federal Government. The trend has been for such states to organize agencies which are given the responsibility for developing the hydro sites on a river and supplying power to the associated area, similar to the basin developments in the United States. While in most states there is a single state utility some states have more than one. For instance, Sao Paulo has three state utilities each charged with specific developments. While many states have electric power agencies it is only those of the larger and richer states which have the organization and resources compatible with large electric utility operations.

17. Among the leading utilities are the following:

FEDERAL

FURNAS (Central Eletrica de Furnas S.A.)

CHESF (Companhia Hidro Eletrica do Sao Francisco)

CAEEB (Companhia Auxiliar de Empresas Electricas Brasileiras -
comprising properties of the former American and Foreign
Power Company)

STATE

· CELUSA (Centrais Eletricas de Urubupunga) State of Sao Paulo

USELPA (Usinas Eletricas do Paranapanema) State of Sao Paulo

CHERP (Companhia Hidroeletrica do Rio Pardo) State of Sao Paulo

CEMIG (Centrais Eletricas de Minas Gerais) State of Minas Gerais

COPEL (Companhia Paranaense de Energia Eletrica) State of Parana

CEEE (Companhia Estadual de Energia Eletrica) State of Rio Grande do Sul

INVESTOR OWNED

Rio Light (under control of the Brazilian Traction Company)

Sao Paulo Light (" " " " ")

There are other federal and state utilities and numerous public (some municipal) and investor-owned distribution companies of comparatively small size. Annex 3 of this volume gives information as of 1964, on the electric power organization and plans for development in various regions and states. It is included to give a broad impression of electric power development, particularly in the remote or underdeveloped areas.

18. There is some flexibility insofar as the development and expansion of electric utilities are concerned. Thus on one major river an agency of the central government, FURNAS, has built one hydro station and is building another whereas CEMIG, a state company, has been given the concession to build a third. With respect to financing expansion, Eletrobras may lend or subscribe equity capital to state owned companies as determined by the interests and resources of the particular state, the size of the project and other factors. It is precluded under its Charter however from lending to investor-owned utilities. In 1964 the legislature refused to amend the Charter of Eletrobras to permit such lending. Further efforts in this connection may be forthcoming.

19. The electric utility industry is disorganized to some extent from the standpoint of its investment program and structure. Between the Federal and State Governments there are probably too many public power companies, the interests of which sometimes conflict. Since each is autonomous, subject to the authority of the Federal or State Government, and has fairly good access to public funds for purposes of expansion, a situation not entirely conducive to sound and systematic policies of expansion and investment sometimes results. This is abetted by the tariff regulatory system which, as noted hereafter, allows rates to be set to give a fixed return on assets regardless of operating circumstances. This tends to remove the risk normally associated with expansion and, as a consequence, to reduce the responsibility which utilities feel for financial considerations in the context of expansion. In any event it appears that expansion of the public power companies has sometimes been planned and executed without due regard to all factors. Among the public agencies there has been little coordination of planning of the power supply until recently.

20. The situation could hardly be permitted to continue. In 1963 a study of the electric utility situation in the south central region was instituted with the objective of examining hydro electric sites and determining the scope and cost of their development, of establishing a priority list for the scheduling of their construction and of recommending a 15 year program in this connection. The study, which is still under way, is being financed by the United Nations Special Fund with the International Bank for Reconstruction and Development (World Bank) acting as Executing Agent. An engineering consortium, Canambra Engineering Consultants Limited (Canambra), assembled from the staffs of several engineering firms in the United States and Canada, was organized to carry out the studies. A committee which includes representation from federal, state, and investor-owned utilities supervises the studies. The initial report was accepted and a plan for the development of hydro projects and associated transmission, to be commenced prior to 1967, is now the basis for the immediate expansion policy in the region. Should the subsequent recommendations made by Canambra receive the continuing support of the Federal and State Governments and other bodies, an objective and economic development of the electric utility industry in the south central area should be reasonably assured. With the advent of numerous large utilities in the south central area there is the need for system operating arrangements to ensure efficient and, to the degree necessary, coordinated operations of the interconnected systems. Recognition of this is increasing and the Canambra activities are proving to be of value in this connection.

21. Two of the important power systems in the country are CHESF in the north east and CEEE in the State of Rio Grande do Sul. The former, as noted in Annex 3, supplies a widespread area involving several states and is Federally owned. The latter is a State utility serving a relatively well developed area. In both instances the history of the utilities has been difficult. In the former it has been a case of reaching into new large territories of low income and limited resources to build a power system to suit the circumstances. Political difficulties

have beset the progress of the latter company. In both cases it would be useful to have a study made of the utility situation with respect to organization, financial operations and planning of the power supply, transmission and distribution expansion. This would help to assure that there is a sound plan for development in each territory.

V. RATE STRUCTURE

22. Since 1957, when the regulating decree was enacted in conjunction with the Waters Code (paragraph 13) the provisions for establishing rates have been specific. The regulations allowed tariffs which would provide for a 10% return after operating costs and allowance for depreciation, amortization and exchange losses on foreign debt service. The regulations permitted up to 5% depreciation on hydro plant, 8% on thermal plant and 3% amortization allowance. There was provision for adjustment of rates at three-year intervals and for "interim" adjustments to cover increases in cost of fuel, purchase of energy and compulsory wage increases, in view of the marked effect of inflation on these costs. Interim adjustments were also allowed for the increase in cost of foreign exchange payments for debt service resulting from the decline in the monetary value of Brazilian currency.

23. With implementation of the regulations, the Federal Government usually granted the public companies rate increases, although frequently after considerable delay. On the other hand the large private companies were generally allowed only to adjust rates to reflect the increase in cost of the "interim" items described in the preceding paragraph.

24. Had the prescribed rate of return been achieved in terms of real value on the basis of 10% return, 5% depreciation and 3% amortization, the result would have been to generate exceptionally large amounts of money in contrast with the more conventional utility allowances of between 6 and 10% return and depreciation of 2½%, with no allowance for amortization. The reasons for the higher depreciation and the amortization allowances are not entirely clear. The effect is to increase revenue and cash generation as the result of higher tariffs, during the early life of the assets, at the expense of lower tariffs, and revenues, in later years. In effect it is a process of highly accelerated depreciation. As this formula was applied during a highly inflationary period on the historic value of assets, the results, as measured by the levels of electricity rates, were not burdensome. Annex 4 of this volume shows certain tariffs which were in effect in June 1964 and illustrates the low rates.

25. In November 1964 the Federal Government issued decrees whereby assets could be revalued by electric utilities for rate making and other purposes and which provide for an annual revaluation, based on cost of living indices published by the National Economic Council. The

Waters Division is to determine the historic value of the assets on the basis of an inventory which it will have made and which will then constitute the official historic value to which the indices will be applied to determine real value. As the inventory to be made by the Waters Division will take some time to make, provision is made for an interim calculation of assets, made by the utility, on which an immediate rate increase can be obtained. The basis for calculating rates established under the Waters Code, respecting rate of return, depreciation and amortization (paragraph 22.) will continue to apply. The regulations now governing rates are given in detail in Annex 5 of this volume.

26. Use of the provisions to maximum effect would in some cases result in extremely large rate increases. Some utilities will not therefore take full advantage but apply only for increases which they believe will be compatible with practical considerations. While the Government is committed to a policy of not subsidizing the consumer, who heretofore has in effect been subsidized, application of the rate provisions to maximum effect might, at the other extreme, penalize him. Thus the rate situation is in a state of flux and it would be difficult to predict the ultimate results which must reconcile the requirements of the investment program (internal generation of funds), reasonable power rates and Federal and State policies. In view of this, projections of the revenue of utilities must, at best, be considered tentative. Annex 4 of this volume shows the 1955 and 1963 price indices for power and other components of the cost of living with evidence that the cost of power has not kept pace. It also gives approximate rates in certain areas in June 1964 as well as an indication of what they might be under applications likely to be made by some utilities under the new provisions.

VI. GOVERNMENT POLICIES

27. It is apparent from the foregoing that Government policy and inflation have been the main factors affecting the utility industry in recent years. In the early sixties the difficulties of utilities, particularly the investor-owned, reached an acute phase and a vicious circle was established; rate increases were limited or not granted at all, funds were thus unavailable for expansion and payment of dividends, and money could not be borrowed on the local or foreign markets because of lack of investor confidence, maintenance had to be minimized, expansion of the distribution systems was suspended and the point was being reached at which it would not be possible to supply additional power to industry and other consumers in important areas. The Government, by its actions, arrested system expansion and made the public accustomed to prohibitively low tariffs (in terms of real value). Moreover funds which could have been generated for expansion purposes were lost.

28. An agreement in principle for the sale of the American and Foreign Power Company properties to the Government was negotiated in

1963. The present administration, which took office before the arrangements were finalized, felt that it might be advantageous for the American and Foreign Power Company to continue to operate. However, the Company was reluctant and further discussions led to acquisition of the properties by the Federal Government in November 1964 under arrangements satisfactory to both sides. The new Government appears to wish the remaining large private utilities, the Brazilian Traction Company's electric utility subsidiaries in Rio de Janeiro and Sao Paulo, to continue to operate. The rate provisions now in force should do a great deal to improve the financial position of the companies and assist their urgent expansion. Developments in this respect will provide an indication of the Government's continuing outlook in response to the situation.

29. The new Government is committed in principle to provide an adequate supply of electricity on a non-subsidized basis with emphasis on the industry itself providing as large a share as possible of the funds for expansion. It is hopeful that the rate provisions will make this possible.

30. The trend to Federal control, as distinct from State control, of the industry goes back many years. The growth of the industry and the tremendous amount of money which its expansion now involves will make the question of its control, and of relationships within it, much more important in the future. As matters stand, the resources of Eletrobras and its authority, through the allocation of funds, to select projects and areas for development and to influence the policies of other utilities thereby, will increase rapidly. The present Eletrobras administration is aware of this and feels to some extent that it should limit its authority and scope. One idea (it has) is that some of the Federally owned utilities should be brought under a form of private control. As an example, the assets would be mainly in the form of debt with perhaps 20% in preferred shares owned by Eletrobras and 10% in common shares owned by private investors. The preferred shares would call for a dividend of 10 - 12%. If the dividend on the common stock came to substantially exceed the preferred dividend, the latter would be increased to match it. Control would revert to Eletrobras if the preferred dividend was not paid. There is also some feeling in Eletrobras that the system of raising public funds, and of allocating them for the use of the industry, should be changed. The thinking is that the tax on utility accounts might be discontinued and rates increased commensurately, so that the cost to the consumer would remain the same. The utilities would then be able to generate more revenue and provide the bulk of the funds for expansion. However it will take time for the development and crystallization of attitudes in these and other matters. If arrangements should remain unchanged Eletrobras would ultimately come to occupy a pre-eminent position.

31. As regards Federal/State relationships, the role and function of Eletrobras, tariffs, taxes and so forth, the Federal Government with the advice and assistance of the states and larger utilities might find it

desirable to make a full review of the situation during the next year or two, with particular attention to the following:

(a) Review the scope of Eletrobras with the objective of establishing functions for it consistent with the broad objectives of the Federal Government, the interests of the States and the practical needs of the utilities. In particular the advisability of divorcing the holding company function of Eletrobras from its function of administrator of public funds for the sector should be considered.

(b) As an adjunct of the previous item the role of public funds in the investment program of the industry should be considered. The main question would be whether the process of obtaining a large amount of the funds available for expansion should continue to be obtained from taxes and internal loans imposed on electricity consumers or whether, at the other extreme, these should be discontinued and the level of tariffs adjusted to provide an increase in revenue which would be directed to expansion. This would have a considerable decentralizing affect.

(c) Consider the adequacy of existing regulatory jurisdiction (Federal) over concessions for development, tariffs and taxing powers to determine whether the States should not be provided with some rights in these areas. In particular, over the long term, some delegation of powers by the Federal Government to the States respecting tariffs and taxing would appear desirable in view of the size of Brazil and the widely varied characteristics and problems of its States.

32. Within the industry there are some problems. It appears that the body of engineers and technicians available in the country, and the established construction industry, should generally be adequate to design and construct the works comprising the program, although foreign assistance may be desirable on occasion. On the other hand the operation of existing utilities is not always satisfactory and leads to apprehension concerning the future. The main problem lies in the financial management of the companies, especially the preparation and use of statements, financial planning and rate analysis. It is apparent that education in this respect would be valuable and the industry would appear to be well advised to establish some training program.

33. Part of this problem results from the lack of circulation of information concerning industry experience and activities. In view of Brazil's size it is not surprising that there is relatively little communication or exchange of information between utilities. It should be useful to establish an industry body on the managerial level to discuss policies, rates, interpretation of Government regulations and other matters, as distinct from engineering and technical matters, such as exists in other countries. This should be of value in increasing the knowledge of its members of the problems of the industry and assist in establishing a basic approach to the treatment of them.

34. Another industry requirement, noticeable by its present lack, is statistics. The Federal Government in collaboration with the states

would appear advised to establish a statistical series on an annual basis to provide basic information concerning generating capacity, demand, energy usage and other utility operations. There are numerous examples of such statistical series in other countries. This information is usually the foundation and starting point of long term studies, plans and other considerations on the national or state scale concerning electric power.

VII. LOAD GROWTH

35. The electricity growth experienced since 1955 has been described in Section III and Annex 1. In the 1955-62 period it averaged approximately 10 - 11%. The forecast for 1965/1970 has been the subject of considerable study with respect to the south central region, but only an approximate estimation can be made for the remainder of the country.

36. Under the United Nations Special Fund survey Canambra has studied the south central growth as the basis for the development plan. This has been somewhat difficult because of the reduced rate of electric power growth experienced in 1963 and 1964, 4.5% and 6.5% respectively. The question is whether this reduction represents a change in the pattern of industry growth or reflects the response of industrial development to the extremely difficult conditions in these years. Canambra is inclined to the latter explanation and views the recession as a temporary condition with the evidence indicating that more normal growth is being resumed. Canambra studied the electricity market in conjunction with industrial, commercial and domestic development in the several areas of the south central region in the light of past trends and possible new development. It concluded that the rate of electricity growth will be between 10 and 11% in the 1965-70 period. The Economic Mission projects that Brazil's industrial growth will return to the rate experienced in the fifties as distinct from the comparatively poor conditions experienced in 1963 and 1964. The Economic Mission is inclined to the belief, therefore, that the electricity growth rate estimated by Canambra is realistic. It should be noted that there are those who feel the electricity growth rate in south central Brazil will be in excess of the 10 - 11% figure for the reason that the policies of the new Government will provide a measure of stability which will act as a catalyst to industrial growth, and, secondly that with so much of the area using so little energy per capita and with improvements in per capita income, the increase in demand will be accelerated. However, at least over the short term, the shortage of financial non-inflationary resources is likely to prevent industry growth exceeding the rate experienced in the fifties.

37. The Canambra plan of development, insofar as it is complete at this time, and based on a 10 - 11% electricity growth has been used as a basis for this report. The program aims at providing by 1970 an amount of generating capacity, supplemented by an appropriate transmission

network, to meet the power needs and which will provide adequate reserve capacity so that in the event of drought conditions in the watersheds there will still be ample energy available.

38. The growth of the electric power for the remainder of Brazil can only be estimated on the basis of trends. As noted in Section III the amount of power used in the rest of the country is normally about half that consumed in the south central region, with a similar rate of growth being experienced in both segments. It has been assumed that this trend will continue. While this is probably reasonable for the short term it is possible that over the long term, 15 - 20 years, the growth rate in the remainder of the country would be accelerated, reflecting an accelerated development of the poorer areas.

39. Expansion of the electrical utilities in the parts of the country outside the south central area is, as indicated in Annex 3 of this volume, to be determined by the states, regions and agencies concerned. In some areas the rate of growth will be dependent on the rate at which power is made available. As an over simplification it may be said that the market will be limited only by availability of power and income. The plans for expansion are such as to indicate the installation of new generating capacity year by year to at least provide for the growth which will result from the continuation of the trend described. Annex 1 of this volume gives the forecast figures of electric energy output for all Brazil, the south central area and the remainder of the country, at an approximate rate of 11% in each case.

VIII. THE PROPOSED EXPANSION PROGRAM

40. A program of expansion of the generation and transmission facilities in the south central region has already been recommended by Canambra insofar as it pertains to the start of construction of projects up to and including 1966, and which are to be completed by about 1970. The Canambra studies are continuing and are to eventually include recommendations for the starting of construction of major projects in the 1967-70 period. The recommendations already made provide for the power requirements to 1970 whereas those which remain to be made will provide for the requirements until about 1975. The Canambra study only touched upon the distribution requirements of the area so that it is essentially a study of generation and transmission.

41. As noted in paragraph 37 the present Canambra recommendation proposes new generating capacity to meet the requirements until 1970, including reserve capacity to offset drought conditions. The tabulation below lists the indicated demand of the south central area from 1963 through 1970 and the estimated generating capacity which will be available on the basis of the Canambra program (see Annex 3 of this volume). The margin of generating capacity over demand is substantial in 1969-70 reflecting the fact that the problem is essentially one of energy.

SOUTH CENTRAL REGION

Estimated maximum capability and demand - Megawatts

	<u>Demand</u>	<u>Capability</u>
1963	3550	3950
1964	3950	4550
1965	4400	4850
1966	4875	5225
1967	5420	5500
1968	6050	6500
1969	6650	7250
1970	7150	8200

42. The distribution system expansion required in this period will be substantial especially in view of its lack of development in recent years (paragraph 7). In particular very large expenditures will be required on the systems formerly owned by the American and Foreign Power Company, and on those of Rio Light and Sao Paulo Light. There will also be a considerable expenditure on the numerous distribution systems in small towns, villages and rural areas, and on the development of new systems. It is only possible to tentatively estimate the level of expenditures in this last connection. To some degree, it will be based on the amount of money available. Estimates of the cost of distribution expansion are included in the investment program.

43. The cost of the generation-transmission program for the south central region is based on Canambra's detailed estimates for projects started prior to 1967 and an estimate of cost of the program to be initiated in the 1967-70 period based on a preliminary list of projects which would provide the power needs in the 1970-75 period. The latter are not identified as Canambra's recommendations will not be forthcoming until later in 1965.

44. The investment program outside the south central region is based on information concerning plans provided by various entities. The amount of capacity planned would be sufficient to meet the load growth based on a continuation of trends as noted in paragraph 37. Annex 6 of this volume lists the projects in the expansion program for the entire country.

IX. INVESTMENT PROGRAM

45. The investment program in the period 1965-70 was established on the basis of Annex 6 of this volume. Total cost of the program over the six year period inclusive is estimated to be of the order of US\$ 2.4 billion equivalent or approximately US\$ 400 million annually. It should be realized that this is an approximate estimate serving as

a broad guide to the industry's capital requirements, to be used in conjunction with the investment requirements of other sectors of the economy to provide an overall view. Specifically the accuracy of the estimate for the electric utility sector will depend on the following factors:

(a) Whether the ultimate recommendations of the Canambra study are accepted and adhered to.

(b) Whether sufficient capital is available to carry out the plans.

(c) Whether the experience with load growth in 1965 and 1966 will be such as to result in an acceleration or a slowing down of the program.

(d) Numerous situations which might arise and which could radically affect the outlook.

The estimate of cost of the program is probably accurate in the range of plus 15% and minus 15% both as to total and to the average annual expenditure.

46. The estimate of the investment program in 1965-66 together with an estimate of the size and source of resources which will be available to finance it is as follows:

SECTOR INVESTMENT AND FINANCING PROGRAM

Billions current cruzeiros (except where noted)

	<u>1965</u>	<u>1966</u>
	<u>INVESTMENT</u>	
Total	715	810
(Equivalent total-millions US\$)	412	403
	<u>FINANCING</u>	
(a) Internal cash generation ^{1/}	110	135
(b) Federal (Including Eletrobras)	205	225
(c) State	205	225
(d) External	195	225
(Equivalent of external in millions US\$)	91	89

^{1/} Internal cash generation equals net income plus depreciation less amortization of external debt - the data in Table 2, Chapter V of Volume I includes funds for debt amortization.

47. The amount of money available from the internal resources of the utilities which can be applied to the expansion program is estimated of the order of US\$ 50 million equivalent each year. This amount has been determined as the net available from total internal resources after deduction of amortization of some US\$ 45 million annually on external debt (Annex 2 paragraph 27). The estimate of total internal resources available is based on estimated revenue and expenses in 1965 and 1966 following implementation of tariff increases as noted in Section 5. The estimate is speculative as the new tariffs have not been set and, in addition, continuing inflation makes it difficult to predict expenses.

48. The funds to be available from public sources, Federal (including Eletrobras) and State have been assumed in 1965 to be of the approximate order estimated by Eletrobras (Annex 2 paragraphs 21-24). As will be realized from Annex 2 of this volume, it is a difficult estimate to make and could be widely off the mark. In 1966, everything else being equal, the resources available to Eletrobras would increase markedly inasmuch as the tax is on an ad valorem basis and increases directly with respect to both increased sales and increased tariffs. However the future level of tariffs and the effect of future inflation cannot be estimated and a conservative figure has been used.

49. The percentage of the investment program provided from internal resources and public resources amounts to 15% and 57% respectively. It has been assumed reasonable, and feasible, to expect that the remainder of the funds will be provided from external sources, amounting to 28% of the program in 1965, and 1966, and representing the equivalent annually of 90 million US\$. In actual fact, sizable external financing from international and foreign agencies and by suppliers credits has already been committed with respect to projects under way or shortly to be started. The rate of disbursement of funds already committed is estimated at about US\$ 60 million in each of 1965 and 1966.

X. THE FOREIGN COMPONENT OF THE INVESTMENT PROGRAM

50. Industry in Brazil is now able to manufacture practically all the distribution equipment needs and power transformers, the bulk of switchgear and accessories, with the exception of certain equipment in the highest voltage class for which a substantial demand is now only being established, nearly all of the mechanical equipment, over 25% of hydroelectric generator requirements (limited by manufacturing capacity) and hydroelectric turbines up to certain diameters. Large thermal generators must be imported. Thus to a large extent the country is self-sufficient from the electric power utility equipment manufacturing standpoint. If external financing were confined to equipment which had to be imported the scope of foreign assistance would be limited.

51. In actual fact the scope of foreign assistance will be increased as the result of several factors. Suppliers credits for equipment from manufacturers in other countries stipulate the purchase of equipment manufactured by them. Loans made by foreign Government agencies of certain countries will be tied so that most if not all the equipment being financed would be manufactured in such countries. On the other hand international agencies normally lend on the basis of international competitive bidding and, in the case of Brazil, it may be anticipated that this stipulation will be continued with Brazilian manufacturers eligible to compete against foreign manufacturers and, when they obtain the award, being reimbursed from the loan.

52. Approximately 40% of the total investment in the electric utility sector can be considered applicable to the cost of equipment, on the average. It is estimated that on the basis of the considerations described in the previous two paragraphs about 50% of the equipment would be imported and 50% provided from domestic sources. In other words approximately 20% of the cost of the investment program, some US\$ 80 million equivalent annually, could represent the importation of equipment.

53. Some of the foreign assistance provided, mainly by the international or foreign agencies, will be for expenditures incurred in Brazil, equipment purchases and services, of which in 1965 and 1966 there might be of the order of the equivalent of US\$ 20 million each year. If there is substantial international or foreign lending for expansion of the distribution systems, lending for Brazilian products will increase markedly as the bulk of the equipment is likely to be provided domestically. The tabulation below summarizes the estimates in connection with imports and external financing:

IMPORT COMPONENT - INVESTMENT PROGRAM

	Millions US\$ (or equivalent foreign currency)	
	<u>1965</u>	<u>1966</u>
Import component	86	80
External financing	71	66
Brazilian "	15	14

EXTERNAL FINANCING - INVESTMENT PROGRAM

External financing	91	89
Foreign currency	71	66
Brazilian currency (US\$ equivalent)	20	23

54. Some difficulties may be foreseen in connection with the foreign investment. A considerable portion of the funds will go toward

the financing of the less organized segments of the industry; that is, small generating stations and transmission and distribution expansion in remote areas of the country. It will be necessary in some instances to identify and prepare projects for the funds to be used. In addition it will be necessary to have or establish organizations to which the funds will be lent and which will have the responsibility of over-seeing their proper use. In the case of some of the publicly-owned small utilities this may be accomplished by lending to one of the established agencies. It may be found desirable to establish some channel by which foreign assistance can be given to the small investor-owned distribution companies.

XI. GENERAL COMMENTS CONCERNING THE PROGRAM

55. The outlook for electric power in Brazil, as indicated by this report, is optimistic. The development program planned for 1967-70 is of massive proportions and in line with justified requirements and there is a good indication that it will be carried out, in at least a very large measure. The main problems are those of financing and organization. Tariffs under the new regulations and tax proceeds will provide for a substantial portion of prospective requirements. These will need to be supplemented by external financing of approximately 20% of total requirements, perhaps more. The present status of coordinated planning and collaboration between Federal and State Governments and the utilities suggests that there is a reasonable chance that the programs will proceed expeditiously.

56. As noted, the present state of electric power supply is adequate although there are certain problems. If the program is adhered to the industry should be in a sound position by 1970. The question arises as to the effects on the electric power industry and on the economy of a lag in the program. Provided that there was no imbalance in generation and distribution expansion it is not likely that a delay in the execution of the program would be of vital consequence. For instance, the program is designed in the south central region, which accounts for two-thirds of the total for the nation, to maintain an adequate reserve in the event of drought conditions by 1969. With normal conditions there should be a very substantial reserve, this in the face of an annual load growth of 11%. Thus, even if the program lags somewhat but normal hydraulic conditions are experienced the situation should be satisfactory. Admittedly if load growth is greater than 11% there could be shortages, but on the basis of recent experience this should only have isolated effects if limited to short periods.

57. On balance therefore the planned program is adequate and some retardation would not likely be very serious. From this standpoint the proposed investment in the sector is of about the right magnitude. This assumes that the financing of the sector does not adversely affect the financing of other sectors involving the use and growth of electric power to an extent that would inhibit their growth.

58. It is clear that from the broad standpoint the planning of electric power supply will require continuing and close attention. This will be necessary in order to maintain a balance between generation and distribution and to ensure that the planning of additional capacity in the various regions is in keeping with the prospective load demand. A potentially serious problem the industry faces is the possibility of over-expansion of supply in individual regions.

May 11, 1965

ELECTRIC POWER PRODUCTION STATISTICS AND FORECAST

ANNEX 1

<u>YEAR</u>	<u>ALL BRAZIL</u>			<u>SOUTH CENTRAL</u> ^{2/}		<u>REMAINDER OF BRAZIL</u> ^{3/}	
	<u>% increase over previous year</u>	<u>Generation Billions-kwh</u>	<u>Per capita kwh</u>	<u>Generation Billions-kwh</u>	<u>Per capita kwh</u>	<u>Generation Billions-kwh</u>	<u>Per capita kwh</u>
1955		13.7	227	9.3	380	4.4	122
1956	13.1	15.5	250	10.5	416	5.0	135
1957	8.9	16.9	266	11.6	443	5.3	139
1958	16.5	19.8	301	13.2	489	6.6	169
1959	6.8	21.1	312	14.2	510	6.9	171
1960	8.3	22.9	322	15.8	547	7.1	171
1961	8.2	24.7	338	17.0	575	7.7	179
1962	11.6	27.6	367	18.9	617	8.7	198
1963 ^{1/}		29.0		19.7		9.3	
1964		31.8		21.7		10.1	
1965		35.5		24.2		11.3	
1966		39.5		26.9		12.6	
1967		44.3		30.2		14.1	
1968		49.2		33.5		15.7	
1969		54.5		37.1		17.4	
1970		60.4		41.1		19.3	

1/ Figures for 1963-70 as forecast

2/ South Central area comprises States of Guanabura, Minas Gerais, Sao Paulo and Rio de Janeiro and part of the State of Parana

3/ That is, excluding South Central area.

ANNEX 2

NOTES ON

ELETRORAS AND INVESTMENT
IN THE ELECTRIC POWER SECTOR

March 16, 1965

Prepared by
Courtesy of
ELETRORAS
November 1964

A. Organization of ELETROBRAS

1. CENTRAIS ELETRICAS BRASILEIRAS, S.A. (ELETROBRAS) was formed in 1961 by the Federal Government, responding to legislation by Congress (Law No. 3,890-A, April 25, 1961). The purposes of the stock corporation are to carry out studies, projects, financing, construction and operation of electric power generating plants and transmission lines, as well as executing trade acts arising out of these activities. The law also provides that, as long as the National Electrification Plan is not approved, ELETROBRAS may directly or through subsidiaries (enterprises in which it holds over 51 percent of the stock capital), take actions to increase the supply of electric power in those regions where the actual demand either surpasses or is about to surpass firm capacity in the existing systems. ELETROBRAS started operations as of June 13, 1962, when its by-laws were approved (Decree No. 1178).

B. Resources

2. ELETROBRAS has at its disposal the resources of the Federal Electrification Fund (FEF), the proceeds from a bond issue taken up by power users, and the revenue from its investments (interests of financing and dividends from partnership participation). As credit for stock subscription and capital increase purposes, ELETROBRAS can use resources from the Federal budget amounting to over Cr\$50 million, and also the value of electric power resources resulting from investment by other public agencies or entities.

3. Resources of the Federal Electrification Fund are deposited in the National Bank for Economic Development (BNDE) under a special account (Article 11 of Law No. 3,890-A).

4. For five fiscal years, as from 1964, consumers of electric power are required to take up ELETROBRAS shares, which pay 12 percent interest and are redeemable within 10 years, in an annual amount equal to 15 percent of their power account in 1964 and 20 percent per year for the next four years (Article 4 of Law No. 4,156, November 28, 1962).

5. The FEF was established (by Law No. 2308) concurrently with the single tax on electric power, as of August 1954 with both partially altered by November 1962 (Law No. 4156).

6. The single tax on electric power (STEP) Art. 1 of Law No. 4156 is determined as a kwh equivalent of percentages of the fiscal tariff ^{1/}. For 1955, the percentages are to be 10 percent for rural consumers, 35 percent for residential and industrial consumers and 40 percent for "others."

^{1/} Fiscal tariff is the quotient of the value in cruzeiros of the power sold by meter in the country, in a given month, in terms of the corresponding physical volume (number of kwh) of power consumed in that month.

For 1963 and 1964 this tax applied to residential and industrial consumers at the rate of 20 percent and 30 percent, respectively, and of 30 percent and 35 percent for "others."

7. From the proceeds of the single tax, 40 percent goes to the Federal Government (FEF), 50 percent to the states and 10 percent to municipalities. Allotments to the states and municipalities are by formula, based on the following factors: 2 percent, production; 18 percent, area; 35 percent, consumption; and 45 percent, population.

8. The Federal Electrification Fund, used exclusively by ELETROBRAS, is basically composed of a) 40 percent of the single tax proceeds; b) 4 percent of Federal excise tax collection (Article 5 of Law No. 4156) and c) 10 percent of the Federal customs service assessment; d) interest and earnings of the Fund itself.

9. The Internal Loan, as mentioned, will amount to 20 percent on the value of monthly electric power accounts. The accounts base does not include taxes; it is calculated on the value of the basic tariff and legal additional charges resulting from adjustments of service costs and/or capital revaluations.

10. Investments by ELETROBRAS are in three basic forms: a) partnership participation - subscription of shares or increase of capital in electric power enterprises controlled by the government ^{1/}; b) medium and long-term financing; c) funds advanced at short-term (90-180 days).

11. As a whole, the investments of ELETROBRAS are oriented, in the formulation of the budget program for each year, along the following lines of priority: a) contractual commitments assumed; b) program under execution or expansion programs of its subsidiaries (enterprises in which it holds share control, and which at the moment are the following: FURNAS, CHESF, CHARQUEADAS and CHEVAP); c) programs for the elimination of critical bottlenecks in the country's power market; d) program under execution or expansion programs of its associate companies (enterprises in which it has share participation but holds no capital control) and e) other electric power programs.

C. Investments in Electric Power, 1962-1964

12. Investments by ELETROBRAS over the period 1962-1964 (in 1962, beginning June 11, 1962; and in 1964 up to October 31, 1964) were as follows:

	<u>In millions of current cruzeiros</u>			
<u>Enterprises</u>	<u>1962</u>	<u>1963</u>	<u>1964</u>	<u>Total</u>
Subsidiaries	2,341.6	21,327.8	27,599.3	51,268.7
State Companies	950.0	4,379.5	11,359.9	16,689.4
	<u>3,291.6</u>	<u>25,707.3</u>	<u>38,959.2</u>	<u>67,958.1</u>

^{1/} Upon approval of the President of the Republic (4.4 of Article 15, Law No. 3890-A), ELETROBRAS may take up shares of electric power enterprises not controlled by the government.

13. Federal Investments in the electric power sector, whether from the Union Budget or from the resources of Federal agencies, were as follows:

	<u>In Millions of Current Cruzeiros</u>		
	<u>1962</u>	<u>1963</u>	<u>1964</u> (part year)
<u>Public Ministries</u>			
Mines and Energy	10,593.4	9,343.3	42,177.0
Justice	13.5	2.5	-
Transportation and Public Works	2,159.0	2,974.9	4,838.2
<u>Presidency of the Republic</u>			
SPVEA	1,390.1	2,261.3	4,751.4
SUDENE	2,067.0	6,737.0	21,136.0
SPVFSUD	-	224.9	235.4
CVSF	1,478.7	1,172.6	3,528.5
CEPCAN	2,581.2	2,370.4	4,302.0
NATIONAL BANK FOR ECONOMIC DEVELOPMENT	7,329.3	6,195.8	4,635.3
BRAZILIAN COFFEE INSTITUTE	-	863.5	542.5
TOTAL	27,612.8	32,146.3	86,146.3

14. No reliable statistics are available on investments by state governments in electric power in the recent past.

C. Investment Forecast

15. The 1965 budget for ELETROBRAS had not been settled at the time this was written. The effect of executive decrees (decrees 54,936/8 of November 4, 1964) which make possible a readjustment of power tariffs, through a revaluation of power companies' assets, was still being discussed, and the Federal Ways and Means bill for 1965 had not been passed by Congress. Even without the official figures, however, it is possible to anticipate the resources which will be available to the electric power sector for 1965, with a reasonable allowance for safety, though forecasts for future years cannot yet be made. The procedure here will be to project the probable level of investment resources and then to make adjustments for likely changes in the resources based on past experience.

1. ELETROBRAS

16. As stressed previously, the principal sources of resources for ELETROBRAS are: proceeds from the internal loan and the Federal Electrification Fund (the latter consisting of 40 percent of the STEP, 10 percent of the Federal tax assessment and 4 percent of the Federal consumption tax).

17. In the order of magnitude, 1965 funds from these sources should amount to:

	<u>In millions of current cruzeiros</u>	
Internal Loan		50,000
State Electrification Fund		
40% STEP	40,000	
10% Federal customs service assessment	2,000	
4% income tax	<u>52,000</u>	<u>94,000</u>
Total		144,000

2. FEDERAL

18. The proposed Federal Budget allotments for the electric power sector are given below for 1965, along with a forecast of disbursements by Federal agencies.

	<u>In millions of current cruzeiros</u>
<u>By Ministries</u>	
Mines and Energy	58,825.0
Transportation and Public Works	4,150.0
<u>By the Presidency</u>	
SPVEA	4,400.0
SUDENE	17,964.0
SPVERFSUD	336.3
CEPCAN	4,090.0
By the Development Bank	<u>20,784.0</u>
Total	115,535.3

19. Based on the preliminary surveys and data supplied by State governments, and in some cases on specific appropriations, reasonable estimates of State investments in electric power in fiscal 1965 are as follows:

<u>STATES</u>	<u>Millions of current cruzeiros</u>
Amazonas	1,490
Para	1,862
Maranhao	500
Piaui	127
Ceara	952
R.G. Norte	713
Paraiba	923

<u>STATES</u>	<u>Millions of current cruzeiros</u>
Pernambuco	1,494
Sergipe	350
Alagoas	545
Bahia	3,805
Esp. Santo	1,016
Minas Gerais	19,500
Rio de Janeiro	4,125
Guanabara	6,602
Sao Paulo	189,240
Parana	14,223
Sta. Catarina	5,820
R.G. Sul	4,801
Matos Grosso	2,093
Goias	2,760
Total	262,940

3. STATE

19. No forecast of State investments has ever been made, nor to date has there been an inventory of power facilities at the State level. In an attempt to bridge this gap, ELETROBRAS has been promoting an "in loco" study to determine the utilization of state power resources from 1956 to 1964. The returns will be used to estimate investment needs for the 1965-1970 period. A large portion of this work has been completed, but as yet the available data do not give a clear nationwide picture of the power sector.

20. An indication of State investment capacity in power can be derived from the portions of the electric power single tax handed over to states and municipalities. The chart below shows data for 1962-1964. Substantial additional amounts have come from State Electrification Funds (funded from additional taxes on sales and consignment taxes) and from specific allotments from State Budgets. Available figures for 1965 give an idea of the size of investment capacity at the State level, but the figures are not accurate enough to be used as a forecast. One of the difficulties of projecting investments by States is that there are many local power facilities which are financed by State revenues but which are not large enough to be listed in the inventory of electric power facilities.

COLLECTION OF THE SINGLE TAX (STEP)
In millions of cruzeiros

<u>Years</u>	<u>Total</u>	<u>Union Quota (40%)</u>	<u>States Quota (50%)</u>	<u>Municipalities Quota (10%)</u>
1962	2,167.8	866.7	1,083.4	216.7
1963 <u>a/</u>	11,937.2	4,774.9	5,968.6	1,193.7
1964 <u>b/</u>	20,912.2	8,364.9	10,450.1	2,091.2
1964 <u>c/</u>	33,000.0	13,200.0	16,500.0	3,300.0

4. SUMMARY AND ADJUSTMENT

21. The forecast of investments in the electric power system, for the fiscal year 1965, can be summarized as follows:

<u>Origin</u>	<u>In Millions of current cruzeiros</u>
ELETROBRAS	144,000
Federal allotments	115,535
State allotments	<u>262,940</u>
	522,475

22. The forecast of cruzeiro resources for the electric power sector is based on the expected collection of funds from Federal and State budgetary allotments for 1965.

23. Experience shows, however, that Federal and State allotments are subject to changes during the fiscal year, due to economy plans or to unexpected cost or investment factors which cannot be postponed. Also the Federal Electrification Fund is subject to the effects of the country's financial policy.

24. Under these circumstances, a more realistic forecast of resources which the electric power sector could rely on for the fiscal year 1965 would be as follows:

<u>Origin</u>	<u>In millions of cruzeiros</u>
ELETROBRAS	110,000
Federal allotments	80,000
State allotments	<u>180,000</u>
	370,000

a/ Altered from specific to "ad valorem" by Law No. 4,156
b/ Collection up to September
c/ Forecast for the year

25. It should be noted that the cost of sector investments for 1965 was based on prices prevailing during the second half of 1964. An adjustment of at least 20 percent should be made for inflation in the meantime.

26. In brief, forecasts of investment plans for electric power are not sufficiently comprehensive or accurate enough to be used as more than a general indication of the magnitudes involved.

D. Commitments Abroad

27. Surveys indicate that commitments connected with the electric power sector abroad amounted to US\$46.2 million, US\$28 million as principal and US\$18.6 million as interest as of 1965. To this total should be added commitments arising from the purchase of the AMFORP, as shown in the payment of interest estimated at US\$8 million and US\$1.5 million in amortizations of certain contractual portions (without mentioning the initial payment of US\$10 million). A reasonable estimate of the foreign exchange commitment during 1965-68 is about US\$55 million per year.

REGIONAL POWER SYSTEMS
(To identify Regions, see Map at back of this volume)

A. THE SOUTHERN REGION

Parana

1. COPEL, the State electric power agency, has undertaken an extensive power program based mainly on the transmission system connecting the north-eastern portion of the State to the Curitiba region. The transmission system in the north and northeast is undergoing expansion with a 220 kv line connecting Londrina-Apucarana-Maringa-Alto Parana. The system is supplied by the 220 kv Salto Grand-Londrina line.
2. An electric power shortage in the Curitiba area was alleviated in 1963 with the installation of an emergency diesel unit of 10,500 kw. The Curitiba region will be supplied, from 1965, with power from the Capivari 220,000 kw hydro plant; a 138 kv transmission line is under construction. This plant is being constructed by Central Eletrica Capivari-Cachoeira S.A., formed in 1963 by COPEL in conjunction with ELETROBRAS.
3. Two plants were inaugurated in 1963. The Chopin I plant, in the south, of 2,000 kw; and the Figueira thermal plant belonging to the UTEFLA, a joint Federal-private company, with 20,000 kw. In 1964 about 5,000 kw from small plants was expected to be placed in operation. Two other COPEL plants were under construction in 1964: Mourao I with 8,500 kw capacity and the Salto Grande plant on the Iguacu River with 14,000 kw capacity.

Santa Catarina

4. One of the State's most important power projects is a coal-burning, thermal-electric plant being built by SOLTECA, a joint company sponsored by the Federal Government through the National Coal Plan Commission. The first stage of 50,000 kw is to be completed in 1964; ultimate capacity will be 100,000 kw.
5. Within the concession areas of the Centrais Electricas de Santa Catarina S.A. (CELESC, the State power agency) there are under construction the 19,200 kw Palmeiras plant and the 9,600 kw Garcia plant. CELESC has planned the completion of the 132 kv transmission system, Ilhota-Blumenau-Indaial-Rio do Sul, to connect the SOTELCA's new thermal plant with the Itajai Valley and Garcia-Florianopolis. In 1963, CELESC inaugurated the 4,200 kw Esperinha plant and the 5,000 kw Joinville thermal plant. Several hydroelectric plants are under consideration by CELESC, the principal ones being Canoas with 200,000 kw capacity, Rafael 8,000 kw, Rio das Flores 10,000 kw, Xanxare X and XI 80,000 kw and Chapecozinho 16,000 kw.

Rio Grande Do Sul

6. The responsibility for supplying most of the electric power in this State rests with CEEE, the State electric power company.

7. The northern zone of the State, the most populous and industrialized, has an electric power supply of about 240 MW capacity, from seven plants interconnected via a system of 138 kv and 69 kv lines:

Jacui	(first stage)	70 MW
Canastra		42 MW
Bugres		12 MW
Charqueadas		54 MW
Gasometro		24 MW
Sao Jeronimo		20 MW
Small units		19 MW

8. The second stage of the Jacui plant (70 MW) is undergoing construction (1964). Preliminary work on the Passo Real plant (250 MW) and the installation of one more unit of 18 MW at Charqueadas is in hand. For future power supplies, layouts are already completed for the Passo Fundo (200 MW) project, and the Tainhas and Rio das Antas projects are in the groundwork stage. Installation in the Charqueadas plant of two additional 50 MW units also is planned.

9. Interconnection of the southern zone is planned through the Charqueadas-Pelotas line of 138 kv. At present, the southern zone is supplied by the coal-burning plant of Candiota (20 MW), which, it is planned to increase to 40 MW. The Paredao dam on the Rio Camacua, with proposed capacity of 100 MW is under study.

10. To supply the western zone of the State the thermal plant of Alegrete, with 66 MW capacity, is under construction. Interconnection with the northern part of the State is planned.

11. CEEE also has a comprehensive expansion plan for its distribution system to the Taquari Valley, Alto Jacui and the northern coast.

B. SOUTH CENTRAL REGION

11. Substantial additional generating and transmission capacity is required in this region, which includes the States of Minas Gerais, Sao Paulo, Rio de Janeiro, Guanabara and Espirito Santo and part of Parana. In the capitals of the States and in the majority of the cities, the distribution networks have not been expanded at the rate necessary to meet normal growth. The full utilization of the electric power from the generating plants under construction or scheduled will be impossible without improvement of the distribution systems.

12. The most serious problem is in the areas served by the Sao Paulo Light, Rio Light, Cia. Brasileira de Energia Electrica, and Centrais Electricas Fluminenses. Poor hydraulic conditions, aggravated by inadequate interconnections, led to rationing of electric power in 1963-4. Plans to overcome the shortage of capacity are as follows:

13. Rapid completion of plants being expanded and of new plants in the final stage of construction

Furnas	-	installation of the 4th, 5th and 6th units (450 MW)
Tres Marias	-	installation of the 4th unit (65 MW)
Limoeiro	-	installation of the 2nd unit (16 MW)
Euclides de Cunha	-	installation of the 3rd and 4th units (50 MW)
Bariri	-	installation of the 1st, 2nd and 3rd units (132 MW)
Graminha	-	installation of the 1st and 2nd units (70 MW)

Completion of plants under construction

Xavantes	-	400 MW
Funil do Paraiba	-	210 MW
Jupia	-	1,200 MW
Santa Cruz (thermal)	-	150 MW
Campos (thermal)		30 MW

14. An additional program of construction, both expansion of existing generating plant and new plant, to meet the demand through 1970 has been recommended as follows:

Expansion

Tres Marias	-	installation of the 5th and 6th units (130 MW)
Peixoto	-	installation of additional 6 units (300 MW)

New Construction

Estreito	-	800 MW
Jaguara	-	500 MW

15. The electric systems of the State of Espirito Santo are being studied separately. ESCELSA, a State company, supplies Vitoria and neighboring districts by means of the 16,800 kw Rio Bonita plant, and this company is building the Suissa plant with initial capacity of 30,000 kw. Both plants need a regulating reservoir to increase their firm output. ESCELSA is also building the Fumaca plant with a 2,500 kw capacity on the Itapemirim River to supply the south of the State.

C. WEST CENTRAL REGION

Matto Grosso

16. The Centrais Electricas of Matto Grosso (CEMAT) has under construction the Mimoso hydroelectric plant of 30,000 kw capacity to supply Campo Grande via a 138 kv line.

17. The CEMAT has planned construction of the third Rio Casca plant of 12,000 kw to supply Cuiaba, an oil burning plant of 8,400 kw at Corumba and small diesel units in various parts of the State.

Goiias

18. Centrais Electricas de Goias S.A. (CELG, State power agency) is constructing the second stage of the Cachoeiro Dourada plant to increase the output to 128,000 kw.

19. To relieve the power shortage found in the CELG area, as well as the Federal district (Brazilia), reinforcement is planned by the interconnection of the Peixoto hydroelectric plant.

20. CELG is also constructing small hydro plants of 5,600 kw and 15,000 kw, and the Farinha project is being studied in agreement with CEMAR and the SUDENE.

21. Through CIVAT, there are plans to study the Tocantins basin in connection with building the Sao Felix project, with a projected output of 600,000 kw.

D. EAST-NORTHEAST REGION

22. The largest supplier of electric power in this area is the Companhia Hidroelctrica do Sao Francisco (CHESF) which operates, and is in the process of expanding, a large hydro plant at Paulo Afonso. The installed capacity of 310,000 kw was scheduled to be augmented with a 65,000 kw unit in 1964, and an additional three units of 80,000 kw were to be commissioned in 1965. Construction of a third powerhouse to contain four units of 160,000 kw has already started.

23. The power program has not been held up by lack of generating capacity as the connecting of subtransmission systems to the CHESF's main lines has been slow. The major consumption centers connected with the CHESF, supplied by subsidiaries of the Empresas Electricas Brasileiras (Salvador and outskirts, Recife and Natal) have not developed connections at a faster pace due to inadequate funds for expansion. Investment funds of the various state and local companies come from State resources, budget appropriations of the Ministry of

Mines and Energy, and endowments from SUDENE. Seven major transmission systems will be supplied from the Paulo Afonso plant as follows:

24. The "South System" is fed by a transmission line of 220 kv, Paulo Afonso to Salvador, tapped at Itabaina where a circuit of 66 kv goes to Aracaju. A second circuit of 220 kv, direct from Paulo Afonso to Salvador, is under construction.
25. The "East System" is fed by two circuits of 220 kv supplying the cities of Recife, Maceio and Joao Pessoa, where transformation to lower voltages is made for the supply of large areas in the States of Pernambuco, Alagoas and Paraiba. Construction of a third circuit for Recife is planned.
26. The "Rio Grande do Norte System" is fed from the substation of Campina Grande, at which originate two circuits of 132 kv to Santa Cruz, where they separate in the direction of Natal (in operation) and of Currais Novos, Acu and Mossoro (being constructed). The substation of Campina Grande is fed by a 220 kv line from Angelim, in the State of Pernambuco.
27. The "Fortaleza System" will be fed by a transmission line of 220 kv from Paulo Afonso to Milagres (in operation) and from there to the Banabuiu water dam. At this point three connections will originate: eastwardly, to Russas; westwardly, to Araras and eventually interconnecting with the Boa Esperanca plant; northwardly, to Fortaleza, which is the only line presently under construction.
28. The "West System" is fed by a line at 132 kv in the direction of Joazeiro and Cabrobo.
29. The "Senhor do Bonfim System" is fed from a 132 kv tap from the West System; it is aimed at supplying a vast area in the interior of the State of Bahia.
30. Additional power resources in the "east-northeast region" are outlined below:

Company	Plant	Type	Installed Power (kw)
CONEFOR, a power subsidiary of SUDENE) Mucuripe (Fortaleza)	Thermal	18,200
) Passeio (Fortaleza)	Thermal	8,400
CFLNB, subsidiary of Former American & Foreign Power	Balde (Natal)	Thermal	6,300
CHESF	Cotegipe	Thermal	20,000
CERC, Electric Power Agency, State of Bahia	Funil	Hydro	20,000
CVSF, Commission to develop San Francisco Valley	Correntina	Hydro	4,000

31. Expansion plans other than Paulo Afonso are limited. CONEFOR is installing 18,000 kw of diesel power in the city of Fortaleza.

32. CERNE, a company created by the SUDENE, is carrying out a program of installation of diesel units and distribution systems in 72 localities of the northeast.

E. WEST NORTHEAST REGION

Maranhao

33. The city of Sao Luiz is supplied by CEMAR, the State electric power agency, by a thermoelectric plant of 4,500 kw. There is a program to improve the operation of the existing plant, to expand it by an additional 3,000 kw, and to improve the city's distribution system.

34. A number of cities will be supplied by the Boa Esperanca plant, under construction on the Parnaiba River, which will ultimately be expanded to 200,000 kw. The first stage of 80,000 kw will supply the cities of Coroata, Sao Luiz, Caxias, Codo, Bacabal and Pedreiras, along with interconnections with other areas. It is controlled by SUDENE, the Superintendency for Development of the Northeast, a Federal agency.

35. CEMAR is carrying out studies for the hydroelectric plants of Munim, on the Munim River (20,000 kw), and of Criminosa, on the Itapecuru River (21,900 kw).

36. Also the object of studies, under an agreement with the Government of Goias, is the hydroelectric plant of Farinha, on the Farinha River, with 30,000 kw capacity. In addition, SUDENE has a program for the installation of small diesel units and isolated distribution systems.

37. The Boa Esperanca plant mentioned above will interconnect with Teresina through a line of 200 kv, as well as with Piripiri, Parnaiba and Araras, and with Campo Maior over a 69 kv power grid. Floriano and Oeiras will also be supplied. Further interconnection with the CHESF at Araras, in the State of Ceara, and at another undetermined point, in the State of Pernambuco, is being planned.

38. SUDENE is also carrying out in this State a program for the installation of diesel units and distribution networks at a large number of points.

Piaui

39. The State agency, Centrais Electricas do Piaui, operates the thermoelectric plant at Teresina, 6,700 kw capacity, which supplies the capital city through a weak distribution system. There are plants in Parnaiba (2,475 kw), Floriano (900 kw) etc.

F. NORTHERN REGION

Territories of Rondonia and Rio Branco, State of Acre

40. Power services are provided by small diesel plants and local systems of distribution.

Territory of Amapa

41. The first stage of the Coaracy Nunes (Paredao) hydroelectric power plant is under construction. It includes two units totalling 34,000 kw and transmission lines of 132 kv to Macapa and Porto Santana. This is largely to supply a mining project.

42. Macapa has 2,010 kw of installed capacity in electric diesel plants and a distribution system which is under expansion.

Amazonas

43. The city of Manaus (population about 200,000) is supplied by a thermal plant of 22,500 kw capacity. The plant is under-utilized

due to an inadequate distribution system. Another unit of 12,500 kw is scheduled to be installed about 1968.

44. Small diesel units and distribution systems are being installed in major cities by the SPVEA, a Federal agency for general development of the Amazon Valley.^{1/} Due to the flat terrain, there are no hydro resources capable of development within several hundred miles of the Amazon River.

Para

45. The city of Belem (the main port on the Amazon River, population about 500,000) is supplied by a thermal plant of 30,000 kw which is in the process of being expanded to 80,000 kw. Two units of 25,000 kw have been ordered. The concession is held by FORLUZ which is controlled by the State electric power agency. FORLUZ is proceeding with the expansion of its distribution network.

46. There are small diesel plants in Braganca, Santarem, Abaetuba, Monte Alegre, etc., and programs are underway for the expansion of distribution networks.

47. The State agency, with the help of CEMIG, the power agency of the State of Minas Gerais, carried out a study of a hydroelectric plant at Palhao, on the Curua-Una River. It is to have 6,000 kw capacity. This company, under an agreement with CIVAT, the Interstate Commission for Valley Development, is also carrying out studies with a view to constructing the Itaboca power plant on the Tocantins River.

^{1/} States of Amazonas, Para, Amapa, Rio Branco, Rondonia and Acre.

NOTES CONCERNING COST INDICESRECENT POWER TARIFFSAND PROSPECTIVE FUTURE TARIFFS(A) COST INDICES, STATE OF GUANABARA (CITY OF RIO DE JANEIRO)

It will be observed that the cost of power to the consumer has increased during the eight-year period by only about two-thirds of other elements in the cost-of-living structure.

<u>1/</u>	<u>1955</u>		<u>1963</u>	
	<u>Price</u> <u>Cr\$</u>	<u>Index</u>	<u>Price</u> <u>Cr\$</u>	<u>Index</u>
Electric power (average price)	0.8911	100	5.8796	660
Cost of living	-	100	-	901
Minimum wage	2,400.00	100	21,000.00	875
Milk (liter)	4.80	100	60.00	1,250
Meat (kilogram)	35.80	100	400.00	1,117
Bread (kilogram)	9.30	100	110.00	1,183
Daily newspaper	2.00	100	20.00	1,000

(B) REPRESENTATIVE TARIFFS, SUMMER 1964

	<u>Cruzeiros</u>	<u>Approximate Equivalent</u> <u>in U.S. cents</u> <u>(Exchange rate</u> <u>1500 CR\$/US\$1)</u>
Rio Light (Residential rate)	25	1.6
Sao Paulo Light (" ")	14	1.0
Cia Paulista Forluz (Campinas)	19	1.3
Cia Central Brasileira (Vitoria)	49	3.3
USELPA (State of Sao Paulo, Wholesale)	7	0.5
Furnas (Federal, Bulk)	5	0.4
CEMIG (State Minas Gerais, Average)		0.5 (1963)
CHESF (Federal, Wholesale)	7	0.5
CEEE (State Rio Grande du Sul, Average)	36	2.4

1/ Data extracted from a paper by Mr. Octavio Marcondes Ferraz, President of ELETROBRAS, July 1964.

(C) COMPOSITION OF REPRESENTATIVE TARIFF, 1964

Sao Paulo Light - Residential Consumption 1/

Basic Tariff	Cr\$	1.25
Surcharges <u>2/</u>		7.97
Tax (STEP)		2.67
Internal Loan		2.65
Social Security Tax		<u>0.74</u>
	Cr\$	14.01 (equivalent to one cent US)

1/ Data extracted from a paper by Mr. Octavio Marcondes Ferraz, President of ELETROBRAS, July, 1964

2/ Added charges allowed for direct cost increases, labor, foreign exchange, purchased power, etc.

(D) PROSPECTIVE FUTURE TARIFFS

(Based on discussions with the utilities concerning the possibilities; new tariffs in 1965 based on revalued assets).

	<u>Summer 1964</u>		<u>1965</u>	
	<u>Cr\$</u>	<u>US Equiv. - Cents Exchange Rate 1500 Cr\$/US\$1</u>	<u>Cr\$</u>	<u>US Equiv. - Cents Assuming 1965 Average Exchange Rate 2150 Cr\$/US\$1</u>
USELPA	7	0.5	16	0.8
Furnas	5	0.4	13	0.6
CEEE	36	2.4	55	2.6

REGULATIONS GOVERNING TARIFFS AS OF 1965

The basic law under which electric utilities operate is the Water Code, Decree No. 24643, promulgated on July 10, 1934. During the ensuing years several amendments and revisions had been enacted in regard to the Water Code, of which one of the most significant was Decree No. 41019, issued on February 26, 1957.

Decree No. 41019 embraced the basic tariff regulations which allows electric utilities a 10% rate of return on the "remunerable investment." The term "remunerable investment" is calculated by the following formula:

The sum of:

- Historical gross cost of fixed assets
- Unrestricted cash to the extent that it does not exceed the reserve for depreciation
- Two months average billings
- Stores inventory
- Amortization fund
- Profit and loss compensable balance

Less:

- Cost of work in progress
- Reserve for depreciation
- Reserve for amortization
- Profit and loss compensable balance

The profit and loss compensable balance represents the excess or deficiency of the actual return compared to the 10% permitted return. Excess balances must be deposited in Bank of Brazil or BNDE. Deficiencies can be drawn from such balances. At the end of a three-year period the profit and loss compensable balance is taken into account when estimating revenues for the next three-year period.

In accordance with this decree electricity tariffs may be established to produce revenues sufficient to cover:

- A return of 10% on remunerable investment
- Operating, maintenance and administrative costs
- Cost of purchased energy
- Depreciation (rates up to 3% for thermal facilities and up to 5% for hydro facilities)
- Amortization (rate up to 3%)
- Exchange losses on foreign debt service

Rates are set for a three-year period but may be adjusted monthly to compensate for compulsory wage increases and increases in fuel costs and purchased energy, and semi-annually for foreign exchange losses.

Because of rapid inflation the application of standard accounting procedures did not result in realistic financial reporting and statements and revenues, in real terms, declined because tariffs were primarily based on historical cost of assets. Article No. 57 of Federal Law No. 3470 issued on November 28, 1958, permitted business organizations to revalue their assets and certain liabilities in accordance with coefficients published by the National Economic Council. The net write-up was subject to a 10% income tax.

Law No. 4357 published on July 16, 1964, amended Law No. 3470 above by providing for mandatory revaluation by all companies except those organizations with 51% or more ownership held by federal, state or municipal agencies.

Three important regulations, Federal Decrees Nos. 54936, 54937 and 54938, all issued on November 4, 1964, pertained to revaluation of assets and certain liabilities of electric power companies for rate making purposes. Electric utilities were thereby given the right to revalue their fixed assets in operation, reserves for depreciation and amortization, foreign loans and local loans from BNDE (National Development Bank) and Eletrobras on the basis of annual coefficients issued by the Government. The net increase in value is subject to a 5% income tax. Increased electricity rates would then be permitted based on the revalued assets which form the major portion of the remunerable investment.

The annual coefficients will be applied to the historic value of assets as determined in each case by an initial inventory to be made under the direction of the Ministry of Mines and Energy. Pending the results, each utility may submit its own estimate and tariff request, based thereon, to the Ministry to obtain interim tariff increases, calculated on the application of the coefficient to the estimate of historic cost of assets.

ELECTRIC POWER SECTOR
INVESTMENT PROGRAM 1965-70

PROJECT	BASIC INFORMATION	STATUS AND TIMING	ESTIMATED COST, 1965-1970		TOTAL (EXPRESSED IN DOLLAR EQUIVALENT)	FINANCING ARRANGEMENTS
			LOCAL (EXPRESSED IN DOLLAR EQUIVALENT)	FOREIGN		
1. Paredao Companhia de Electricidade do Amapa (CEA) Amapa Territory	Construction of hydroelectric power plant with 2 x 17 000 Kw in its first stage. Transmission lines of 69 Kv to Macapa and Porto Santana.	Civil construction work already started. Construction at a standstill for lack of financial resources.	11,600	-	11,600	Conversations with a Japanese concern for the financing of US\$2,518,135.00 for the plant's electro-mechanical equipment. Payment in 10 years with a grace period of 3 years.
2. Belem Thermoelectric Plant Forca e Luz de Belem S.A. (FOELUZ) State of Para	Expansion of existing plant with the installation of 2 x 25 000 Kw; expansion of Belem's distribution network	Civil construction work being executed and mechanical and electrical equipment being manufactured by Westinghouse International	3,120	5,467	8,587	Financing of US\$5,700,000.00 granted by Westinghouse International.
3. Boa Esperanca Companhia Hidroeletrica de Boa Esperanca (COHEBE) State of Piaui.	Construction of hydroelectric plant with 2 x 50 000 Kw of installed power in its first stage. Transmission lines of 220 and 69 Kv to Teresina, Sao Luis and Parnaiba.	Civil construction work in early stage of execution. Study of transmission system already carried out.	23,200	7,000	30,200	
4. CHESF System Companhia Hidroeletrica de Sao Francisco (CHESF) Main plant located on the Sao Francisco river in the north of the state of Bahia, and transmission system covering the states of Ceara, Rio Grande do Norte, Paraiba, Pernambuco, Alagoas, Sergipe and Bahia	Expansion of existing hydro plant with the installation of units 7, 8 and 9 (3 x 80 000 Kw) and expansion of the transmission system to the Salvador and Recife areas. Construction of the 3rd power house with the installation of 600 000 Kw and expansion of the transmission system. Completion of the Milagres-Banabuiu-Portaleza line and expansion of substations. Expansion of the regional subtransmission systems, comprising construction of lines and substation.	Underground power house under construction. Mechanical and electrical equipment ordered and being manufactured. Transmission lines being executed.	19,600	7,211	26,811	Financing of US\$15,000,000 granted by IBD.
5. Expansion Program of ESCELSA. Espirito Santo Centrais Electricas S. A. (ESCELSA) State of Espirito Santo.	Construction of plants, transmission lines and distribution network	Services in progress.	14,500	4,594	19,094	Financing of US\$7,000,000 granted by USAID. Part of this loan can be used in national currency. German financing of about 10 million dollars, out of which 3 millions for purchases in Brazil. Financing of Lit. 1,298,000,000 by the Italian group GIE.
6. Campos Thermoelectric Plant Centrais Electricas Fluminenses S.A. (CELFL) State of Rio de Janeiro	Construction of thermoelectric plant (2 x 15 000 Kw). Construction of the Campos-Macabu-Rio da Cidade 138 Kv transmission line	Close to 20% of civil construction work already executed. Mechanical and electrical equipment already manufactured, a large part of which is already on the construction site. Construction of transmission line being started.	2,580	-	2,580	
7. Rosal Centrais Electricas Fluminenses S.A. (CELFL) State of Rio de Janeiro	Construction of hydroelectric plant of 100 000 Kw with initial installation of 2 x 25 000 Kw	Study of project already carried out	15,600	1,226	16,829	
8. Expansion Program of CELFL Centrais Electricas Fluminenses S.A. (CELFL) State of Rio de Janeiro	Expansion of transmission and subtransmission system; frequency conversion of the northern area of the state of Rio de Janeiro	Services in progress	13,100	448	13,548	

ELECTRIC POWER SECTOR
INVESTMENT PROGRAM 1965-70

- 2 -

PROJECT	BASIC INFORMATION	STATUS AND TIMING	ESTIMATED COST, 1965-1970		TOTAL (EXPRESSED IN DOLLAR EQUIVALENT)	FINANCING ARRANGEMENTS
			LOCAL (EXPRESSED IN DOLLAR EQUIVALENT)	FOREIGN		
9. Fasil do Paraiba Companhia Hidroelétrica do Vale do Paraiba (CHEVAP) State of Rio de Janeiro	Construction of hydroelectric plant (3 x 70 000 Kw)	Close to 30% of civil construction work already executed. Mechanical and electrical equipment already ordered. Transmission lines under study.	16,500	2,536	19,036	Total financing in the amount of US\$2,477,255 for the purchase of electromechanical equipment, granted by Alsaio San-Giorgio, Loro and Parisini, Sprenger & Schuh.
10. Santa Cruz Thermo electric Plant Companhia Hidroelétrica do Vale do Paraiba (CHEVAP) State of Guanabara	First Stage: installation of 160 000 Kw (2 x 80 000 Kw) Second Stage: installation of 160 000 Kw more.	Execution of civil construction work being started. Mechanical and electrical equipment being manufactured by Westinghouse International. Transmission lines already defined. Under study	5,240	15,222	20,462	Financing of US\$15,500,000 granted by USAID.
11. CHEVAP Transmission System Companhia Hidroelétrica do Vale do Paraiba (CHEVAP) States of Guanabara and Rio de Janeiro	Construction of 138 Kv transmission line for the interconnection of Fasil plant with the Rio Light and Sao Paulo Light systems; construction of 138 Kv transmission lines from the Santa Cruz thermal plant to Jacarepagua and Angra dos Reis.	Under study	7,620	1,800	9,420	
12. Frequency Conversion of the Rio Light System Rio Light - Servicos de Electricidade S.A. States of Guanabara and Rio de Janeiro	Frequency conversion of the Rio Light system (800 000 Kw)	Planning already completed. The first stage of the program is in the phase of being detailed by a group set up by Elektrobras, Rio Light and the governments of Guanabara and Rio de Janeiro	12,000	3,000	15,000	
13. Peixoto Companhia Paulista de Forca e Luz (CPFL) State of Minas Gerais	Expansion of existing plant with the installation of 300 000 Kw (6 x 50 000 Kw)	Sub-structure of power house already executed. Project of civil construction work and specification of new units already completed.	15,400	14,800	30,200	Financing requested to USAID in the amount of US\$25,579,000, US\$14,763,000 to be used in foreign currency and US\$10,816,000 in national currency.
14. Estreito Central Eletrica de Furnas S.A. (FURNAS) States of Sao Paulo and Minas Gerais	First Stage comprises the installation of 600 000 Kw and the construction of a 345 Kv connecting line with the Furnas Peixoto and Jaguarua plants. Second stage comprises the construction of a transmission line to Sao Paulo and the expansion of the Furnas-Guanabara transmission system.	Project of civil construction work and specification of equipment already completed. Building of access road and construction-site camping already started. Transmission lines under study.	33,000	35,425	68,425	Financing requested in the amount of US\$48,000,000 under negotiations with IBRD US\$13,000,000 for purchases in Brazil.
15. Peixoto-Furnas-Guanabara Transmission Line and Expansion of the Furnas Transmission System Central Eletrica de Furnas S.A. (FURNAS) States of S. Paulo, Minas Gerais, Rio de Janeiro and Guanabara.	Construction of the first 345 Kv circuit of the Peixoto-Furnas-Guanabara transmission line; construction of the 2nd 345 Kv circuit of the Furnas-Sao Paulo line, and expansion of substations.	The second circuit of the Furnas-Sao Paulo line is under construction, with 40% of facilities already executed. Studies of the Peixoto-Furnas Guanabara line have already been completed. The equipments for lines and substations are in the stage where bids are being submitted.	15,000	16,555	31,555	Financing granted by USAID in the amount of US\$16,555,000
16. Jaguarua Centrais Eletricas de Minas Gerais (CEMIG) State of Minas Gerais.	Construction of hydroelectric plant with 500 000 Kw of installed power.	Civil construction work plan already completed.	36,900	19,800	56,700	Financing in foreign currency being negotiated with IBRD

ELECTRIC POWER SECTOR
INVESTMENT PROGRAM 1965-70

- 3 -

ESTIMATED COST, 1965-1970

THOUSANDS OF U.S. DOLLARS

PROJECT	BASIC INFORMATION	STATUS AND TIMING	LOCAL (EXPRESSED IN DOLLAR EQUIVALENT)	FOREIGN	TOTAL (EXPRESSED IN DOLLAR EQUIVALENT)	FINANCING ARRANGEMENTS
17. Expansion of CEMIG's System	Installation of the 4th, 5th and 6th units (3 x 65 000 Kw) at the Tres Marias hydroelectric plant.	Unit 4 being assembled, units 5 and 6 already ordered	8,130	3,200	11,300	Financing of units 5 and 6 being negotiated with the German Government
Centrais Eletricas de Minas Gerais (CEMIG) State of Minas Gerais	Expansion of the transmission system. Distribution networks. Rural electrification under the responsibility of Eletricificacao Rural de Minas Gerais (ERMIG)	Plans concluded and some services being executed	61,000	13,900	74,900	
		Services in progress	36,200	7,600	43,800	
			8,460	1,820	10,280	
18. Chavantes	Construction of hydro electric plant with 400 000 Kw (4 x 100 000 Kw) of installed power.	Close to 30% of civil construction works already executed	21,200	18,089	42,289	Financing requested to IIRD in the amount of US\$ 20,000,000
Usinas Eletricas do Parapanema (USFLPA) State of Sao Paulo	Construction of 220 Kv transmission lines.		14,700	6,500	21,200	
19. Jupia	Construction of hydro electric plant with 1 200 000 Kw (12 x 100 000 Kw) of installed power.	Around 30% of civil construction works have already been carried out. Mechanical and electrical equipment already ordered and in manufacturing stage.	50,000	42,143	92,143	Financing granted by OIR in the amount of US\$63,000,000 and re-financing by I&D in the amount of US\$13,250,000
Centrais Eletricas de Urubupunga (CELUSA) State of S. Paulo	Construction of 400 Kv transmission line to bauru and Louveira	Transmission lineplan under study.	32,700	2,816	35,516	
20. Bariri	Construction of hydroelectric plant with 138 000 Kw (1 x 46 000 Kw) and of 138 Kv transmission lines for interconnection with neighbouring systems	Civil construction work in final stage of execution. Mechanical and electrical equipment being assembled. Transmission lines and substations of the CHERP system	5,900	-	5,900	Electromechanical equipment financed by Czechoslovakia.
Companhia Hidroeletrica do Rio Parado (CHERP) State of Sao Paulo			6,250	815	7,065	
21. Ibitinga	Construction of hydroelectric plant with 129 000 Kw (3 x 43 000 Kw) and of 138 Kv transmission lines for interconnection with neighbouring systems.	Construction work in early stage of execution. Mechanical and electrical equipment already ordered.	31,400	4,160	35,560	Electromechanical equipment financed by Czechoslovakia.
Companhia Hidroeletrica do Rio Parado (CHERP) State of Sao Paulo						
22. Capivari-Cachoeira	Construction of hydroelectric plant with 115 000 Kw (2 x 57 500 Kw) of installed power in its first stage	Civil construction work already started. Mechanical and Electrical equipment at bid-receiving stage. Transmission line being studied.	18,400	7,925	26,325	Financing granted by I&D in the amount of US\$5,500,000
Central Eletrica de Capivari-Cachoeira (ELETCAP) State of Parana						
23. Expansion of the CCOPEL System	Construction of small hydroelectric plant; installation of diesel groups; expansion of transmission and sub-transmission systems; installation and expansion of lowering substations; distribution network.	Program in execution	37,800	12,200	50,000	Financing requested to USAID in the amount of US\$12,186,000
Companhia Paranaense de Energia Eletrica (COPEL) State of Parana						
24. Capivari Thermo-electric Plant	Construction of thermo-electric plant (2 x 50 000 Kw)	Civil construction work practically completed.	5,000	-	5,000	
Sociedade Termoeletrica do Capivari (SOELCA) State of Santa Catarina	Construction of 138 Kv transmission lines to Florianopolis, Lages, Joinville and Curitiba	Mechanical and electrical equipment in assembly stage. Transmission lines under construction.	6,250	-	6,250	
25. CEL&SC's Expansion Program	Construction of hydroelectric plant and expansion of transmission systems and distribution network	Program being carried out	31,000	6,900	37,900	
Centrais Eletricas de Santa Catarina (CELESC) State of Santa Catarina.						
26. Charqueadas Thermo-electric Plant	Installation of the fourth unit. Expansion of plant with the installation of 2 x 50 000 Kw or equivalent power	Civil construction work for the 18 000 Kw unit, including boiler, already completed. The 100 000 Kw stage is as yet only planned	270	986	1,256	
Usina Termoeletrica de Charqueadas State of Rio Grande do Sul			7,400	14,130	21,530	

ELECTRIC POWER SECTOR

INVESTMENT PROGRAM 1965-70

- 4 -

ESTIMATED COST, 1965-1970

THOUSANDS OF U.S. DOLLARS

PROJECT	BASIC INFORMATION	STATUS AND TIMING	LOCAL (EXPRESSED IN DOLLAR EQUIVALENT)	FOREIGN	TOTAL (EXPRESSED IN DOLLAR EQUIVALENT)	FINANCING ARRANGEMENTS
27. Alegrete Thermoelectric Plant Companhia Estadual de Energia Eletrica (CEEE) State of Rio Grande do Sul	Construction of thermoelectric plant of 66 000 Kw (2 x 33 000 Kw) and of a 69 Kv transmission system to feed vast area in the southwest of the state of Rio Grande do Sul	Civil construction work well advanced, and mechanical and electrical equipment in early assembly stage. Transmission lines already studied.	12,200	15,000	27,200	Financing requested to USAID in the amount of US\$12,186,000
28. Passo Real or Equivalent Plant Companhia Estadual de Energia Eletrica do Estado do Rio Grande do Sul. (CEEE) State of Rio Grande do Sul	Construction of hydroelectric plant of 250 000 Kw of installed power and construction of 138 Kv transmission line to Jacui, Venancio Ayres and Porto Alegre.	Civil construction work plan and specification of equipment. Transmission lines under study	38,200	9,888	48,088	
29. CEE's Expansion Program Companhia Estadual de Energia Eletrica do Estado do Rio Grande do Sul (CEEE) State of Rio Grande do Sul.	Expansion of the transmission and subtransmission network. Thermoelectric plant of Porto Alegre	Plans already completed. Facilities in early stage of execution. Civil construction work already started. Equipment partially bought.	22,800 940	1,232 414	24,032 1,354	Electromechanical equipment purchased in Czechoslovakia.
30. Cachoeira Dourada Centrais Eletricas de Goias (CELG)	Construction work of the 2nd stage of this project, comprising the installation of 100 000 Kw (2 x 50 000 Kw).	Civil construction work well advanced, Mechanical and electrical equipment already ordered.	17,200	-	17,200	Electromechanical equipment purchased in Czechoslovakia.
31. CELG's Expansion Program Centrais Eletricas de Goias (CELG) State of Goias.	Construction of small hydroelectric plants and installation of diesel groups. Expansion of the transmission and subtransmission systems.	Services in early stage of execution.	1,530	-	1,530	
			2,480	-	2,480	
32. Electrification Program of the State of Mato Grosso. Centrais Eletricas Matogrossenses (CEMAT) State of Mato Grosso.	Construction of small hydroelectric plants, installation of diesel units, transmission lines and distribution system	Part of the program is already being executed.	8,650	2,468	11,118	Financing granted by USAID in the amount of US\$2,468,000
33. Programs of Small utilities and Government Agencies	Installation of 100 000 Kw at small plants and groups of diesel units	Services in progress	20,000	-	20,000	
34. Rio Light's Distribution System	Reinforcement and expansion of the distribution system of the city of Rio de Janeiro (including subtransmission lines)	Studies already completed. Some projects being executed.	64,000	11,000	75,000	
35. Sao Paulo Light's Distribution System	Reinforcement and expansion of the distribution system of the city of S. Paulo (including subtransmission lines).	Studies already completed. Some projects being executed.	75,000	12,100	87,000	
36. Expansion of the Distribution System of the Empresas Eletricas Brasileiras Group	Reinforcement and expansion of the distribution systems of Natal, Maceio, Salvador, Vitoria, B. Horizonte, Niteroi, Curitiba, P. Alegre, Pelotas and interior of the State of S. Paulo (including subtransmission lines).	Studies being carried out. Only small consumer connecting services are being executed.	144,000	16,000	160,000	
37. Other Distribution systems	Expansion of Distribution networks of other utilities (including subtransmission lines)	Small services being executed	131,000	8,000	139,000	

ELECTRIC POWER SECTOR
INVESTMENT PROGRAM 1965-70

ESTIMATED COST, 1965-1970
THOUSANDS OF U.S. DOLLARS

<u>PROJECT</u>	<u>BASIC INFORMATION</u>	<u>STATUS AND TIMING</u>	<u>LOCAL (EXPRESSED IN DOLLAR EQUIVALENT)</u>	<u>FOREIGN</u>	<u>TOTAL (EXPRESSED IN DOLLAR EQUIVALENT)</u>	<u>FINANCING ARRANGEMENTS</u>
Estimate of cost of generation and transmission projects, not identified, which are to be placed in service in 1970 and subsequently and construction of which must be started in the period 1965-70. The estimate of cost covers only the total expenditure in this period.	This estimate is based on the additional facilities likely to be required in 1970 and subsequently based on a load projection for that period. It includes tentative proposals of utilities for commissioning additional capacity for that period.	Projects not identified specifically. Construction to be started in the period 1966-70 and completed by 1975.	450,000	150,000	600,000	
Approximate Totals			1,810,000	570,000	2,380,000	

February 26, 1965

