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DEPARTMENT OF STATE
AGENCY FOR INTERNATIONAL DEVELOPMENT
Washington, D.C. 20523

CAPITAL ASSISTANCE PAPER

Proposal and Recommendations
For the Review of the
Development Loan Committee

BRAZIL - CCFBE: (Mascarenhas Hydro-Electric)

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AID-DLC/P-450

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DEPARTMENT OF STATE
AGENCY FOR INTERNATIONAL DEVELOPMENT
Washington, D.C. 20523

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AID-DLC/P-450
June 17, 1966

MEMORANDUM FOR THE DEVELOPMENT LOAN COMMITTEE

SUBJECT: Brazil - CCFBE: (Mascarenhas Hydro-Electric)

Attached for your review are the recommendations for authorization of a loan in an amount not to exceed $13,300,000 to Companhia Central Brasileira Forca Electrica ("Borrower") to assist in financing the United States dollar costs of a project for the construction of a hydro-electric plant at the Borrower's site on the Doce River in the State of Espirito Santo, the construction of transmission lines and sub-stations, the improvement of related electrical distribution facilities, and related engineering services.

This loan proposal is scheduled for consideration by the Development Loan Staff Committee at a meeting on Friday, June 24, 1966.

Rachel C. Rogers
Assistant Secretary
Development Loan Committee

Attachments:
Summary and Recommendations
Project Analysis
Annexes I-V

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June 17, 1966

BRAZIL - MASCARENHAS HYDROELECTRIC PROJECT AND DISTRIBUTION SYSTEM EXPANSION PROGRAM

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June 17, 1966

BRAZIL - MASCARENHAS HYDROELECTRIC PROJECT AND DISTRIBUTION SYSTEM EXPANSION PROGRAM

SUMMARY AND RECOMMENDATIONS

1. BORROWER: Companhia Central Brasileira de Forca Eletrica (CCBFE)

2. GUARANTOR: ELETROBRAS

3. AMOUNT OF A.I.D. LOAN: US$13.3 million

4. TOTAL COST OF PROJECT: (US$ millions)

	Local Costs	Foreign Exchange	Total Cost
Mascarenhas Hydroelectric	$ 21.6	$ 10.3	$ 31.9
Distribution System	9.5	3.0	12.5
CEMIG Interconnection	4.6	-	4.6
	$ 35.7	$ 13.3	$ 49.0

5. PROJECT DESCRIPTION AND PURPOSE OF A.I.D. LOAN:

A. Mascarenhas Hydroelectric

CCBFE will construct this hydroelectric project at the Mascarenhas site on the Doce River in the State of Espirito Santo. The plant will include three 38.5 Mw units, two of which are planned for operation in 1971 and the third in 1972.

The A.I.D. Loan would supplement ELETROBRAS and Company funds in the financing of the Mascarenhas project. Specifically, A.I.D. funds in the amount of US $10.3 will be utilized to finance two 38.5 Mw units manufactured in the United States, as well as associated equipment, and engineering services.

B. Transmission and Distribution System Expansion

The Borrower has embarked on an expansion and modernization program which will: (1) provide for the construction of transmission lines and substations (1966-1973); (2) overhaul and expand the distribution system (1966-1970), and (3) implement a frequency conversion program (1966-1969). The A.I.D. Loan will be used to finance the foreign exchange costs associated with the importation of goods and equipment from the United States.

Of the total loan of $13.3 million, $1.5 million will be utilized by Brazilian manufacturers to purchase imported components from the United States using the Letter of Commitment procedure. The balance, $11.8 million, will be for direct procurement by CCBFE of U.S. equipment and services.

6. OTHER FREE WORLD FINANCING:

A. The IDB in a letter to AID/Washington, dated May 18, 1966, indicated that they were not interested in the project.

B. The Export-Import Bank has no interest in the project.
C. IBRD has no interest in the project.

7. PLACE OF THE LOAN IN THE PROGRAM:

The project will provide the energy base which in turn will make it possible for a significant industrial expansion to take place in the State of Espirito Santo. As such, the project will contribute to industrial decentralization and create an alternative economic base to the present obsolete coffee economy upon which the State's activity now rests.

8. STATUTORY CRITERIA: All statutory criteria have been satisfactorily met (see ANNEX I).

9. ISSUES: None

10. COUNTRY CLEARANCE: COCAP has indicated approval of the project.

11. RECOMMENDATIONS: It is recommended that the subject loan proposal be authorized as follows:

A loan extended to the Companhia Central Brasileira de Forca Eletrica not to exceed $13.3 million to finance the cost of (i) two 38.5 Mw units manufactured in the United States, (ii) associated electrical equipment, (iii) goods and equipment imported from the United States to be utilized in the transmission and distribution expansion programs and (iv) U. S. consulting engineering services. The following terms and conditions will be incorporated:

(1) Repayment will be made within twenty-four (24) years from the date of first disbursement, including a four- (4) year grace period;

(2) Interest at five and one-half percent (5-1/2%) will be charged on the disbursed portion of A.I.D. loan funds during the term of the loan, including the grace period;

(3) Interest and principal will be repaid in United States dollars, in semi-annual installments;

(4) Supervisory engineering services will be contracted with a firm satisfactory to A.I.D., and under approved A.I.D. conditions.

(5) All equipment, material, and services financed under this loan are to have their sources and origin in the United States of America;

(6) The two-step loan option will be offered to the GOB, with repayment scheduled at forty (40) years including a ten- (10) year grace period with interest at one percent (1%) during the grace period and two and one-half percent (2-1/2%) thereafter.

(7) GOB approval will be required in regards to the importation without restrictions of United States goods, equipment and services financed under the A.I.D. Loan, prior to disbursement;

(8) The Company will undertake to revalue its assets as a basis for rate adjustments in accordance with appropriate monetary correction factors as provided by Brazilian law.

(9) And such other conditions as A.I.D. may deem necessary.

12. PROJECT COMMITTEE:

Loan Officer	Edgar B. Howard USAID/B - ADCD
Engineer	William Reed USAID/B - ENRO
Legal Officer	P. A. Hornbostel USAID/B - LGS
Drafting Officers	Edgar B. Howard, ADCD William Reed, ENRO
Approved by:	Philip Glaesner, LA/CD Jerome Levinson, ADCD Dwight B. Johnson, ADCD

BRAZIL - MASCARENHAS HYDROELECTRIC PROJECT AND DISTRIBUTION SYSTEM EXPANSION PROGRAM

SECTION I - PLACE OF THE LOAN IN THE PROGRAM

In 1964 and 1965, A.I.D. made substantial investments in the power sector in Brazil. These include: (1) distribution projects in the two major urban industrial areas in Brazil, Rio de Janeiro and Sao Paulo; (2) major hydro and thermal generation and transmission projects in the South Central region in Brazil; (3) financial and technical assistance to newly-formed State power companies in the frontier State of Matto Grosso and the fast-growing State of Parana; (4) the major hydroelectric project being undertaken in the Northeast of Brazil, Boa Esperanza. The level of A.I.D. financing in this sector amounts to $137 million out of total authorized loans of $241 million, as of May 30, 1966. Thus, the A.I.D. power program is extensive in coverage. Moreover, power has dominated the A.I.D. project loan program.

This situation is a reflection of a number of factors. First, the fact that there was a well-conceived investment backlog ready to be financed in the immediate post-revolution period. Second, a power plan for the South Central region establishing priorities had been formulated by a group of international consultants under World Bank auspices. Third, the other international financing agencies had not yet determined their level of financing in Brazil.

This situation has now substantially changed. In the past 18 months, the World Bank has invested over $200 million in power projects in Brazil. The major hydroelectric projects in the South Central region now have their external financing largely assured. The next series of projects to cover the power needs of the period 1972 through 1975 will not require fund commitments until 1968. Within this context then, the A.I.D. power financing program assumes a much more limited role. Thus, in FY 66, A.I.D. authorized a $150 million program loan and expects to authorize approximately $80 million in new project loans as follows:

	Million of Dollars
Agriculture	20.0
Feasibility Studies	11.0
Transport	20.4
Water and Sewerage	5.2
Power	22.3
Total	78.9

As the following discussion shows, the project is a part of the program of one of the former subsidiary companies of the American/Foreign Power Group in Brazil. These companies were purchased by the Brazilian Government and are now wholly-owned subsidiaries of ELETROBRAS. The project here proposed to be financed is located in the State of Espirito Santo, a relatively depressed area presently dependent on an obsolete coffee economy, but one which has substantial growth possibilities. These possibilities are fundamentally based upon the fact that the port of Tubarao, located close to Vitoria, capital city of the State, forms a natural outlet for the high-quality iron ore deposits located in the interior of Minas Gerais and transported to Tubarao by a relatively efficient railroad network. As the discussion shows, these possibilities are already being realized. Important investments are being made or are in an advanced state of planning. With the development of this industrial complex, alternative economic activity will be provided for the economy of the State. This, in turn, will lead to further industrial decentralization which is clearly desirable in Brazil and possibly to a slowdown in the rate of migration of the underemployed rural population to the overly congested urban areas of Rio and Sao Paulo. The development of this alternative, however, presupposes an adequate energy base. This project is designed to provide that base. In short, the justification for the project rests upon the growth prospects of the region that the project is to serve. As the paper shows, these prospects are soundly based.

SECTION II - THE BORROWER

The applicant is the Companhia Central Brasileira de Forca Eletrica, hereafter referred to as CCBFE, a corporation founded for the purpose of providing electric power service (production, transmission, distribution and marketing) in the State of Espirito Santo.

The CCBFE, founded in 1927, was a subsidiary of the American & Foreign Power Co. Inc. until November 12, 1964, at which time it was acquired along with nine other AMFORP operating companies, by Centrais Eletricas Brasileiras S.A. (ELETROBRAS). ELETROBRAS is a Federal Government corporation authorized to investigate, study, finance, construct and operate electric power plants, transmission lines and distribution facilities throughout Brazil. With the ten companies, ELETROBRAS also acquired their mutually, wholly-owned service company, Companhia Auxiliar de Empresas Eletricas Brasileiras (CAEEB). The role of CAEEB is that of managing the companies as a group for ELETROBRAS. This managing control is exercised by CAEEB on nine of the ten companies; the remaining company being under juridical administration.

The total number of individuals employed by CAEEB as of April 1966 was 299, as follows:

Department	No. of Individuals
Administrative	29
Accounting	62
Commercial	5
Engineering	40
Purchasing	53
Legal	20
Rate	22
Transport	14
Miscellaneous	54
Total	299

In 1964, A.I.D. made a US$ 20.4 million loan to ELETROBRAS for a 300 Mw expansion of hydroelectric generating facilities at Peixoto. This loan was subsequently assumed by CAEEB and will eventually be turned over to one of the operating companies, Cia. Paulista de Forca e Luz. CAEEB management has displayed competence in its supervision of the Peixoto expansion to date. Consequently, we have good reason to believe that they can successfully implement the proposed Mascarenhas project.

In accordance with its By-laws, the CCBFE's head office is located in Rio de Janeiro, State of Guanabara, and is administered by a Board of Directors, composed of a president and four directors. The present Board, elected in March 1965 for three years, includes: Messrs. Leo Amaral Penna (President), Firmo Ribeiro Dutra, Antonio Benjamin Jaques Horta, Luiz Burgos Netto, and Oswaldo Adalberto Guimaraes.

SECTION III - DETAILED DESCRIPTION OF THE PROJECT

A. ENGINEERING ANALYSIS

Present System

(a) Generating Plants

Prior to its purchase in 1964 by ELETROBRAS, the Company was unable to generate sufficient funds required for a long-term expansion program. Consequently, CCBFE was limited to its 50 cycle hydroelectric power installations at Jucu and Fruteiras, constructed in 1909, 1924, 1928 and 1911, respectively. In order to meet the increasing demand requirements of customers during the 1949-1965 period, eight 1,000 Kw General Motors Diesel units were installed, five located in Vitoria and three in Cachoeiro do Itapemirim.

Due to the lack of firm power in this region, two mixed-economy industrial corporations have been forced to install their own diesel generators, which will provide them with an assured although costly power supply; CFAV owns diesel units totaling 2,800 Kw, located in their steel mill in Vitoria; and CVRD put in operation in mid-1966 four diesel units totaling 6,000 Kw, located at their iron ore harbor works in Tubarao, near Vitoria.

The State government in 1956 organized ESCELSA to initiate the development of hydroelectric sites on the Santa Maria River in order to provide power for the State's central region. Subsequently, the 50 cycle Rio Bonito and Suica plants were constructed and went on stream in 1959 and 1965, respectively. In 1960, CCBFE started purchasing power from ESCELSA to complement the output of its own plants.

Due to the small watershed of the Santa Maria river (542 and 804 Km^2 respectively), the generation of the ESCELSA plants is limited. Thus, even after the Rio Bonito plant went into operation in 1959, diesel generation was still necessary during dry periods. At present, with the recent inauguration

of the Suica plant, and owing to 1965 having been a fairly wet year, there has been little diesel generation. However, intensive diesel generation will again be required in the dry seasons of immediate future years if another source of hydroelectric power is not made available.

The four hydroelectric generating plants in operation in the CCBFE-ESCELSA system have an aggregate maximum peaking capacity of 51,000 Kw and total estimated average capability of 180 million KWH per year, as follows:

HYDROELECTRIC PLANTS

CCBFE	Jucu	2,200 Kw	13GWH/year
CCBFE	Fruteiras	2,200 Kw	12GWH/year
ESCELSA	Rio Bonito	16,800 Kw	55GWH/year
ESCELSA	Suica	30,000 Kw	100GWH/year
TOTAL		51,000 Kw	180GWH/year

(b) Transmission System

CCBFE's main 33 Kv transmission system runs lengthwise across its concession area from Vitoria in the north to the Paineiras substation in the south, as indicated in Plate 7.

From the substations, which are joined by trunk lines, 33 or 11 Kv feeder lines run to different towns or large consumers. The total distance covered by the company's transmission lines is 348 Km.

System Expansion Program

The system expansion program now planned will place CCBFE on a sound basis by 1971. It compensates for postponed improvements and expansion to meet current needs and system growth and the accelerated industrial development in the area. This latter is due primarily to the new harbor facility at Tubarao which

has recently gone into operation.

The program being undertaken by CCBFE includes (1) a transmission tie with CEMIG, (2) the proposed 115 Mw Mascarenhas hydroelectric plant, (3) transmission and distribution improvements and expansion and (4) converting the system from 50 cycles to Brazil's standardized 60 cycles.

The Project

Aid has been requested to assist in financing the 115 Mw Mascarenhas hydroelectric plant and the transmission and distribution improvements.

Mascarenhas Hydroelectric Plant

The Mascarenhas hydroelectric plant will be located on the lower Doce River, slightly downstream from the Minas Gerais-Espirito Santo border. (See plate 7). It is about 150 Km from the mouth of the river and 110 Km transmission line distance from Vitoria. The Doce River basin covers an area of 74,300 Km^2. Its discharge over 27 years of observation averages 927 m^3/sec and a minimum of 208m^3/sec.

The dam will permit development of a net head of about 19 meters. It will take the shape of an open "s" connecting the banks and running across an island in midstream (See Dwg). An overflow spillway with a capacity of 12,000 m^3 with ten taintor gates will be built on the left side; a stretch of concrete gravity dam is to cross the island in the direction of the river flow. The powerhouse of the semi-outdoor type with water intakes will occupy the right side. The dam is to be made of concrete throughout. It will be 625 meters long and a maximum height of 28 meters.

The reservoir will be small as this is essentially a run-of the-stream hydro. Water will be backed up about 11 Km with an average width of 300 meters at the 60 meter contour line.

It will be necessary to relocate about 6 Km of railroad track and the construction of two small earth fill dykes (See plate 4).

1/ Plates references are to Annex II Table references refer to Annex III unless otherwise specifically stated.

The powerhouse will be designed for four 38.5 Mw Kaplin turbine generator units with three units installed initially as part of this project. A step-up substation will be built on the right bank of the river immediately upstream for the dam. The CEMIG to Vitoria transmission (described below) will connect through this substation and provide the means to deliver power into the system loan centers.

Transmission and Distribution System

Improvements and expansion of the transmission and distribution system is required. Surplus power in one area cannot be delivered to a power-short area. Losses are high and service is unreliable. The project includes some new circuits, improvements to existing circuits, new substations and expansion and improvements to existing ones. The distribution system will be overhauled and expanded in the cities of Carapina, Serra, Praia, Vitoria, Cachoeiro do Stapemirem, Vila Velha, Cariacica and other communities. A breakdown of the elements is shown in Annex II, Plate 8 (Expansion Plan Schedule 1966-1970).

Included as part of these improvements will be the changing of the system frequency from 50 to 60 cycles. The plans include modifications to present generating stations and substations. Surveys of customers' installations, engineering and design for the frequency change program are to be provided. A new communications system is included for the power stations, headquarters and key substations. Also equipment for the general management and operations of the system, laboratory apparatus, special tools and vehicles and a training program for personnel will be provided.

One of the key items for operations will be a transmission circuit connecting into the CEMIG system at Governador Valadares and Vitoria. There is no foreign exchange or AID financing on this item but it is part of the program. It consists of a 250 Km 138 Kv line between Governador Valadares in Minas Gerais and Vitoria in Espirito Santo. It will tie into the

CEMIG system at Governador Valadares and will pass the Mascarenhas hydro site to Vitoria. With this line CCBFE will be able to obtain 50 Mw of power from CEMIG from 1967 to 1971 when initial operation of Mascarenhas is programmed.

Besides providing the interm power supply, this line will tie the Mascarenhas hydroelectric plant into the system load centers and will provide a means for exchange of power with the South Central System through CEMIG.

Preliminary Planning and Feasibility Studies

The feasibility study, dated January 1966, was prepared by Servex Engenharia S. A., a Brazilian firm of consulting engineers. The report followed the outline and content suggested in the A.I.D. Feasibility Guide. Working with Servex was the firm of Economia e Engenharia Industrial S. A. (ECOTEC) who are economists of high repute in Brazil.

Servex used many available sources for detail and support of their study. River flows and hydrology was available from the Division of Water in the Ministry of Mines and Energy which had maintained gauging stations on the Doce River since 1938. The computer and network analyzer of CEMIG was used to determine power flows and other information for interconnected operations with CEMIG and the South Central Area.

The preliminary studies for choosing the site, the study of alternatives and preliminary layouts were based on maps from aerial photographs by Servicos Aerofotogrametrices Cruzerio do Sul S. A. in 1961. A detailed topographic survey of the project site was carried out by the engineer.

The Servex study was deficient in the benefit-cost study. A fortunate coincidence developed in that Montreal Engineering who have had responsibility in the CANABRA group study of the power needs of the South-central region were completing a section of their work and they had some highly qualified engineers immediately available. The Borrower employed Montreal to review the Servex study and prepare a benefit-cost

study. This was done with the cooperation of ECOTEC and Servex. The Montreal engineers were able to use their enormous background of detailed economic, load growth and power engineering data accumulated over the past three years they have been studying the South Central Area. Included was detailed studies they had already made of the Doce River and the Mascarenhas site. Estimates and cost data were reviewed and verified or modified. The Geology and site exploration were reviewed and verified. A report dated April 1966 was prepared to supplement the Servex report which included some recommended modifications. Montreal confirmed the Servex findings that foundation conditions are unusually good. They recommended however certain further investigation at time of construction which USAID will require be carried out:

1. To control seepage, it may be necessary to provide some upstream blanketing and a system of drains and filters on the downstream toe of the dam.

2. There is some disagreement on flow data from the different gauging stations. Servex used the more conservative data. Flows during the driest years are about 3% less than Montreal has been using and Servex's design flood condition is somewhat higher. Additional readings and further examination at the time of final design may permit a decrease in design flood with a consequent saving in cost.

The transmission and distribution systems were studied by Eletrotecnica Consultoria e Projectos Ltda (ELECTRA). Their findings were incorporated in a report dated April 1966. It was prepared in close collaboration with the borrower's engineers. This work was based on (1) a previous study for improvement in the system and operation made by ELECTRA in August 1965 and a transmission study made in February 1966 and (2) a preliminary report on frequency conversion made by the State of Espirito Santo. This report provides the one-line diagrams, preliminary designs of substations and maps with system layouts in sufficient detail to develop cost estimates.

These studies have been made and reviewed and together are in sufficient scope and depth to assure the soundness of the conclusions, preliminary planning, engineering and cost estimates to assure a technically sound project. Consequently, the provisions of Section 611 of the FAA have been met.

Site Selection and Alternatives

The Doce River is the major river passing across Espirito Santo which has significant possibilities of development. Plate #1 shows the profile of the proposed river development. While Espirito Santo is outside the South Central Area and the scope of the CANAMBRA study because most of the sites are in Minas Gerais it was studied in detail. Consideration for the initial development was between 120 Mw Oculos, favored by CEMIG and 115 Mw Mascarenhas. Oculos had the advantage of seasonal storage and river flow control. However, it is a costly project and would take about six years to build. Mascarenhas with its more modest civil works could be completed much more quickly at a more modest investment. Also, in spite of limited water storage, its output operated with the South Central tie through CEMIG would provide the requirements for CCBFE. Therefore, Mascarenhas was selected for the initial development in the Doce River with three 38.5 Mw units. A fourth unit will be installed in the future, probably with the construction of the Oculos or Resplendor plants with large reservoirs for river control.

After other hydro sites in Espirito Santo had been investigated, it was found that Mascarenhas was the only one capable of supplying the load at an acceptable cost. The surveys carried out by the Power Study of South Central Brazil on the Doce River likewise found it the best on that river. Thus, insofar as regional hydro power is concerned, Mascarenhas is the best project to serve the needs of Espirito Santo through 1976.

Energy and Capacity from Mascarenhas

The Doce River at Mascarenhas site suffers a considerable rise in stage during the wet season and there will be a reduction in plant capability at these times. This condition can occur during January and February. In the dry season, this will not be serious. On the basis of the highest stage on record, the following shows the loss:

No. of Units	Plant Capability - Mw at rated head	at Max. recorded stage
2	77.0	38
3	115.5	58
4	154.0	77

Under high water conditions it will therefore be necessary to make up the deficit in peak capacity from other sources. The tie with CEMIG will provide assistance up to 50 Mw which is adequate for load forecasts through 1976 after which time one of the large storage reservoirs upstream would be completed to provide river control. The capacity and energy for the average water year are shown in Tables 8 and 9. These were calculated from flow, head and power potential duration curves which in turn were plotted on a hydrograph of flows by month from 1937 through 1964.

Giving consideration to expected unavoidable losses such as a failure to maintain headpond elevations or optimum loading of units, the primary energy of the project is limited to 38 average Mw or about 340,000 Mw hrs. per year based on natural flow.

However, a unique situation exists by which Mascarenhas can be credited with a very much greater capability. With the transmission tie into the South Central System, the storage in the Tres Marias, Billings and Furnas reservoirs plus other large reservoirs being constructed become available to Mascarenhas. During periods when the energy output exceeds the system requirements, the surplus can be delivered into the South Central System allowing an increase in an equivalent amount of storage. During periods where there is a deficit due to high tail water, unit outage or low river flow, then power can be drawn from the South Central System. For average water year with 3 units, the annual output is 817 GWH.

While Mascarenhas is relatively small compared with South Central System, it connects into an area of CEMIG which is electrically remote from power supply. It will provide a source of stability for CEMIG in this area. It will substitute for a time

for CEMIG until Oculos is built.

Technical Problems

The technical problems inherent in projects such as this have been identified and examined. Where precise solutions must await detailed design such as control of seepage and design flood conditions, the more conservative solution has been assumed to ensure adequate estimates and planning. No unusual or unexpected conditions are foreseen.

However, a delay in funding from this proposed loan could seriously set back the timing of the project. Construction must be coordinated with river conditions.

B. MARKET ANALYSIS

CCBFE Energy Sales

Service Area - Introduction

The presence of gold created the first significant influx of population in the State of Espirito Santo in the 18th century. The depletion of these deposits stimulated iron ore mining, agriculture, and lumbering, the latter supplying fuel to the Vale do Rio Doce railroad and iron smelters. As the soil south of the river has become exhausted, areas to the north have opened up to coffee plantings, the principal agricultural endeavor. The population of the State, which approximates two million, is still predominantly rural. In 1965, the population of the three largest cities of the State--Vitoria, Cariacica, and Vila Velha--totalled less than 250,000.

The CCBFE's system, interconnected since 1960 with that of the Espirito Santo Centrais Eletricas S.A. (ESCELSA), serves the South Central region of the State of Espirito Santo. These two systems meet 90% of the State's energy demand south of the Doce River. The remaining 10% are supplied by individual generating sources, belonging to country authorities or small companies.

Past Energy Consumption

The following two tables indicate the total number of customers as well as a classification of energy sales during 1965, and the 1960-1964 period. They show the relative importance as well as growth of industrial sales vis a vis other sales classifications to CCBFE, a factor anticipated to be of increasing importance in the future.

CUSTOMER CLASSIFICATION--1965

Customer Classification	% of Total Sales Consumed	Number of Consumers
Industrial	42.6 %	493
Residential	27.3	33,127
Commercial	14.2	5,794
Public Serv. & Light	12.4	501
Other	3.5	-
	100.0 %	39,915

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CUSTOMER CLASSIFICATION, ENERGY SALES

		Energy Sales, MWH					
Year	Customers	Resident	Commercial	Indust.	Publ.Serv. & Light	Misc.	Total Energy Sales
1960	29,778	16,591	9,268	14,909	7,526	1,994	50,288
1961	31,917	18,920	10,401	19,160	9,608	2,004	60,093
1962	33,909	20,736	11,301	28,549	10,422	1,811	72,819
1963	35,955	21,031	11,225	30,391	11,417	5,542	74,900
1964	37,739	21,371	11,132	35,332	12,479	354	80,668

Source: Company Records.

Total energy sales increased 82.0% during the 1959-1964 period or 12.2% annually, and 151.3% from 1955-1964, or 10.8% per annum. During these same periods, respectively, peak load growth was 90.7% or 13.8% annually and 154.9% or 11.0% per annum. It is apparent that the rate of growth of energy sales and peak load has been greater in the more recent period.

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Load Forecast

CCBFE's primary load center, the Vitoria area, may be characterized as a relatively small one. However, recent developments indicate that this situation may change significantly in the relatively near future.

A mixed-economy company, The Companhia Vale do Rio Doce (CVRD), is creating a modern, efficient port 10 kilometers north of Vitoria at Ponta do Tubarao. These docking facilities, which opened to iron ore traffic in April, 1966, will eventually be capable of handling vessels up to 100,000 tons. The CVRD's railroad connects this port with Brazil's extensive and high-quality ore deposits located in the "Iron Quadrangle" near Belo Horizonte, capital of Minas Gerais State.

The ore deposits of this region are of two basic types: (1) Hematite, having an iron content ranging between 64% and 69%, with very few impurities. This content makes these deposits among the highest-grade ores in the world. Hematite occurs in tw forms: compact and blue dust. Blue dust as well as iron dust (fines) do not have the commercial value of processed compact unless they are converted into pellets. (2) Itabirite, an iron ore of lower grade(45%-50%)which requires special treatment for use in metallurgical processes. The itabirite deposits are not generally mined, due to the difficulties and cost involved in their processing, as well as the availability of substantial hematite deposits.

Sizeable quantities of fines are left as residue during mining, transporting and grading operations. Several sintering processes have been developed which can convert this residue into pellets. World production of and demand for pellets has increased considerably in recent years, as their uniformity of size, porosity, and high metal content raises furnace output by 20%, and reduces the quantity of coke required by the process.

Currently, there is an over-supply of iron ore in the world markets. What are Brazil's prospects for improving its ore exports to the major steel-producing nations, in the light of intense competition offered especially by Canada and Africa? They are favorable if the following factors are taken into consideration:

(1) The costs of preparing the ore for export must be reduced through mechanization and the utilization of the latest technology. (2) Transportation costs to customers' plants must be lowered. This entails modernization and greater efficiency of Brazil's railroads. In addition, ocean freight costs can be reduced by chartering huge super-carriers as well as the utilization of modern loading/unloading systems, which will assure a minimum amount of time spent in port. Whenever these vessels can be employed to transport coal, petroleum, etc., on their return voyages, the ore charges will be even lower.

It should be recognized that distances and volumes transported are not the only variables involved which affect the economics of ocean shipping. Surely as important a consideration is the unit value of the cargo being carried. The high-grade ores of Brazil's "Iron Quadrangle" can clearly absorb freight charges more easily than can inferior ores.*

In short, this highly over-simplified presentation of the prospects for a significant expansion of Brazil's iron ore exports is made with the following point in mind. A tremendous potential exists at this time in the Tubarao port region for the establishment of an iron-steel industry, oriented towards exports. The single most important ingredient missing however is a firm source of electric power.

Despite the limitations imposed by this energy deficiency, at least two large companies have made commitments to locate pelletizing plants in the Tubarao port region. They are confident that the power deficit in this area will be corrected in the near future. Letters have been received from these companies outlining their expansion plans and power requirements; these are offered as Exhibits 1 and 2.

The Mascarenhas project is recognized as having the capability and flexibility of meeting the current and future energy requirements of industrial developments in the area. The Mascarenhas site is located just outside of the so-called "Central-Southern region." Consequently, it was not originally included in the survey of power resources undertaken by the

* For a more detailed discussion, see: Document of the Inter-American Development Bank, CP/64/DP-21 Rev., 28 October, 1964).

"Comite Coordenador de Estudos Energeticos da Regiao Centro-Sul," with the assistance of Canambra Engineering Consultants Ltd. However, as previously noted, the project was reviewed by Canambra and recommended by them as the first step in the development of the Rio Doce, in their memorandum to the above Committee--CAN/168, of June 4, 1965.

The table below sets forth the Borrower's estimates of the future requirements of the CCBFE-ESCELSA systems during the 1966-1976 period.

Table A

CCBFE-ESCELSA SYSTEM REQUIREMENTS - POWER - MW

	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
1. CCBFE (except large industrial, including losses)	28	31	35	39	44	49	55	62	69	77	86
2. Large Industrial											
(a) CVRD	6	6	21	36	36	36	36	36	36	36	36
(b) CFAV	11	11	11	11	11	11	11	11	11	11	11
(c) MBR	-	-	-	-	20	20	20	20	20	20	20
3. ESCELSA (except large industrial; including losses)	5	6	7	7	8	9	10	12	13	15	17
4. Losses (transmission for large industrial)	1	1	2	3	4	4	4	4	4	4	4
5. Net System Demand	51	55	76	96	123	129	136	145	153	163	174

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In our estimation, these are reasonable projections in the light of the possibilities discussed in the ensuing paragraphs. Collectively, these prospective projects indicate that a sufficient demand will exist for power generated by the Mascarenhas plant. Continual reference is made to this table in our discussion of the individual projects below.

Components of Load Forecast

1) CCBFE: On the basis of load growth observed between 1960 and 1964 (Table A, p16), it was assumed that the system's load, both demand and generation, would increase at a constant rate of at least 12% per year of the system's actual load in 1964, thus maintaining the annual load factor of 52% observed in that year.

2) ESCELSA: Owing to the lack of statistical data for the ESCELSA system's load, it was assumed that its generation in 1964 was the difference between the total production at the CCBFE's and ESCELSA's plants, and the generation assigned to the CCBFE system. To the generation level obtained in this way, the same rate of growth of 12% per year was applied, the load factor remaining the same as that for the CCBFE.

3) CFAV: The Companhia Ferro e Aco de Vitoria has a steel plant at Cariacica, in Vitoria, with an annual capacity of 130,000 tons. They are considering the construction in Vitoria of a blast furnace and another steel plant with an annual production capacity of 1,000,000 tons. It would be scheduled for operation after 1970.

The World Bank, in its report on the economic position and prospects of Brazil (March 12, 1965), recommended a technical study to determine the allocation of additional productive steel capacity between existing plants and new ones. This study, conducted by Booz, Allen & Hamilton, may recommend deferral of the CFAV project in favor of an alternative project. We feel there is a strong possibility of this eventuality, and for this reason have not increased the company's load beyond the indicated 1966 level.

4) CVRD: The Company has embarked on an expansion and modernization program which is designed to increase its handling of iron ore exports from approximately 9.8 million tons in 1965 to approximately 20 million tons by 1970. Multiplying this volume by an average unit price of US$8.10 would yield about US$160 in gross foreign exchange earnings in 1970.

The most important project in this undertaking is the new ore and coal terminal at Ponta do Tubarao which went into operation in April, 1966. This facility is a highly mechanized, semi-automated loading and unloading operation with a system capacity of 6000 tons per hour. Due to the lack of sufficient power in this region, the Company was forced to install four 1,500 KW diesel units. However, this costly source of electric energy will be placed in reserve as soon as CCBFE completes a 132 KV transmission line to the Tubarao site. Table A, page 20 reflects a 6,000 KW demand until 1968, when an additional 18,000 KW will be required by CVRD's first pelletizing plant.

The pellet plant installation, the second one in Latin America (Marcona Mining Co. has one in Peru) will be capable of producing two million tons per annum. It is anticipated that it will commence operation in March, 1968, allowing two years for delivery of the plant by the Austrian firm VOEST and its installation. The short-range expansion plans of CVRD contemplate the addition of a second two million ton unit shortly thereafter. Thus the total additional demand attributable to the CVRD project is likely to be 15 MW. Long-range plans of the Company envisage the expansion of the pelletizing plant to a limit of 12 million tons per year.

5) CAEMI: The Companhia Auxiliar (CAEMI), a holding company with participation in at least 21 subsidiaries, recently submitted their expansion program to the GOB for its approval. It encompasses three areas of endeavor: (a) the mining and sale of iron ore, (b) the production of iron pellets for export and domestic consumption and (c) the construction of a steel mill oriented for exports. The mining and pelletizing phases will be carried out by Mineracoes Brasileiras Reunidas S/A (MBR), a nearly wholly-owned subsidiary of CAEMI. The steel project, if found feasible, will be conducted by a separate company, in which CAEMI will have a controlling interest.

The Tubarao port region is being considered as the location for a pelletizing plant as well as a point of shipment of MBR iron ore. Negotiations with CVRD have led to a general agreement over the site location of a pelletizing plant. In addition to the Tubarao area, two other locations are under consideration by MBR for such a plant. It is our opinion that the Tubarao site will be favored due to: (a) its excellent port facilities, (b) the CVRD railroad link with MBR's iron ore deposits, and (c) the possible reluctance on the part of MBR to allow the Brazilian State-controlled CVRD to monopolize the pelletizing industry in this important export site.

According to MBR statements, the plant will be constructed during 1967-1968, and be placed in operation during 1969. As presently conceived, it would have a capacity of 2.75 million tons per annum and result in a maximum demand of electric energy of 22 mw. Table A, page 20 reflects a 20 mw. demand in 1970.

There are a number of other load prospects for the region which may increase the demand projection as presently envisaged. Due to the varying degrees of uncertainty entailed in these projects, they are not reflected in the borrower's estimates of energy demand. These include:

1) Studies being conducted by CAEMI indicate a good possibility of producing semi-finished steel products at competitive prices in Brazil for the international market. The Tubarao port location is being considered for the prospective plant, which would have an annual production capacity of two million tons. The Company has indicated that such a plant might start production in 1971.

While a steel mill of this size necessitates approximately 65,000-75,000 KW, the demand from CCBFE would most likely be considerably less, as the plant would utilize its coking gases for generating a portion of its electric energy needs.

2) Westmoreland Coal and Virginia Coal are collectively considering locating a coking plant in the Tubarao area, which would supply the coking needs of a steel mill in that region.

3) CFAV may install two electric furnaces at its Vitoria plant to smelt scrap iron from the Usiminas steel plant. These units would each consume approximately 6,000 KW; the first unit would be scheduled for operation in 1967, and the second in 1968.

4) AMFORP is currently discussing railroad shipment rates with CVRD for transporting iron ore from a recently-acquired mine to the Tubarao port for export. In conjunction with this scheme, they are considering a pelletizing plant and/or a blast furnace for pig iron, to be located in that area.

5) At least two Scandinavian firms have expressed interest in locating pulp-processing plants in the region, plants which would produce short fibres for shipment to Scandinavia.

National Benefits

In addition to the commercial viability of the Mascarenhas project, it is important to consider the contributions of this project to Brazil.

1) The most significant consideration is the stimulus that the project will undoubtedly provide to industrial development in the general Vitoria area. In addition to the contemplated iron-steel projects at the Tubarao site, it is a reasonable supposition that ancillary industries will locate in the region. The effect of industrialization at this location on the nation would be most beneficial, in the light of the GOB's efforts to decentralize economic activity from the Rio and Sao Paulo concentrations. However, this development clearly presupposes an adequate energy base which this project will provide.

2) Exports from the Tubarao port will have a positive effect on the national balance of payments. The expansion program of the CVRD alone is anticipated to result in exports

of iron ore of approximately 20 million metric tons in 1970. Multiplying this volume by an average unit price of US$8.10 would yield nearly US$160 million in gross foreign exchange earnings. While CVRD's external loans must be serviced out of this amount as well as imported components and commodities utilized in its mining and processing operations, the net balance is still appreciable.*

* Developed further in: Document of Inter-American Development Bank, CP/64/DP-21-Rev., October 28, 1964.

C. BENEFIT COST ANALYSIS

Espirito Santo is isolated electrically and will depend on its own power resources in or near the State for the foreseeable future. The most attractive power development is on the Doce River where Mascarenhas is the initial project in order of priorities. Eventually as the Doce River is developed, power will be exported to supplement requirements in Minas Gerais and to Bahia (after 1980).

Montreal Engineering, in its review of the feasibility study, explored all reasonable alternatives to the Mascarenhas Hydro Project. They examined the most logical ones in the event that Mascarenhas was not built.

One was a 120 Mw oil fired two-unit thermal plant at Vitoria. Including transmission losses and charges on Mascarenhas, the benefit-cost was 2.03.

Another and more likely possibility would be to obtain power from the Lower Grande System. This is the nearest major power source likely to be developed in the next decade and within reasonable transmission distance to Vitoria. Therefore, this source is the logical alternative to Mascarenhas.

Basis of Analysis

No average cost of power from the Lower Grande System has been developed. Due to interconnections with the Rio and Sao Paulo Systems, the fact that major components are under construction or just going into operation, average costs are not available. Therefore, for this analysis, a typical plant which is considered to be average was chosen and costs developed for it to represent system costs.

The South Central program indicates that during the period 1971-1975 when Mascarenhas would be in production, the 270 Mw Porto Colombia project on the Grande would also be commissioned and was chosen as representative of the average for the Lower Grande plants.

Plate No. 2 shows the Grande in relationship to Mascarenhas and Vitoria. There will be a transmission link by 1970 between the Lower Grande and Vitoria. It would be possible by strengthening the 230 Kv system between Belo Horizonte, Ipatinga and Mascarenhas to transmit demands equivalent to those to be met by Mascarenhas to Vitoria.

For purposes of this analysis, it is assumed transmission would start at Jaguara because of the high capability of interplant ties. The 230 Kv line from Belo Horizonte to Ipatinga would be shared and the 50 Mw section from Ipatinga to Mascarenhas would have to be strengthened. The estimated cost is that of the increment of line capacity, transformation, switching and compensation. The shared use of the lines from Jaguara through Belo Horizonte to Ipatinga would advance the date CEMIG would need the additional line construction.

Its cost has not been considered in the interest of simplifying the analysis. An agreement would be required with CEMIG and the advanced investment and the shared use should be compensated for. It is therefore possible the cost of transmission should be higher than used in this study.

Losses

For this comparative study, delivery of power is common to the high tension side of the Mascarenhas substation. Therefore, losses within the CCBFE system can be ignored. Losses for power delivered from the Lower Grande are taken as 14%.

Interest Charges

The interest rate used is 9% during construction and 10% per year after. Foreign exchange and local costs are treated equally. These rates find their bases in the CANABRA study for the South Central System. There is no reasonable guide or criteria that could be reliable for use for long-term investments in Brazil.

These rates grew out of detailed investigations by economists working with the CANABRA group and have been accepted by the steering committee and the GOB for this class of investment. While this rate may be somewhat arbitrary, it has precedence and is reasonable in an inflated economy.

Conclusion

The benefit-cost calculations are shown on Table No. 11. On this basis, the benefit-cost ratio is 1.48. Further by reference to Plate 2 it will be noted that Vitoria would be at the extreme end of a radial 138 Kv transmission line from Ipatinga which, in turn, would receive power from the Lower Grande. Total distance from Vitoria to Jaguara is over 800 Km largely under control of other power organizations. This would not be considered a sufficiently reliable source for the new industrial development in the Vitoria area.

The Doce River is in an area of CEMIG that is also weak in generation but where the metallurgical industry is rapidly developing. CEMIG is looking to the Doce River development for its future power supply in this area. In the meantime, with Mascarenhas operating on the 50 Mw tie with CEMIG it would improve conditions there. There are problems of Voltage regulation and stability which affect the quality of service. This is particularly true of the Usiminas steel plant with its large hot-strip rolling mill.

D. FINANCIAL CONSIDERATIONS

This section (1) analyzes the financial capability of CCBFE to meet its future debt service obligations, including a brief review of the Company's past operating results as well as a consideration of its future prospects; and (2) examines those factors which may materially affect its future profit position, i.e., rate legislation, depreciation policies, revaluation of assets, etc.

Estimated Capital Cost of CCBFE Investment Program

CCBFE investment program, including interest during construction, is summarized in the Table shown below:

	as million dollars		
	Local Costs	Foreign Exchange	Total
Mascarenhas Hydro Plant	21.6	10.3	31.9
Transmission and Distribution	9.5	3.0	12.5
Tie with CEMIG	4.6	-	4.6
	$35.7	$13.3	$49.0

A detailed breakdown of these amounts is provided in ANNEX III, Table 6.

Estimate of A.I.D. Financed Items

CCBFE originally requested A.I.D. financing in the amount of US$18 million for dollar and local costs associated with the Mascarenhas and Distribution projects. This proposal was rejected by A.I.D. due to the large local cost financing component envolved. The Company therefore recast the financing program, requesting an A.I.D. contribution of US$12 million. However, subsequent discussions with ELETROBRAS and CCBFE led to a request for an additional A.I.D. commitment. As a consequence of these discussions, the USAID agreed to propose an additional US$1.3 million of A.I.D. financing. This amount represents the imported components that will be necessary to be incorporated in locally fabricated equipment, as well as additional engineering services. It was agreed that these components would be financed under the Letter of Commitment procedure. In the absence of this additional financing, the likelihood is that these

components would be imported from Europe. At the same time, ELETROBRAS committed itself to finance the residual capital costs of the program, not financed by A.I.D.

The financial projections included in ANNEX III of this report were prepared on the basis of an anticipated A.I.D. commitment of US$12 million. The subsequent marginal change in the financing plan was not considered decisive enough to warrant alterations of these tables. It should be noted, however, that the increased A.I.D. contribution will result in a corresponding reduction in ELETROBRAS' commitment. Thus the Company's debt service requirements are lessened accordingly; the annual interest rate on the A.I.D. Loan of 5.5% is considerably less than ELETROBRAS' debt charges of 13%.

The Investment Schedule (ANNEX III - Table 6) presents a global plan for disbursements for the Mascarenhas project as well as other construction. According to this table, the total cost of these projects will be as follows:

INVESTMENT SCHEDULE
(US$1,000)

	1966	1967/71	Total
a) MASCARENHAS (Units 1 to 3)			
Direct	-	26,749	26,749
Interest		5,136	5,136
b) TRANSMISSION LINES			
Direct	4,474	2,797	7,271
Interest	283	396	679
c) SUBSTATIONS			
Direct	755	3,745	4,500
Interest	38	670	708
d) DISTRIBUTION			
Direct	737	2,868	3,605
e) FREQUENCY CONVERSION			
Direct	45	313	358
f) TOTAL	6,332	42,674	49,006

During the period of A.I.D. financing (1967-1971) the sources and proportions of long-term debt and equity contributions to total resources will be:

FINANCING PLAN (1967-1971)

		US$1,000		-%-
Loans:	A.I.D.	13,300		31
	ELETROBRAS	13,620		32
TOTAL			26,920	
Equity Share Capital:	ELETROBRAS	10,380		24
	CCBFE Profits & Other Cash Flows	5,374		13
TOTAL			15,754	
TOTAL RESOURCES AVAILABLE			$ 42,674	100%

The proposed financing scheme is in agreement with ELETROBRAS' basic policy of supplying resources to its subsidiaries in the proportion of 40% equity and 60% debt. The ELETROBRAS contributions to the project during the 1966-1970 period will be:

		US$1,000	-%-
Loans:	1966	2,000	
	1967/70	13,620	
TOTAL		15,620	60
Share Capital:	1967/70	10,380	40
Total ELETROBRAS Contributions		$26,000	100%

Past Operating Results

CCBFE operated for a number of years under unfavorable economic conditions, due to the fixing of rates on the basis of original cost, unadjusted for monetary corrections. This resulted in a continuous operating deficit and a deterioration of physical plant. This situation remained until the advent of a new government in April 1964, which subsequently instituted realistic rate policies. These are discussed briefly below.

Electric Utility Rates

The basic law governing utility rates is the "Waters Code" of 1934 which established the criteria of "service at cost" for determining rates. Subsequent decrees in 1957 and 1964 have implemented and to some extent revised the Code and are the basis for establishing tariffs and administration procedures. These decrees and the principal features are as follows:

1. Decree 41,019 of February 26, 1957, continued the service at cost concept (including 10% return on assets) of the Waters Code and provided for certain automatic adjustments in basic rates. These were to cover: (a) increases in wages, (b) increased annual cost of servicing foreign debts, (c) increases in cost of purchased power, and (d) increases in cost of fuel. The decree also limited the allowable depreciation rate to 5%, except for thermal plant installations for which 8% is allowed, and a 3% amortization or reversion charge. The reversion charge is for the purpose of providing funds to indemnify concessionaires for the reversion of assets and installations in service at the end of the concession.

2. Decree 54,636 of November 4, 1964, provided for annual monetary corrections of accounts for purposes of establishing utility rates. Gross utility plant and related depreciation reserves could be revalued and the consequent monetary increases would be reflected in (a) the allowance for depreciation and (b) the return on investment. The revaluation is done by applying official coefficients published by the National Economic Council (CNE).

3. Decree 54,937 of November 4, 1964, establishes a joint government-company commission for each concessionaire to undertake a survey and appraisal of plant in service to update historical cost.

In general, rates are established on the basis of cost of service plus a maximum of 10% return on investment (defined as net utility plant plus certain working capital accounts). Components of the cost of service are:

(a) Salaries, social legislation charges;

(b) Operation costs, materials, supplies, fuel, purchased power;

(c) Foreign debt service, interest and principal at prevailing exchange rates;

(d) Changes arising from monetary corrections of investment;

(e) Depreciation on depreciable plant, 8% p.a. maximum on thermal plant, and 5% p.a. on hydroelectric facilities;

(f) Reversion 3% p.a.

Rates are to be set each three years based on the value of plant at the start of each three-year period. In the intervening years, rates are adjusted through surcharges to cover (a) variations in cost of fuel and purchased power, (b) increases in costs of wages and social legislation charges, (c) increases in debt service of foreign debt, and (d) increases in the return on investment, depreciation allowance and amortization allowance from monetary corrections.

Past Operating Deficits

The operating deficits shown below reflect the financial strain the Company experienced until tariff reform was instituted in November 1964. The sizeable deficit reduction which took place between 1964 and 1965, illustrates the favorable impact of the new tariffs and monetary corrections on CCBFE's operations. Between 1964 and 1965 the Company reduced its annual deficit from approximately $450,000 (equivalent) to about $50,000 (equivalent).

Year	Net Operating Deficits (Cr$1,000)	
	Cr $: Actual	Cr $: Adjusted *
1961	48,870	367,507
1962	160,725	781,126
1963	308,962	682,806
1964	701,633	891,074
1965	99,375	99,375

* Adjusted on basis of 1965 revaluation index published by: The National Economic Council.

The average rate charged per kilowatt hour during the 1961-1965 period was as follows:

Year	Average Tariff (Cr$/Kwh)
1961	3.545
1962	4.344
1963	8.774
1964	22.750
1965	38.757

As indicated above, the first increase in rates was allowed in 1964. In 1965, the Company applied for and obtained a new basic rate, reflecting monetarily corrected assets as per the CNE index for the period ending December 31, 1963, published in early 1964. That is, the Company was one full year behind in applying monetary correction to its assets and its rates. The new rates were applied to July billings of that year.

In 1966, CCBFE applied for and was granted a third adjustment in rates, based on corrected assets as per the CNE index for 1964, published in February 1965. The new rates will be reflected in July billings of this year. In September 1966, the Company will apply for a fourth rate adjustment on the basis of monetarily corrected assets reflecting the CNE index for 1965 which came out in February 1966. It is anticipated that this adjustment will be applied to November 1966 billings. At that time the Company's rate structure will be up to date with respect to monetary corrections.

Balance Sheets

Following is the Company's adjusted balance sheet for the year ending December 31, 1965. Its fixed assets reflect the monetary correction made in April 1966, on the basis of GOB indices published in that month for 1965. As shown below, the Company was in a reasonably sound financial position at the close of 1965. The current ratio was 1.5 and the ratio of debt to equity was 1.85.

CCBFE - Adjusted Balance Sheet (December 31, 1965)*

Assets	
1. Current & other Assets	$1,227
2. Investments	8
3. Capital Assets	
a) Fixed Assets	4,625
b) Construction in Progress	548
4. Gross Assets (1+2+3)	6,408
5. Accumulated Provision for Depreciation	(743)
6. Total Assets (4-5)	$5,665
Liabilities	
1. Current and other Liabilities	$ 799
2. Long-term Debt	3,191
3. Capital Stock	1,827
4. Reserves	52
5. Surplus or Deficit	(204)
6. Total Liabilities & Capital	$5,665

* Converted at Official Rate: US$ =Cr$2,220

Projected Financial Operating Results

It should be readily apparent from the preceding analysis that CCBFE's future earning power will not be contingent on its past operating condition. A substantial change in the structure and size of CCBFE's capitalization can be expected in the future, reflecting continuing monetary corrections of assets, rate alterations, increases in capital stock and long-term borrowing. Below is a comparison of the relationship of debt and equity for 1965 with that of 1975 reflecting these changes:

Comparison of Capitalization Structures: 1965, 1975

	1965 (millions)	%	1975 (millions)	%
Long-Term Debt	$3,191	65	$19,077	50
Capital Stock and Surplus or Deficit	1,675	35	18,941	50
	$4,866	100	$38,018	100

In order to implement successfully its planned expansion program, the Company must be assured of a continuation of realistic rate policies on the part of the GOB, as well as a favorable load growth in its operating area. The GOB has consistently stated its intent to continue the current, and realistic, rate-making policies. However, some changes in the Company's tariffs can be expected:

(1) As indicated in the previous section, utility companies are allowed the option of a 3% amortization or reversion charge of their monetarily corrected plant. The original purpose of this decree was to provide funds to indemnify concessionaires for the reversion of assets and installations in service at the end of the concession. By definition, this charge should not be utilized by CCBFE, a public company. However, it has been used to date, to build up the Company's rates. It is not unlikely that CCBFE may be forced to drop it in the future.

(2) Legislation was recently presented to the Brazilian Congress for their approval which would reduce the "Imposto Unico" and the "Emprestimo Compulsorio" by 50%. These are charges to consumers' bills; the first is a utility tax and the other represents a compulsory purchase of ELETROBRAS shares. Assuming eventual approval of this law, individual customer billings may be reduced by as much as 10-1/2 cruzeiros/Kwh, or approximately 15% of the value of the average tariff charged in the Vitoria area. However, this will not effect revenues of the Company which are determined independently of the "Imposto Unico."

(3) There is a long-overdue change in the structure of the basic rate currently under study. To date, the rate structure has been more or less computed on a linear basis; in other words, all classifications of customers have paid relatively the same basic rate. It is anticipated that the new structure will result in higher residential, commercial, and public service rates, and lower industrial rates. The initial effect of these changes on CCBFE's earnings should be negligible.

Basis for the Projections:

Projections of Profit and Loss, Cash Flows and Balance Sheets are contained in Tables 1, 2 and 3 of the Annex. Tables 4 and 5 summarize the calculations used in the projections of the utility rates and total revenue.

As shown in Table 4, the asset base used in the rate calculations is composed of construction completed and installed, plus working capital, less depreciation and amortization charged in previous years. The annual charges for return on investment, depreciation, and amortization are calculated from this asset base.

The effect of these asset calculations on the unit sales price that can be charged by the Company is shown in Table 5. In accordance with Brazilian rate legislation, the Company will be able to recoup in revenues:

(a) the depreciation and amortization (5% and 3% respectively);

(b) a return on investment of 10% of the asset base; and

(c) operating and maintenance costs including cost of fuel oil and the cost of electric power purchased from other companies.

The total revenues the Company is thereby entitled to charge is summarized on line 4 of Table 5. These total revenues are then divided by projected sales volume (in kilowatt hours) to arrive at an average unit price or rate. In accordance with Brazilian rate legislation, these individual annual tariff rates are averaged over three-year intervals as shown in line 7 of Table 5. This analysis then, serves as the basis of the Profit and Loss Statement.

ANALYSIS OF PROFIT AND LOSS STATEMENTS (Table I)

The profit and loss projections are summarized in Table I of the Financial Review. As can be seen from the revenue projections, gross revenue from sales (line A-3) increases steadily during the life of the project, from a level of $2.4 million in 1966 to a level of $9.8 million in 1970. This indicated growth in sales prior to the completion of the Mascarenhas plant in 1971, is largely attributable to power purchases from the CEMIG system. After 1971, revenues continue at roughly a $10 million level, as the generating capacity of Mascarenhas is realized. Operation expenses increase to a high of about $6.4 million in 1970, largely due to an expansion of the cost and volume of purchased power. Thereafter, the cost of purchased power is reduced as Mascarenhas' new facilities come on stream. However, fixed charges of depreciation and amortization on the new plant double in 1971 over the 1970 level, maintaining total production costs (line D of Table I) at roughly the $6 to $7 million level.

The degree of profitability of the Company is shown below for the 1971-1976 period, when the Mascarenhas plant facilities will be in operation. The declines indicated in 1973 and 1976 reflect a downward adjustment of the Company's unit sales price in thos years.

	Net Profit as % of Total Assets	Net Profit as % of Net Worth
1971	3.1	8.6
1972	3.0	7.8
1973	1.9	4.8
1974	3.5	7.9
1975	5.2	10.8
1976	3.7	7.2

See footnote on following page.

Footnote:

The Statement of Operations (projection of profit and loss in Table I) is somewhat distorted by the treatment of capitalized interest during the construction period. In fact, the Company plans to capitalize interest on the new construction and recoup that interest through its return on investment and depreciation after 1971 when the plant is on stream. However, the operating statements in Table I include interest on construction in the total interest charge on line F. In order to obtain a true picture of earnings prior to Macarenhas' going on stream (1971), the projections add back the capitalized interest into "Other Income" (line A-4 of Table I). Thus, the "Net Profit or Loss before Interest" (line E) is overstated by the amount of the capitalized interest during construction. However, the "Net Profit or Loss after Interest" (line G) has netted out the effect of capitalized interest, and is a true estimate of net revenues during the period prior to 1971.

ANALYSIS OF CASH FLOW STATEMENTS (Table II)

The cash flow statements appear in Table II of the Financial Annex, showing the total cash budget for the Company's construction program. As indicated on line 17, the Company can undertake the planned construction program, and maintain a relatively level cash balance at the end of each year. However, a more relevant consideration is the Borrower's ability to service the A.I.D. and ELETROBRAS loans. Is the projected level of revenues stemming from the Company's expansion program sufficient to meet the debt service requirements indicated in Table II? The following abbreviated cash flow analysis will summarize this relationship.

SOURCES OF FUNDS (1971 - 1976)
(U.S.$1,000)

	1971	1972	1973	1974	1975	1976
Net Profit Before Interest	4,744	4,329	3,478	3,754	4,093	3,161
Depreciation and Amortization	4,001	4,453	4,541	4,659	4,763	4,875
Total	8,745	8,782	8,019	8,413	8,856	8,036
Less Income Tax	80	225	208	125	213	307
	8,665	8,557	7,811	8,288	8,643	7,729

USES OF FUNDS (1971 - 1976)
(U.S.$1,000)

	1971	1972	1973	1974	1975	1976
Debt Service						
-Amortization of Principal[a]	2,709	2,709	2,709	2,709	2,382	2,382
-Payment of Interest	3,242	2,944	2,639	2,334	2,046	1,784
Total Debt Service Requirements	5,951	5,653	5,348	5,043	4,428	4,166

CASH FLOW BEFORE INTEREST AFTER TAX: ÷ DEBT SERVICE

1.5	1.5	1.5	1.6	1.9	1.9

a/ Including A.I.D., ELETROBRAS, Eximbank loans.

As shown in the above analysis, the debt is adequately covered during the period. The ratios of cash flow before interest and after tax to total debt service range from 1.5 (during 1971-73) to 1.9 in 1976. As was previously noted, however, the depreciation and amortization allowances included in the above cash flow are quite high for normal utility company operations and, perhaps in the future, they may be cut back by a revised electric utility regulation. However, the above debt coverage suggests that the debt service is adequately covered, even with the reduced cash flow from lower levels of amortization and depreciation. For example, the cash flow from depreciation and amortization could be halved and debt could still be serviced.

E. IMPLEMENTATION

Schedule

A tentative schedule for the major items in the Project are shown on Plate #6. The Project has slipped about 8 months; therefore, this schedule should show the first item "Bids and Contracts" beginning in first quarter of 1967 instead of second quarter of 1966. All other items should be displaced accordingly.

Because the third unit will be contracted simultaniously with unit one and two, this item together with the last two items can be moved up about eight months. This should result in a complete project including the unit in the fourth quarter of 1970.

The transmission, distribution and frequency conversion will be scheduled to coordinate with completion of Mascarenhas. Some frequency conversion will be required in fourth quarter of 1966 to utilize the CEMIG power delivered over the 50 MW tie now under construction.

Urgency

There is some urgency in getting the Project underway as soon as possible. Initial river diversion must be coordinated with flood stage in the river in January. The construction contractor therefore must be mobiled sufficiently to effect diversion in December 1966 or about 6 months construction time will be lost.

Present Status of Project

Except for work relating to access and field investigation and surveys, no construction has been started. Also no engineering, equipment or other contractual committments have been made.

Project Management and Engineering

CCBFE will be responsible for carrying out the Project under the general supervision of CAEEB who are also responsible for AID financed Peixoto project. The implementations of this

project will be similar to Peixoto.

A comprehensive engineering contract will be let, probably to a joint venture of USA and Brazilian firm or a USA firm with a Brazilian subsidiary. The scope of these services will include project design, procurement, inspection and construction management of the Hydro Electric plant. Technical assistance, design review, inspection and fiscalization will be provided for the transmission and distribution system.

Construction

Construction will be performed by qualified Brazilian construction contractors under the engineers general supervision and management. Quality of Brazilian construction contractors are adequite but not outstanding. However, they will be performing under the direct supervision of the engineer. Also major construction equipment will be provided by the owner. Both the latter being financed under this proposed loan. In effect, the local contractor will be providing the skilled, semiskilled and common labor for the project.

An alternative to this may be a large USA contractor in joint venture with a Brazilian contractor or a Brazilian subsidiary, who would both manage and do the construction. The dollar portion would be financed from this loan and would be taken from the field supervision and management part of the Engineering cost item.

The choice of methods should have no effect on cost estimates and will be settled when the implementation plan (one of the conditions precedent) is approved. The transmission and distribution construction will be performed by contractors and by force account. None of the construction is to be financed from this proposed loan. This work has to be coordinated with system requirement.

Procurement

Imports are subject to the limitations established by Brazil's Federal Law No. 3244 of August 14, 1957 designed to

protect local industry. This law commonly known as the "Law of Equivalence" or "Law of Similars" forbids the importation of products which:

-- are manufactured in Brazil and are of equivalent quality.
-- can be delivered within the time schedule required by the project.

This law is administered by CACEX who authorize import licenses. Because Brazilian industry has a growing capability in the production of power equipment and power project procurement extends over several years, it is impossible to predict what may or may not be imported. CACEX depends to a major extent on advice of Brazilian industry concerning its' capability to delivery and meet quality standards.

USAID has had discussions with representatives of the heavy electric and power equipment manufacturers in Brazil. They are aware of the problems faced by foreign lending institutions such as AID. Where assistance is provided by foreign financing in the public sector, they state that if Brazilian industry gets a 60-40 or nearest equivalent split, they will not oppose the imports through CACEX.

In the case of this loan if one of the turbine-generator units, with related circuit breakers and power transformers were left to the Brazilian industry, they would not oppose the importation of the other two unit from the U.S. Therefore, the project has been set up on this basis.

It is the intent of USAID to require a formalization of this agreement as a Condition Precedent prior to disbursement from the loan for any procurement.

Indirect Procurement

The equipment of Brazilian origin would be financed by GOB resources except for some "indirect purchases". These indirect purchases are the components and material that the

Brazilian manufacturer must import for his product. These would include such items as silicon steel and copper for generators and transformers, governors and large forgings for the turbines. Where these are obtained from the USA., loan funds would be used to provide the foreign exchange needed.

One of the advantages of including these indirect purchases as part of the AID loan is that the Brazilian supplier could be "encouraged" to modify designs of auxiliaries and their operating set up to match the U.S. equipment. Thus a better operating plant could be provided.

Construction Material and Labor

At the project site and adjacent areas, there is an abundance of a variety of gneisses which are excellent for preparing concrete or for rock filling. Some quarries were started nearby during construction of the railroad.

Sand for mixing concrete may be obtained in sufficient quantities from the river bed. These are silt and clay soils in the area for dykes and coffer dams.

Skilled labor has to be recruited in other parts of the country. Some unskilled labor is in the area but most will have to be attracted from further away. Some labor may be recruited from other jobs as they are completed such as the Tubarao harbor works near Vitoria.

Copper

The project includes about 250T of copper estimated to cost $630,000. Most of this is for conductor for the distribution systems. Before USAID authorizes financing this copper, the borrower will be required to investigate to the satisfaction of USAID the possibility of substituting aluminum. Only such copper for which there is no reasonable substitution will be authorized.

SECTION IV - REPAYMENT CAPACITY

See Financial Analysis

SECTION V - IMPACT ON U. S. ECONOMY

The impact on the U. S. economy is clearly favorable. Equipment and services in the amount of $11.8 million will be procured directly from the U.S. by the company. Additionally, $1.5 million will be spent in the United States by Brazilian fabricators of equipment. Without this loan, it is likely that the necessary imported components for locally fabricated equipment would be procured from Europe.

SECTION VI - ISSUES

None

CHECK LIST OF STATUTORY CRITERIA (ALLIANCE FOR PROGRESS)

(FAA - Foreign Assistance Act of 1961, as amended by the Foreign Assistance Act of 1965.)
(App.- Foreign Assistance and Related Agencies Appropriations Act, 1966.)

1. FAA Section 102. **Precautions that have been or are being taken to assure that loan proceeds are not diverted to short-term emergency purposes (such as budgetary, balance of payments, or military purposes) or any other purpose not essential to the country's long-range economic development.**

Adequate control will be exercised to assure that loan proceeds are not diverted to short-term emergency purposes (such as budgetary, balance of payments, or military purposes) or any other purpose not essential to the country's long-range economic development. US AID personnel will approve all requests for opening letters of commitment and will assure that funds are disbursed only for goods and services needed for the project.

2. FAA Section 102. **Information on measures taken to utilize United States Government excess personal property in lieu of the procurement of new items.**

Equipment to be procured for this project is with the exception of construction equipment, custom made. In view of the size and scope of the construction job it is unlikely that excess equipment will be adequate. However, the Borrower and his consulting engineer will be required to determine whether excess property can be used.

3. FAA Section 102. **Information whether the country permits, or fails to take adequate measures to prevent, the damage or destruction by mob action of United States property.**

The Government of Brazil does not permit, and takes adequate measures to prevent, the damage or destruction by mob action of U.S. property.

4. **FAA Section 201(d). Information and conclusion on legality (under laws of country and United States) and reasonableness of lending and relending terms of the loan.**

The proposed loan is consistent with the laws of Brazil and the United States and the terms are considered reasonable by both the Borrower and A.I.D.

5. **FAA Section 251(a). Manner in which loan will promote country's economic development and contribute to the welfare of its people.**

This loan will promote Brazil's economic development and contribute to the welfare of its people. (See Section I and Section III)

6. **FAA Section 251(b)(1). Extent to which country is adhering to the principles of the Act of Bogota and Charter of Punta del Este and is showing a responsiveness to the vital economic, political, and social concerns of its people, and extent to which country has demonstrated a clear determination to take effective self-help measures.**

Account has been taken of Brazil's adherence to the principles of the Act of Bogota and the Charter of Punta del Este, and the Borrower's responsiveness to the vital economic, political and social concerns ot its people. A full report of Brazil's efforts to comply with both the Act of Bogota and the Charter of Punta del Este is set forth in the 1966 Country Program submission.

7. **FAA Section 251(b)(2). Information and conclusion on activity's economic and technical soundness.**

This activity has been found economically and technically sound. (Section III)

8. **FAA Section 251(b)(3). Information and conclusion on activity's relationship to and consistency with other development activities, and its contribution to realizable long-range objectives.**

(See Section I)

9. **FAA Section 251(b)(4). Information and conclusion on possible effects on U. S. economy, with special reference to areas of substantial labor surplus.**

The loan will finance procurement in the U.S., and thus will have positive effects on the U.S. economy. See Section IV.

10. **FAA Section 251(b). Information and conclusion on availability of financing from other Free World sources, including private sources within the United States.**

Export-Import Bank, the IDB and the IBRD have stated that they are not interested in financing this project.

11. **FAA Section 251(b). Information and conclusion on capacity of the country to repay the loan.**

It appears reasonably certain that the Borrower will be capable of repaying the loan. (Section III-D)

12. **FAA Section 251(b). Information and conclusion on country's efforts to repatriate capital invested in other countries by its own citizens.**

Brazil's policies are directed toward this end.

13. **FAA Section 251(b). Information and conclusion on reasonable prospects of repayment.**

It appears reasonably certain that the Borrower will have the capacity to repay the loan. (See Section III-C)

14. FAA Section 251(e). **Information and conclusion on availability of an application together with sufficient information and assurances to indicate reasonably that funds will be used in an economically and technically sound manner.**

The Borrower has made a formal application for loan-funded assistance in this activity. The Borrower has supplied in the form of a feasibility study, prepared by competent engineers, sufficient information and assurances to demonstrate that the funds will be used in an economically and technically sound manner.

15. FAA Section 251(g). **Information and conclusion on use of loan to assist in promoting the cooperative movement in Latin America.**

Not applicable.

16. FAA Section 252(a). **Total amount of money under loan which is going directly to private enterprise, is going to intermediate credit institutions or other borrowers for use by private enterprise, is being used to finance imports from private sources, or is otherwise being used to finance procurements from private sources.**

All goods and services financed under the loan will be procured from private U.S. sources.

17. FAA Section 601(a). **Information and conclusions whether loan will encourage efforts of the country to: (a) increase the flow of international trade; (b) foster private initiative and competition; (c) encourage development and use of cooperatives, credit unions, and savings and loan associations; (d) discourage monopolistic practices; (e) improve technical efficiency of industry, agriculture, and commerce; and (f) strengthen free labor unions.**

The project will provide necessary electric power to faster industrial growth and improve the technical efficiency of industry and commerce (see Section I).

18. FAA Section 601(b). Information and conclusion on how the loan will encourage U. S. private trade and investment abroad and how it will encourage private U. S. participation in foreign assistance programs (including U. S. private trade channels and the services of U. S. private enterprise).

All goods and services financed under the loan will be procured in the U.S. from private sources.

19. FAA Section 601(d). Conclusion and supporting information on compliance with the Congressional policy that engineering and professional services of U. S. firms and their affiliates are to be used in connection with capital projects to the maximum extent consistent with the national interest.

A United States engineering firm will be engaged in joint venture with a Brazilian firm to provide engineering services for the project.

20. FAA Section 602. Information and conclusions whether loan will permit American small business to participate equitably in the furnishing of goods and services financed by it.

As all procurement will be U.S., all procurement will be advertised in the A.I.D. small business circular.

21. FAA Section 604(a), App. Section 108. Compliance with restriction of commodity procurement to United States except as otherwise determined by the President and subject to statutory reporting requirements.

All materials, and services financed under the loan shall be procured from the United States.

22. FAA Section 604(b). **Compliance with bulk commodity procurement restriction to prices no higher than the market price prevailing in the United States at time of purchase.**

No bulk commodity procurement is contemplated under this loan.

23. FAA Section 604(d). **Compliance with requirement that marine insurance be purchased on commodities if the host country discriminates, and that such insurance be placed in the United States.** Loan funds will be made available for marine insurance on commodities shipped when such insurance is placed on a competitive basis as specified in this Section of the Act. In the event that Brazil discriminates against any U.S. marine insurance company, it will be required that insurance be placed with a U.S. company, as required by this Section.

24. FAA Section 611(a)(1). **Information and conclusion on availability of engineering, financial, and other plans necessary to carry out the assistance and of a reasonably firm estimate of the cost of the assistance to the United States.**
Necessary technical and financial plans have been completed, and a reasonably firm estimate of the cost to the United States of the activity to be financed has been attained. (See Section III-A)

25. FAA Section 611(a)(2). **Necessary legislative action required within recipient country and basis for reasonable anticipation such action will be completed in time to permit orderly accomplishment of purposes of loan.**

Legislative action is not required.

26. FAA Section 611(b), App. Section 101. **If water or water-related land resource construction project or program, information and conclusion on benefit-cost computation.**

(See Section III-C)

27. FAA Section 611(c). Compliance with requirement that contracts for construction be let on competitive basis to maximum extent practicable.

Construction contracts will not be financed under the Loan.

28. FAA Sections 612(b) and 636(h). Appropriate steps that have been taken to assure that, to the maximum extent possible, the country is contributing local currencies to meet the cost of contractual and other services and foreign currencies owned by the United States are utilized to meet the cost of contractual and other services.

The Loan is for U.S. dollar costs only. All local currency costs are being borne by local contributions.

29. FAA Section 619. Compliance with requirement that assistance to newly independent countries be furnished through multilateral organizations or plans to maximum extent appropriate.

See Item No. 10 above.

30. FAA Section 620(a), App. Section 107(a). Compliance with prohibitions against assistance to Cuba and any country (a) which furnishes assistance to Cuba or failed to take appropriate steps by February 14, 1964, to prevent ships or aircraft under its registry from carrying equipment, materials, or supplies from or to Cuba; or (b) which sells, furnishes or permits any ships under its registry from carrying items of primary strategic significance, or items of economic assistance to Cuba.

No assistance will be furnished under this loan to the present Government of Cuba, nor does Brazil furnish assistance to the present Government of Cuba. Brazil has taken appropriate steps to prevent ships or aircraft under its registry from engaging in any Cuba trade.

31. FAA Section 620(b). If assistance to the government of a country, existence of determination it is not controlled by the international Communist movement.

The Secretary of State has determined that Brazil is not controlled by the international communist movement.

32. FAA Section 620(c). If assistance to the government of a country, existence of indebtedness to a U. S. citizen for goods or services furnished or ordered where such citizen has exhausted available legal remedies or where the debt is not denied or contested by such government or the indebtedness arises under an unconditional guaranty given by such government.

Brazil is not known to be indebted to any U.S. citizen for goods or services furnished or ordered where such a citizen has exhausted available legal remedies or where the debt is not denied or contested by the Borrower or the indebtedness arises under an unconditional guaranty of payment by the Borrower.

33. FAA Section 620(d). If assistance for any productive enterprise which will compete in the United States with U. S. enterprise, existence of agreement by the recipient country to prevent export to the United States of more than 20% of the enterprise's annual production during the life of the loan.

NOT APPLICABLE.

34. FAA Section 620(e)(1). If assistance to the government of a country, extent to which it (including government agencies or sub-divisions) has, after January 1, 1962, taken steps to repudiate or nullify contracts or taken any action which has the effect of nationalizing, expropriating, or otherwise seizing ownership or control of property of U. S. citizens or entities beneficially owned by them without taking appropriate steps to discharge its obligations. Neither the Government of Brazil nor any governmental agency or subdivision thereof has, on or after January 1, 1962, nationalized, expropriated, or seized ownership or control of property of any U.S. citizen or firm, taken steps to repudiate or nullify contracts with such citizens or firms, or imposed or enforced discriminatory taxation or other exactions or restrictive conditions, or taken other actions having the effect of nationalizing, expropriating or otherwise seizing ownership or control of peoperty owned by U.S.citizens or firms, as specified in this section of the Act, without taking appropriate steps to discharge its obligations, as specified in this section of the Act.

35. FAA Section 620(f); App. Section 109. Compliance with prohibitions against assistance to any Communist country.

Assistance provided under this loan will not be furnished to any Communist country.

36. FAA Section 620(g). Compliance with prohibition against use of assistance to compensate owners for expropriated or nationalized property.

Assistance provided by this loan will not be used to compensate for expropriated or nationalized property.

37. FAA Section 620(h). Compliance with regulations and procedures adopted to insure against use of assistance in a manner which, contrary to the best interest of the United States, promotes or assists the foreign aid projects or activities of the Communist-bloc countries.

Assistance provided by this loan will not be used in a manner which, contrary to the best interests of the U.S., promotes or assists the foreign aid projects or activities of the Communist-bloc countries.

38. FAA Section 620(i). Existence of determination that the country is engaging in or preparing for aggressive military efforts.

The President has not determined that Brazil is engaging in or preparing for aggressive military efforts.

39. FAA Section 620(k). If construction of productive enterprise where aggregate value of assistance to be furnished by United States will exceed $100 million, identification of statutory authority.

NOT APPLICABLE.

40. FAA Section 620(l). Compliance with prohibition against assistance after December 31, 1966, for the government of a country which fails to institute investment guaranty program.

Brazil has signed and instituted such an agreement.

41. FAA Section 620(n); App. 107(b). Compliance with prohibition against assistance to countries which traffic or permit trafficking with North Vietnam.

The Host Country does not traffic or knowingly permit trafficking with North Vietnam.

42. FAA Section 620(o). If country has seized, or imposed any penalty or sanction against, any U. S. fishing vessel on account of its fishing activities in international waters, information on the consideration which has been given to excluding the country from assistance.

Brazil has not seized or imposed any penalty or sanction against any U. S. fishing vessel in international waters.

43. FAA Section 621. Information and conclusion on how the loan in providing technical assistance will utilize to the fullest extent practicable goods and professional and other services from private enterprise on a contract basis. If the facilities of other Federal agencies will be utilized, information and conclusion on whether they are particularly suitable, are not competitive with private enterprise, and can be made available without undue interference with domestic programs.

Engineering services and technical assistance provided under the Loan will be procured from private enterprise.

44. App. (Section Unnumbered). Use of funds to carry out FAA Section 205, which pertains to IDA.

Funds will not be so used.

45. App. Section 102. Compliance with requirement that payments in excess of $25,000 for architectural and engineering services on any one project be reported to Congress.

Payments in excess of $25,000 for engineering services on this project will be reported to Congress pursuant to the requirement of this section.

46. App. Section 104. Compliance with bar against funds to pay pensions, etc., for military personnel.

Funds obligated by the loan will not be used to pay pensions, annuities, etc. as prohibited in this Section.

47. App. Section 106. If country attempts to create distinctions because of their race or religion among Americans in granting personal or commercial access or other rights otherwise available to U. S. citizens generally, application which will be made in negotiations of contrary principles as expressed by Congress.

No attempts by the Host Government to create distinctions because of race or religion among Americans in granting personal or commercial access or other rights otherwise available to U.S. citizens generaly are known. If the Host Government attempts to create such distinctions, application will be made in negotiations of contrary principles as expressed by Congress.

48. App. Section 111. Compliance with existing requirements for security clearance of personnel.
Not applicable.

49. App. Section 112. Compliance with requirement for approval of contractors and contract terms for capital projects.

Firms which provide engineering and procurement services financed by the loan for the project, and the terms of their contracts, shall be approved by A.I.D.

50. App. Section 114. Compliance with bar against use of funds to pay assessments, etc., of U.N. member.
Loan funds will not be used to make any payment to U.N. Member.

51. App. Section 115. Compliance with regulations on employment of U.S. and local personnel for funds obligated after April 30, 1964, (Regulation 7).

Not applicable.

52. App. Section 401. Compliance with bar against use of funds for publicity or propaganda purposes within United States not heretofore authorized by Congress.

Loan funds will not be used for publicity or propaganda purposes within the United States.

ANNEX II

PLATES:

1.) Location Map

2.) South Central Brazil: Transmission Lines

3.) Flow, Head and Power Duration Curves

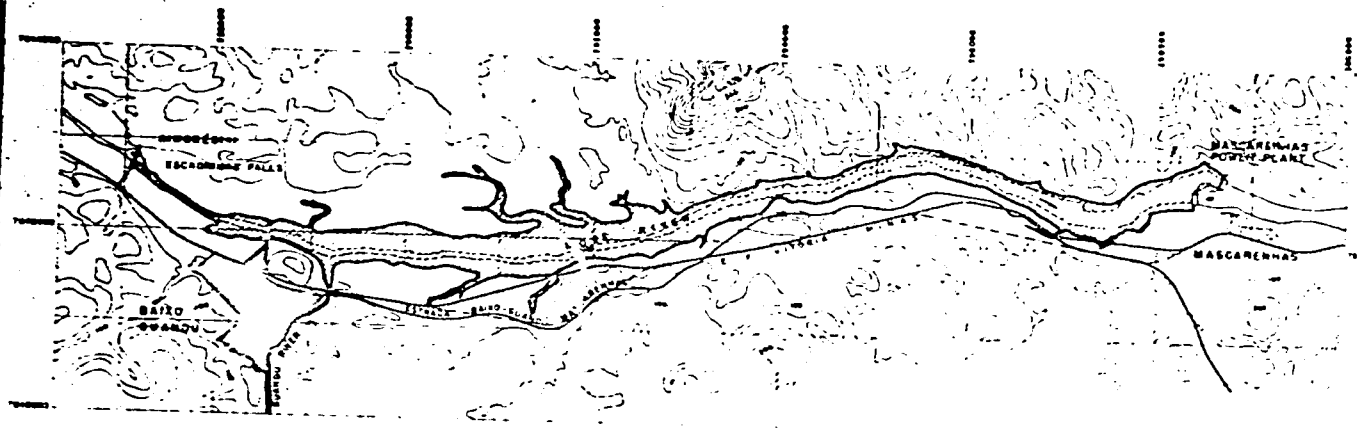
4.) General Arrangement of Project

5.) Dam and Power House

6.) Construction Schedule

7.) Espirito Santo Transmission Systems

8.) Transmission and Distribution Schedule

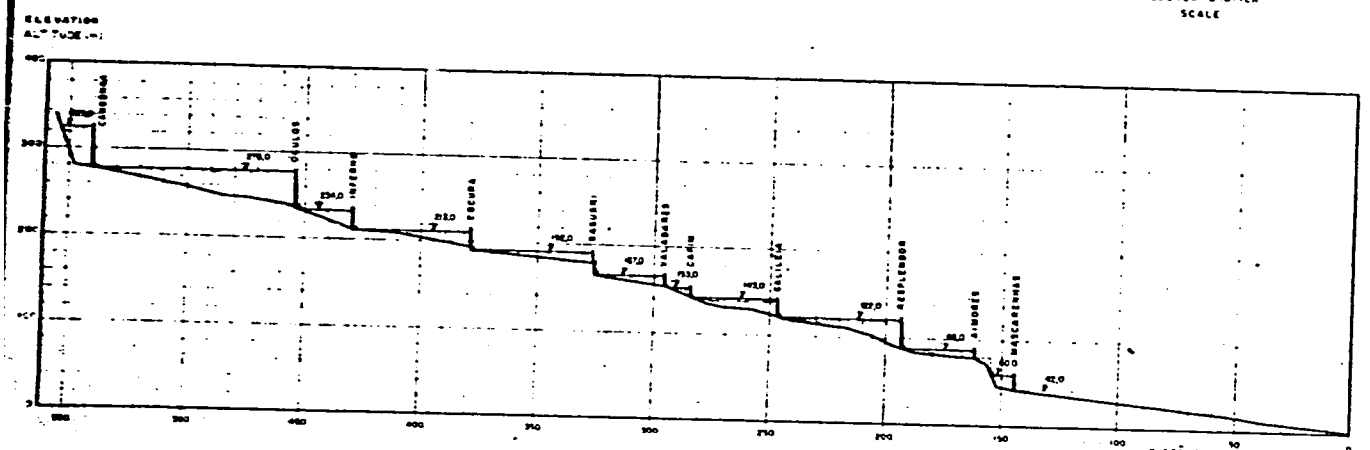


ÁREA DO REMANSO

HEADPOND AREA

ESCALA GRÁFICA

SCALE



PERFIL ESQUEMÁTICO DO RIO DOCE

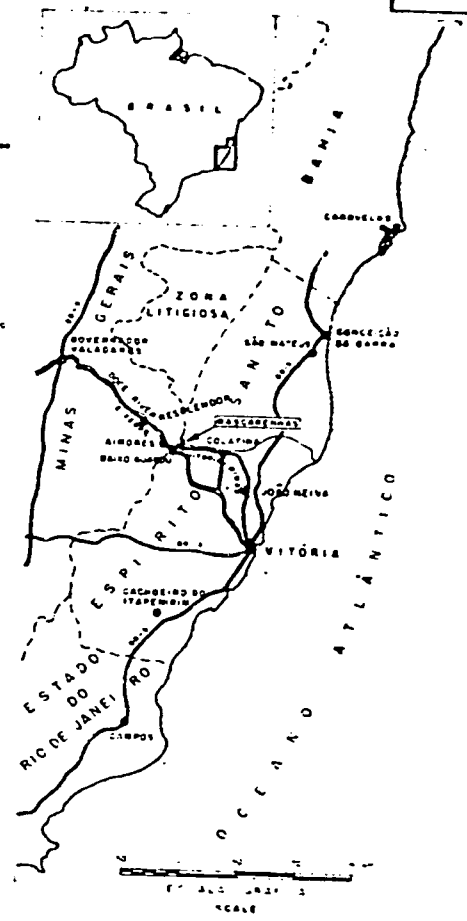
SCHEMATIC PROFILE OF DOCE RIVER

(COMITÉ ENERGÉTICO DA REGIÃO CENTRO-SUL)

REFERENCE DRAWING

DESENHO DE REFERÊNCIA

5047-RE Al 9660 - BARRAGEM E USINA



CIA. CENTRAL BRASILEIRA DE FÔRÇA ELÉTRICA

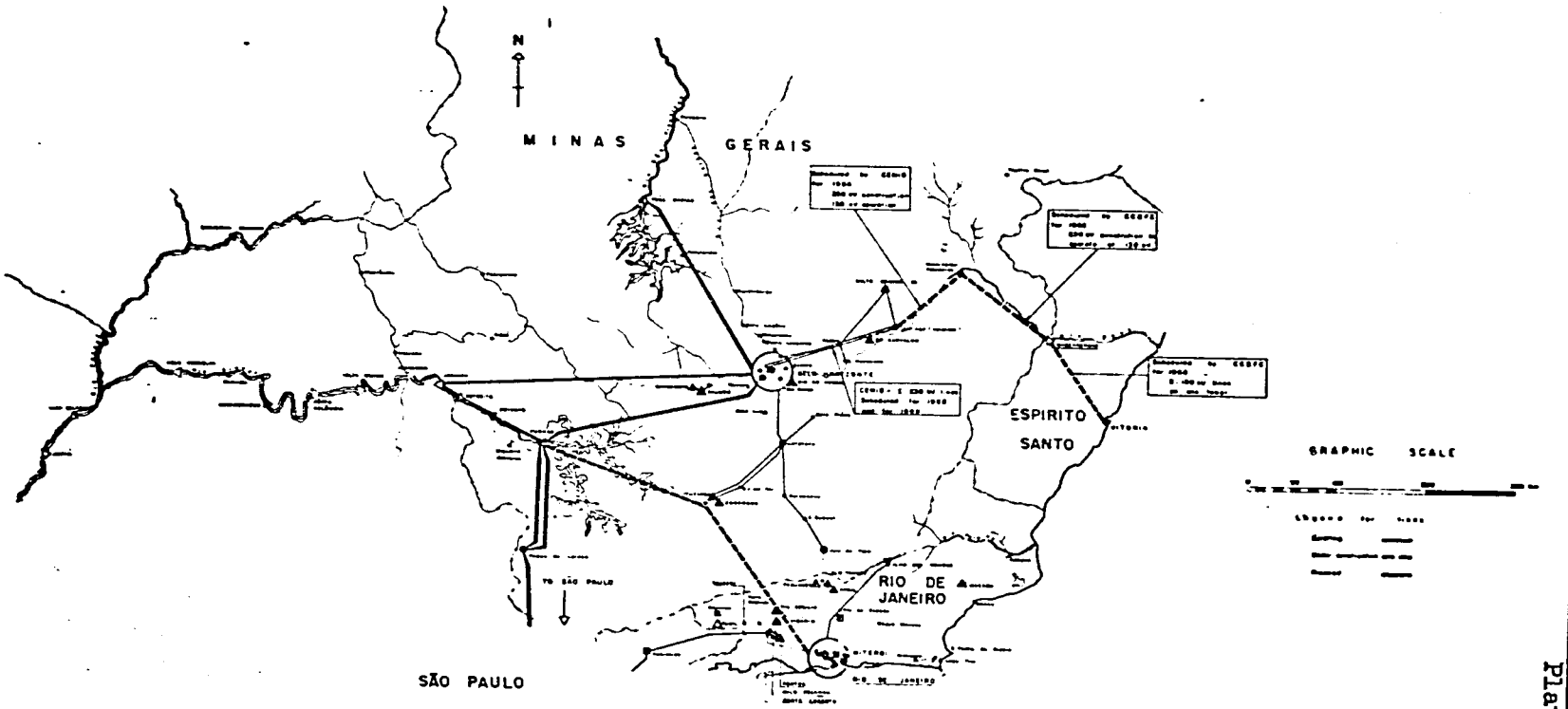
APROVEITAMENTO HIDRELÉTRICO DO RIO DOCE EM MASCARENHAS

MAPAS DE LOCALIZAÇÃO

LOCATION MAPS

VISTO	SERVIX ENGENHARIA S.A. RIO DE JANEIRO - SÃO PAULO	DATA
APROV.	DESENH.	ESC.
DATA	DES.	5066 01 Al 9659

UNCLASSIFIED
ANNEX II, Plate 1



CIA CENTRAL BRASILEIRA DE FÔRCA ELÉTRICA

APROVEITAMENTO HIDRELETRICO DO RIO DOCE EM MASCARENHAS

SOUTH CENTRAL BRAZIL — TRANSMISSION LINES IN RELATION TO ESPIRITO SANTO

SERVIÇO ENGENHARIA S.A. RIO DE JANEIRO — SÃO PAULO

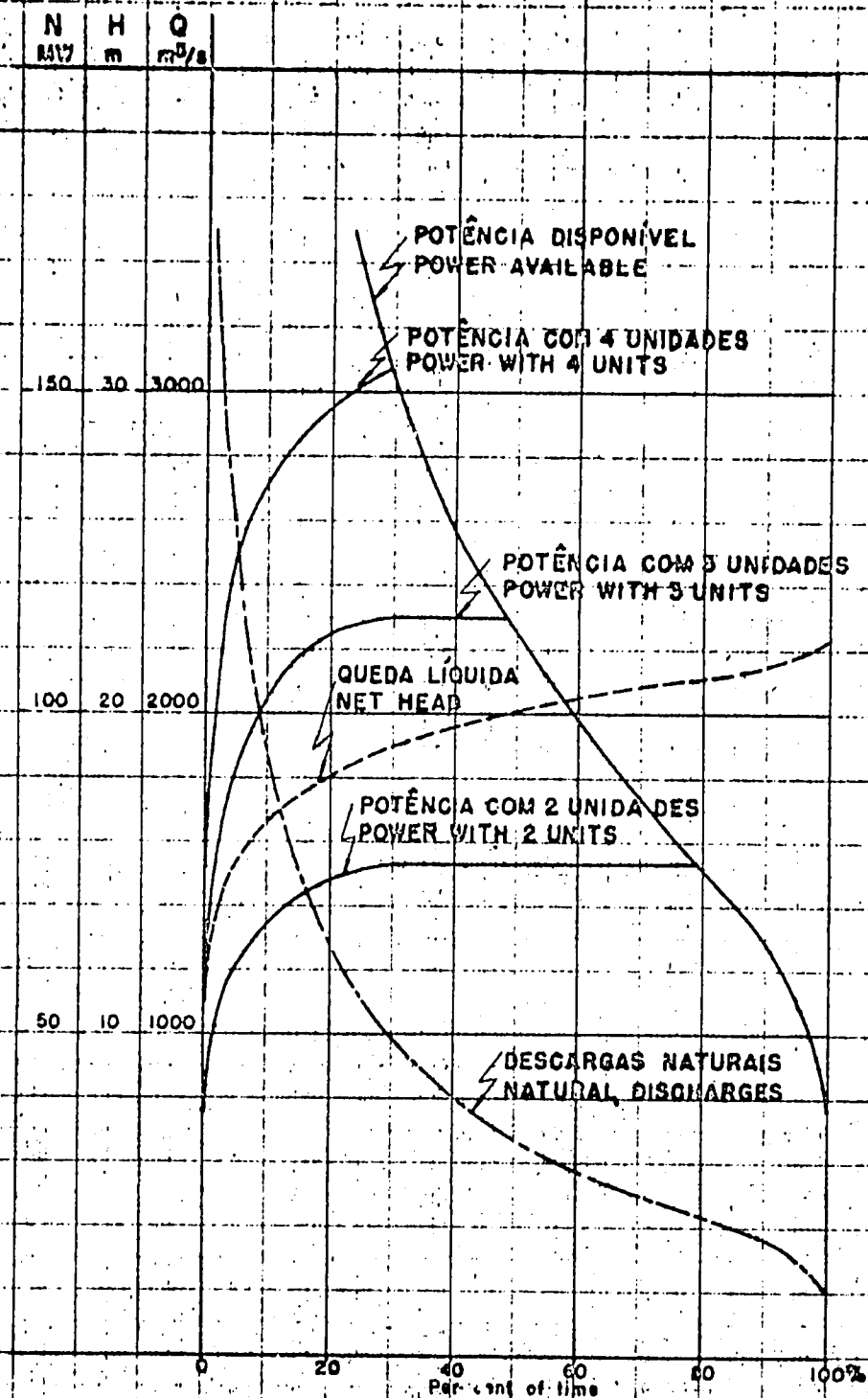
5046-65 A1-10003

UNCLASSIFIED

ANNEX II

Plate 2

PLATE Nº 3



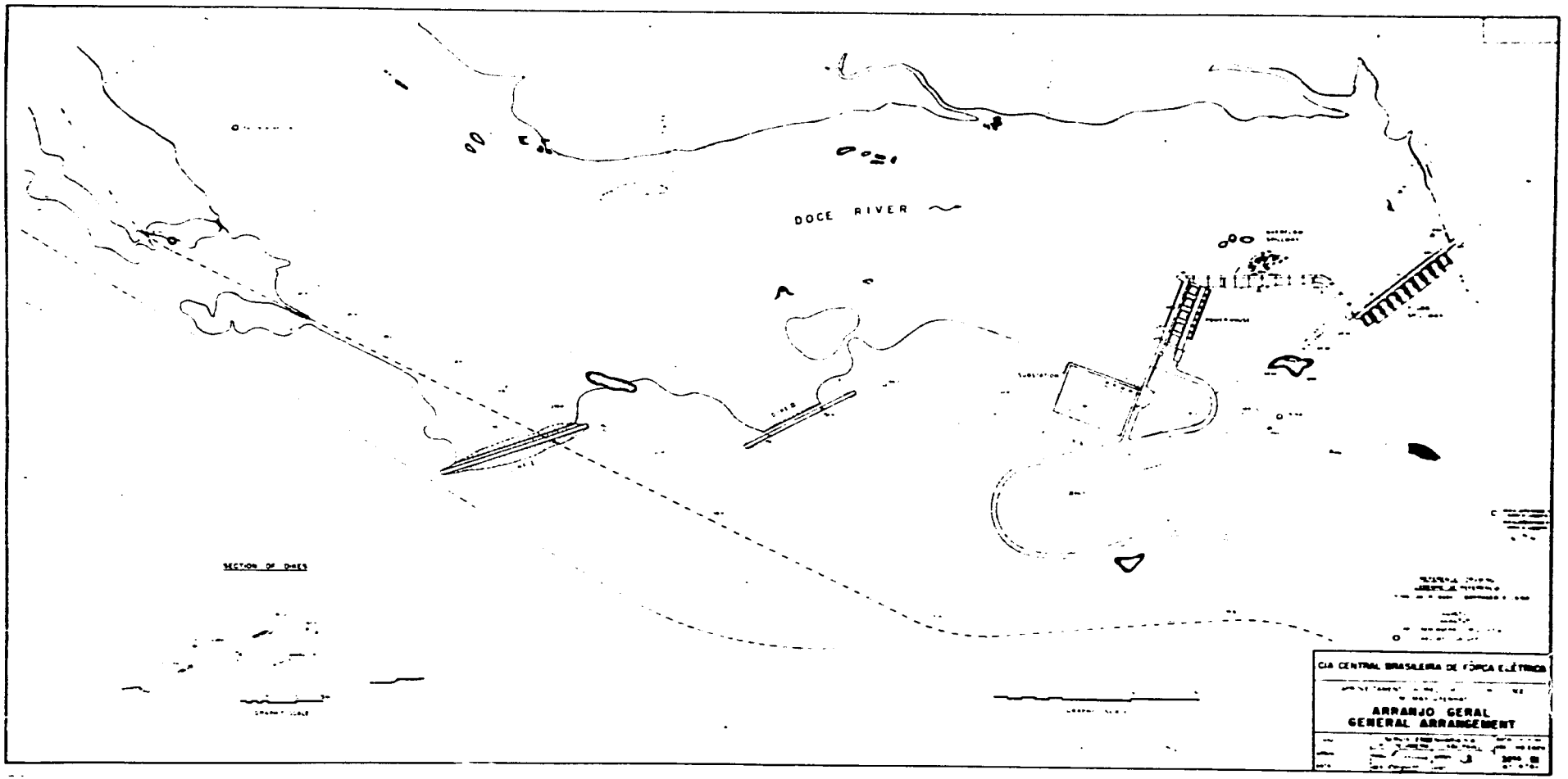
FLOW, HEAD & POWER POTENCIAL DURATION CURVES

CIA. CENTRAL BRASILEIRA DE FÔRÇA ELÉTRICA

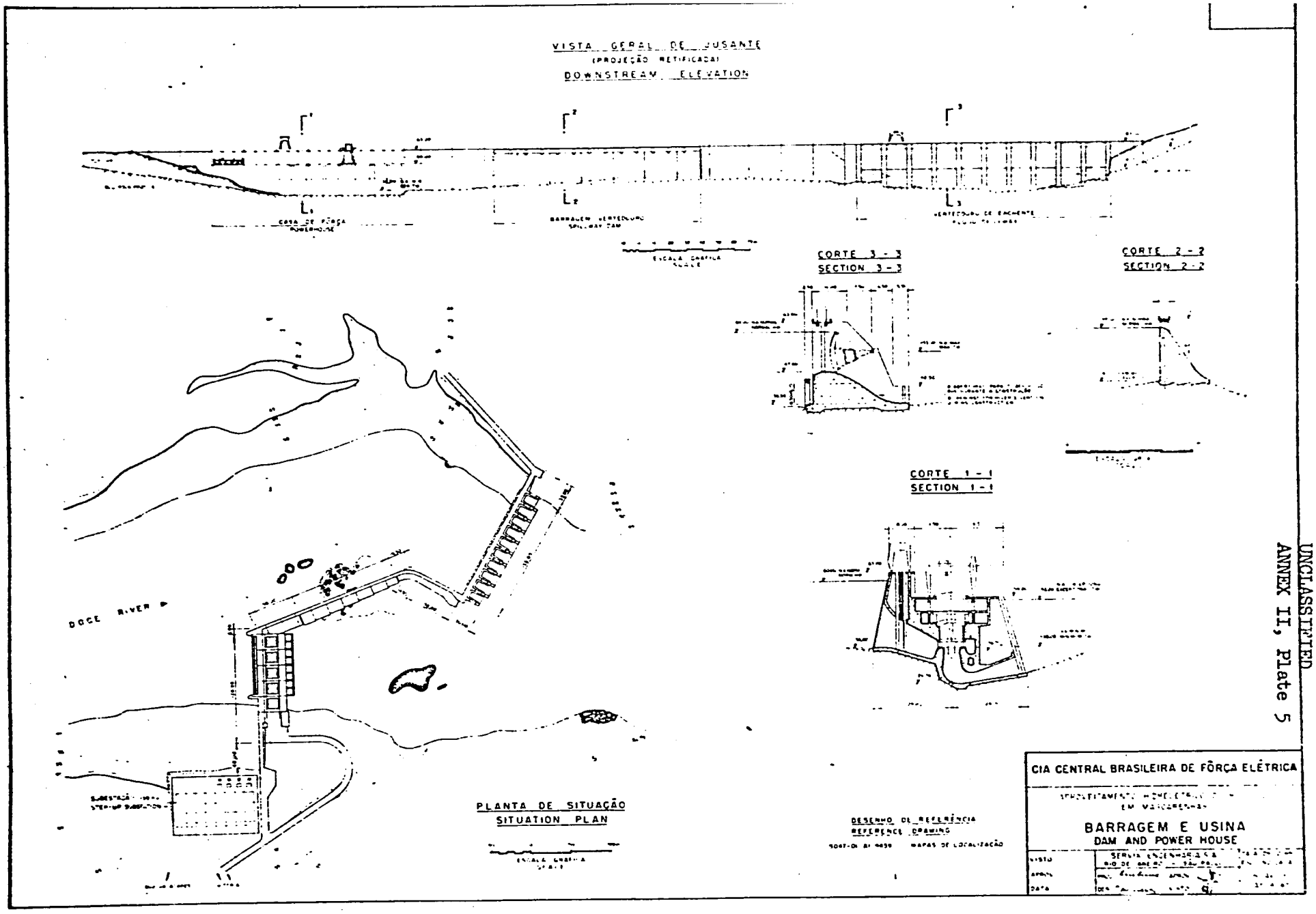
APROVEITAMENTO HIDRELÉTRICO DO RIO DOCE EM MASCARENHAS

CURVAS DE PERMANÊNCIA DESCARGA-QUEDA-POTÊNCIA

VISTO:	SERVIX ENGENHARIA S.A. RIO DE JANEIRO - SÃO PAULO	DATA: 29-4-959
APROV.	PROJ.	APROV.	EST.
DATA	DES.	VISTO	5046-26 A4-10013

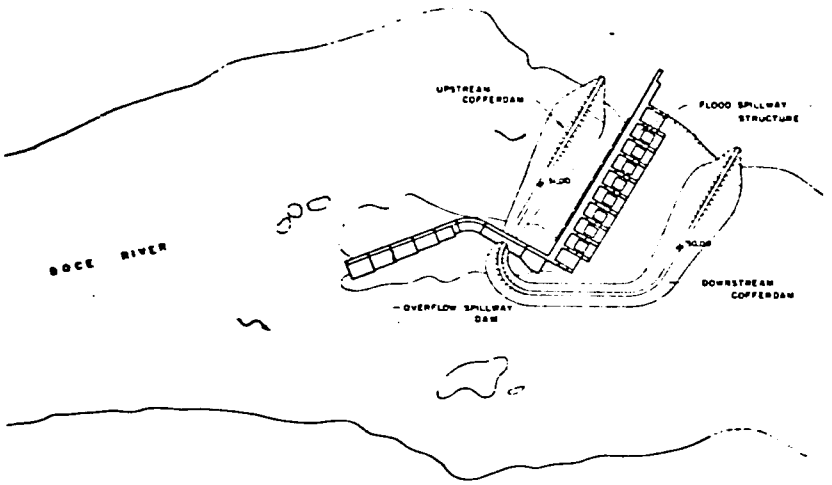


UNCLASSIFIED
ANNEX II
Plate 4



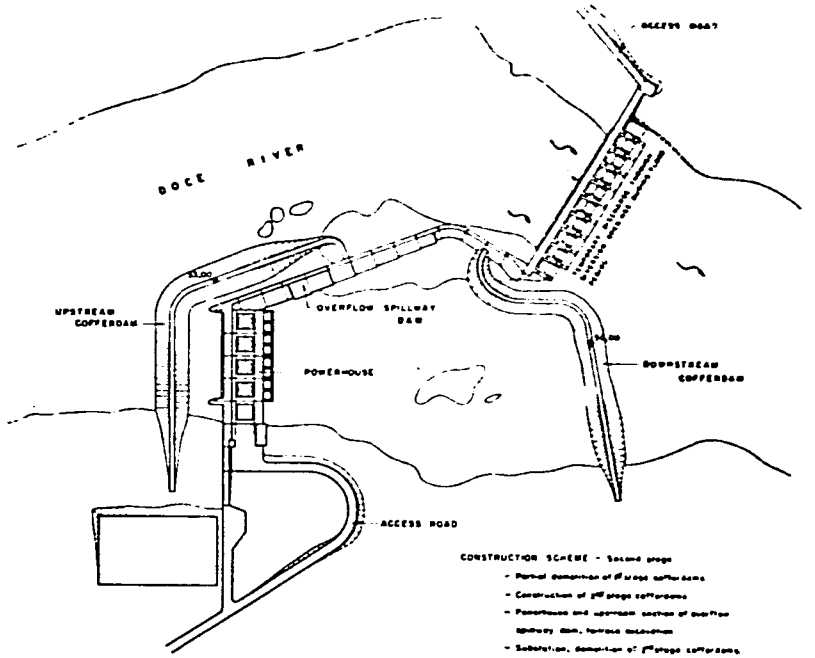
UNCLASSIFIED

ANNEX II, Plate 5



CONSTRUCTION SCHEME - First stage

- Above water level section of overflow spillway dam
- Cofferdams of flood spillway structure as shown
- Flood spillway structure and downstream section of overflow spillway dam



CONSTRUCTION SCHEME - Second stage

- Partial demolition of 1st stage cofferdams
- Construction of 2nd stage cofferdams
- Powerhouse and upstream section of overflow spillway dam, turbine installation
- Substation, demolition of 1st stage cofferdams

CONSTRUCTION SCHEDULE

ITEM	QUANTITIES	UNITS	1966	1967	1968	1969	1970	1971
BIDS AND CONTRACTS								
CONSTRUCTION OF CAMP								
EFMM RELOC AND INDEMNITIES								
STRUCTURES AND IMPROVEMENTS								
Powerhouse and intake								
excavation	89 000	m³						
concrete	46 800	m³						
miscellaneous								
Downstream intake								
RESERVOIRS, DAMS & WATERWAYS								
Headpond clearing	300	ha						
Dams and spillways								
cofferdams	200 000	m³		1st stage	2nd stage			
dam excavation	13 500	m³						
dam concrete	87 000	m³						
spillway excavation	6 000	m³						
spillway concrete	46 000	m³						
gates								
drainage								
[illegible]	25 000	m³						
[illegible] (above erection)								
tailraces excavation	54 000	m³						
concrete	1 000	m³						
TURBINES AND GENERATORS								
Turbine 1 & 2								1st 2nd
3								
Generator 1 & 2								
3								
ACCES ELEC EQUIP AND TRANSF								
MISCEL POWERHOUSE EQUIP								
INVESTMENTS US $1000	2 units 27 103; 3 - 31 865		-	9433; 3433	7231; 7231	8952; 9030	628; 7709	2254

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ANNEX II, Plate 6

CIA CENTRAL BRASILEIRA DE FÔRÇA ELÉTRICA

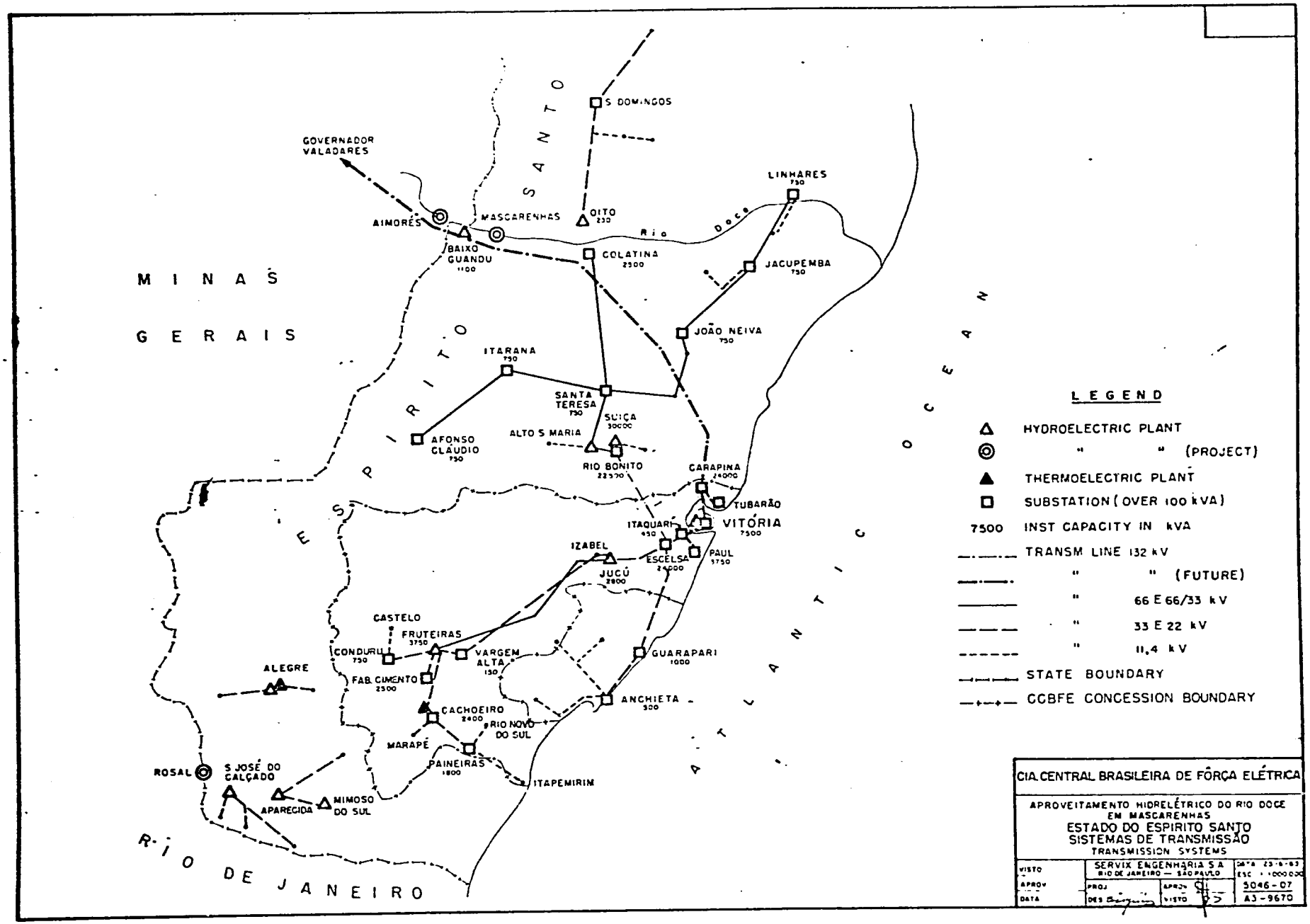
APROVEITAMENTO HIDRELÉTRICO DO RIO DOCE EM MASCARENHAS

CONSTRUCTION SCHEDULE

SERVIX ENGENHARIA S.A. RIO DE JANEIRO — SÃO PAULO

3046 - CB

81-9746



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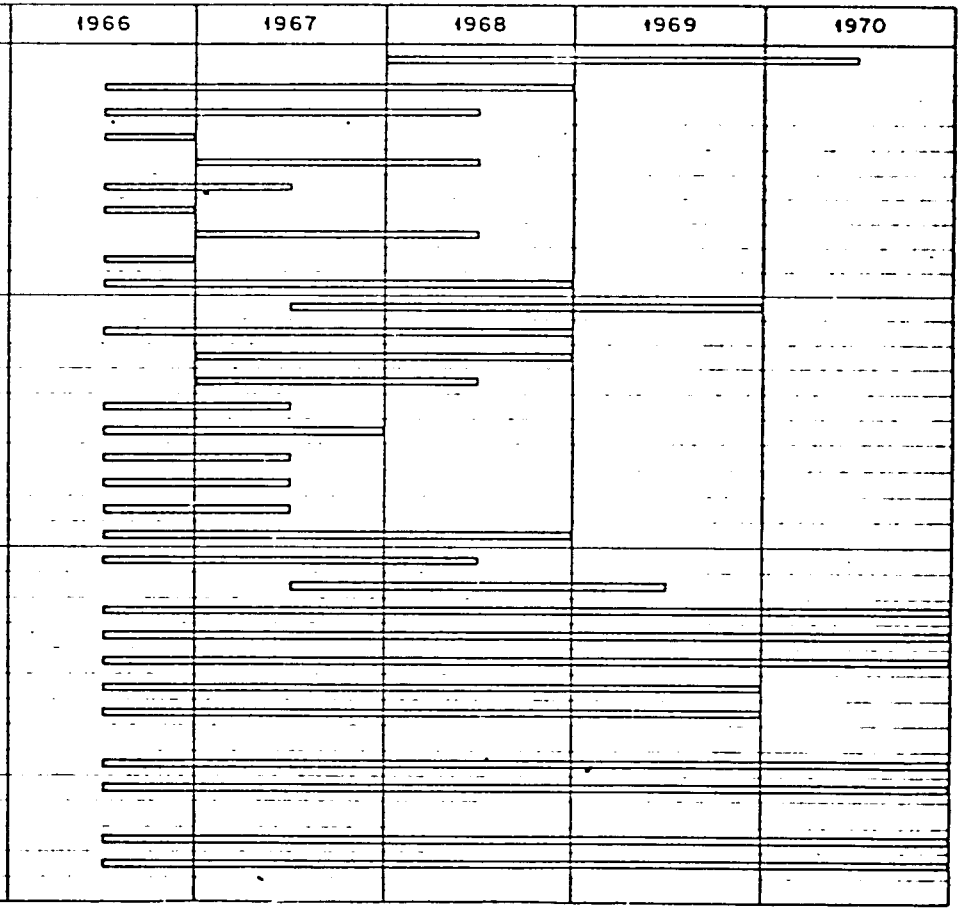
ANNEX II, Plate 7

CCBFE SYSTEM
EXPANSION PLAN SCHEDULE 1966 - 1970

	REF.	DESCRIPTION
TRANSMISSION LINES	1	MASCARENHAS - CARAPINA (138 kV - 120 km - 2ND CIRCUIT)
	2	CARAPINA - ALTO LAJE (138 kV - 25 km - 1ST CIRCUIT)
	3	ALTO LAJE - CACHOEIRO (138 kV - 110 km - SINGLE CIRCUIT)
	4	AREINHA - JUCU (69 kV - 16,5 km - SINGLE CIRCUIT)
	5	CACHOEIRO - ENTRONC. ITABIRA (34,5 kV - 13 km - DOUBLE CIRCUIT)
	6	VITÓRIA - PRAIA (34,5 kV - 5 km - SINGLE CIRCUIT)
	7	ALTO LAJE - AREINHA (69/34,5 kV - 7,5 km - DOUBLE CIRCUIT)
	8	CACHOEIRO - FAB ITABIRA (34,5 kV - 18 km - SINGLE CIRCUIT)
	9	ALTO LAJE - VITÓRIA (IMPROVEMENTS)
	10	IMPROVEMENTS IN OTHER LINES
SUBSTATIONS	11	CARAPINA (SYNCHR COND, ADD 50MVA TRANSF AND IMPROVEMENTS)
	12	ALTO LAJE (ADD 138 AND 34,5 kV FEEDERS, 34,5/69 kV SUBSTATION)
	13	GUARAPARI SWITCHING (NEW)
	14	CACHOEIRO (NEW)
	15	PRAIA (NEW 34,5 kV FEEDER)
	16	VITÓRIA (ADD 7,5 MVA TRANSF AND IMPROVEMENTS)
	17	PAUL (ADD. 3,75 MVA TRANSF AND IMPROVEMENTS)
	18	CAMPO GRANDE (NEW)
	19	FRUTEIRAS (NEW)
	20	IMPROVEMENTS IN OTHER SUBSTATIONS
DISTRIBUTION SYSTEM	21	NEW FEEDERS IN VITÓRIA - V. VELHA - CARIACICA
	22	CARAPINA - SERRA AND CARAPINA - PRAIA PRIMARY FEEDERS
	23	NETWORK EXPANSION IN VITÓRIA - V. VELHA - CARIACICA
	24	NETWORK EXPANSION IN SERRA
	25	NETWORK EXPANSION IN CACHOEIRO DO ITAPEMIRIM
	26	NETWORK IMPROVEMENTS IN VITÓRIA - VILA VELHA - CARIACICA
	27	NETWORK IMPROVEMENTS IN CACHOEIRO DO ITAPEMIRIM
	28	TRANSFORMERS, CAPAC., AND ACCESSORIES IN VITÓRIA - -VILA VELHA AND CARIACICA
	29	TRANSFORMERS AND ACCESSORIES IN SERRA
	30	TRANSFORMERS AND ACCESSORIES IN CACHOEIRO DO ITAPEMIRIM
	31	METERS



COMPANHIA CENTRAL BRASILEIRA DE FÔRÇA ELÉTRICA

PLANO DE EXPANSÃO DO SISTEMA NO PERIODO 1966/70

CRONOGRAMA GERAL

ESCALA

VISTO

APROV

ELECTRA

ELETROTÉCNICA CONSULTORIA E PROJETOS LTDA

PROJ

DES

APROV

DATA 3/5/66

DESENHO Nº CB - A3 - 026

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ANNEX II, Plate 8

ANNEX III

TABLES

1.) Statement of Operations

2.) Cash Flow

3.) Balance Sheet

4.) Legal Basis for Return on Investment

5.) Unit Sales Prices

6.) Investment Schedule

7.) System Requirements - Power Energy (GWH)

8.) System Demand (MW)

9.) Energy Sources (Mwh)

10.) Project Cost Estimates

11.) Benefit Cost Analysis

CCEPE - COMPANHIA CENTRAL BRASILEIRA DE FÔRÇA ELÉTRICA

FINANCIAL PROJECTION

I - STATEMENT OF OPERATIONS

	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
A- REVENUE											
1- Annual sales (MWh)	98,913	134,180	253,794	372,429	555,260	575,009	595,928	620,430	646,670	676,057	708,971
2- Unit sales prices (US$/MWh)	24,5	23,1	23.1	23.1	17.7	17.7	17.7	15.8	15.8	15.8	13.9
3- Gross revenue from sales (1 x 2)10^3 US$...	2,423	3,100	5,863	8,603	9,838	10,178	10,548	9,803	10,217	10,682	9,855
4- Other Income 10^3 US$	440	644	1,362	1,750	2,270	295	-	-	-	-	-
5- TOTAL INCOME (10^3 US$"	2,863	3,744	7,225	10,353	12,098	10,473	10,548	9,803	10,217	10,682	9,855
B- COST OF OPERATION (10^3 US$)											
1- Production expenses											
a) Existing plants (Jucu & Fruteiras).....	109	109	109	109	109	109	109	109	109	109	109
b) Fuel oil (diesel)	-	-	-	-	365	-	-	-	-	-	-
c) Mascarenhas plant	-	-	-	-	-	97	118	118	118	118	118
d) Purchased Power	1,063	1,502	2,931	4,346	5,596	728	671	607	536	456	366
2- TOTAL, production expenses	1,172	1,611	3,040	4,455	6,070	934	898	834	763	683	593
3- Main transmission expenses	-	25	25	39	44	44	44	44	44	44	44
4- Subtransmission & distribution expenses...	174	195	218	244	273	306	343	384	430	482	540
5- Other Expenses	119	119	-	-	-	-	-	-	-	-	-
6- TOTAL, operating expenses	1,465	1,950	3,283	4,738	6,387	1,284	1,285	1,262	1,237	1,209	1,177
C- FIXED CHARGES (10^3 US$)											
1- Depreciation & Amortization	370	852	952	1,442	1,719	4,001	4,453	4,541	4,659	4,763	4,875
2- Administration and general	177	186	195	205	215	226	237	249	261	274	288
5- Consumer accounts and sales	123	138	155	174	195	218	244	273	306	343	384
7- TOTAL, fixed charges	670	1,176	1,302	1,821	2,129	4,445	4,934	5,063	5,226	5,380	5,547
D- TOTAL PRODUCTION COSTS (B6 C7)	2,135	3,126	4,585	6,559	8,516	5,729	6,219	6,325	6,463	6,589	6,724
E- NET PROFIT OR LOSS (before interest) A - D ..	728	618	2,640	3,794	3,582	4,744	4,329	3,478	3,754	4,093	3,161
F- INTEREST	558	1,307	2,114	2,495	3,063	3,242	2.944	2,639	2,334	2,046	1,784
G- NET PROFIT OR LOSS (E - F)	170	(689)	729	1,299	519	1,502	1,385	839	1,420	2,047	1,377

UNCLASSIFIED
ANNEX III
Table 1

CCBFE - CIA. CENTRAL BRASILEIRA DE FÔRÇA ELÉTRICA

FINANCIAL PROJECTION

II- CASH FLOW

(US$ 1,000)

	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
A- CASH RECEIPTS											
1. Net profit before interest	728	618	2,640	3,794	3,582	4,744	4,329	3,478	3,754	4,093	3,161
2. Depreciation taken	370	852	952	1,442	1,719	4,001	4,453	4,541	4,659	4,763	4,875
4. Increase in paid in share capital	1,776	3,700	3,000	2,400	1,800	-	-	-	-	-	-
5. Borrowings											
a) This AID project	-	3,000	3,000	3,000	3,000	-	-	-	-	-	-
b) Eletrobrás new loans	2,000	3,800	3,600	3,500	3,500	-	-	-	-	-	-
c) Eletrobrás already negotiated	2,190	-	-	-	-	-	-	-	-	-	-
10/11. Increase in Acc. Payable & other liabilities	29	36	45	56	69	85	106	132	163	201	250
13. TOTAL RECEIPTS	7,093	12,006	13,237	14,192	13,670	8,830	8,888	8,151	8,576	9,057	8,286
B- CASH DISBURSEMENTS											
2. Construction Expenditures											
a) Mascarenhas	-	5,430	7,233	9,259	7,709	2,254	-	-	-	-	-
b) Other constructions (transm. & distribution)	6,332	4,742	3,590	1,408	1,086	1,269	1,100	1,469	1,300	1,400	1,500
c) Planned reserve for future major project	-	-	-	-	-	-	-	-	500	1,200	300
5. Debt service											
a) Amortization of principal											
1) AID loan	-	-	-	-	-	600	600	600	600	600	600
2) Eletrobrás (new loans)	-	-	-	-	-	1,640	1,640	1,640	1,640	1,640	1,640
3) Long term borrowing Eximbank	36	36	36	36	36	36	36	36	36	36	36
4) Long term borrowing Eletrobrás (existing)	-	106	106	106	106	106	106	106	106	106	106
5) Long term borrowing Eletrobrás (already negotiated)	-	163	163	278	278	327	327	327	327	-	-
b) Payment of interest											
1) Requested AID loan	-	83	248	413	578	660	627	594	561	528	495
2) Eletrobrás (new loans)	105	583	1,060	1,520	1,975	2,132	1,919	1,706	1,492	1,279	1,066
3) Long term borrowing Eximbank	17	16	14	13	11	9	8	6	4	3	1
4) Long term borrowing Eletrobrás (existing)	346	346	332	318	304	290	277	263	249	235	221
5) Long term borrowing Eletrobrás (already negotiated)	88	277	255	229	193	150	112	69	27	-	-
6) Long term borrowing Eletrobrás (guarantee)	2	2	2	2	2	1	1	1	1	1	1
3/7/8. Increase in cash account receivable and inventories	116	163	203	252	312	386	479	595	737	913	1,133
10. Decrease in other liabilities (past income tax)	16	-	-	-	-	-	-	-	-	-	-
12. Other disbursements											
a) Income tax	-	26	-	79	195	80	225	208	125	213	307
b) Cash to dividends	-	-	-	-	-	-	870	870	870	870	870
13. Total Disbursements	7,058	11,973	13,242	13,913	12,785	9,940	8,827	8,490	8,575	9,024	8,276
14. Increase (Decrease) in Cash (except normal cash)	35	33	(5)	279	885	(1,110)	561	(339)	1	33	10
15. Cash balance beginning of year	415	462	478	498	523	554	593	641	701	775	866
16. Increase in normal cash	12	16	20	25	31	39	48	60	74	91	113
17. Cash balance end of year	462	478	498	523	554	593	641	701	775	866	979

ANNEX III
Table 2

CCBFE - CIA. CENTRAL BRASILEIRA DE FÔRÇA ELÉTRICA

FINANCIAL PROJECTION

III- BALANCE SHEET, END OF PERIOD

(US$ 1,000)

	Dec.1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
A - ASSETS												
1. Current Assets	986 x	1,137	1,333	1,531	2,062	3,259	2,535	3,575	3,831	4,569	5,515	6,658
2. Investments	8	8	8	8	8	8	8	8	8	8	8	8
3. Capital Assets												
a) Fixed Assets (in operation)	4,625	10,648	11,898	18,022	21,486	50,075	55,726	56,826	58,295	59,595	60,995	62,495
b) Construction in Progress	789	1,098	10,020	14,719	21,922	2,128	-	-	-	-	-	-
c) Planned Reserve for Future Projects	-	-	-	-	-	-	-	-	-	500	1,700	2,000
d) TOTAL	5,414	11,746	21,918	32,740	43,408	52,203	55,726	56,826	58,295	60,095	61,795	64,495
4. Gross Assets (1 2 3)	6,408	12,891	23,259	-	-	-	-	-	-	-	-	-
5. Accumulated Provision for Depreciation	(743)	(1,113)	(1,965)	(2,917)	(4,359)	(6,078)	(10,079)	(14,532)	(19,073)	(23,732)	(28,495)	(33,370)
8. Total Assets, End of Period	5,665	11,778	21,294	31,363	41,119	49,392	48,190	45,877	43,061	40,940	39,723	37,791
B - LIABILITIES												
1. Current And Other Liabilities	799	812	848	893	949	1,018	1,103	1,209	1,341	1,504	1,705	1,955
2. Long Term Debt	3,191	7,345	13,840	20,135	26,215	32,295	29,586	26,877	24,168	21,459	19,077	16,695
3. Share Capital	1,827	3,603	7,303	10,303	12,703	14,503	14,503	14,503	14,503	14,503	14,503	14,503
4. Reserves	52	52	52	52	52	52	52	52	52	52	52	52
5. Surplus or deficit	(204)	(34)	(749)	(20)	1,200	1,524	2,946	3,236	2,997	3,422	4,386	4,586
6. Total Liabilities & Capital	5,665	11,778	21,294	31,363	41,119	49,392	48,190	45,877	43,061	40,940	39,723	37,791

NOTE: (x) 241 taken from current assets and transferred Construction in Progress.

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ANNEX III
Table 3

CCBFE - COMPANHIA CENTRAL BRASILEIRA DE FÔRÇA ELÉTRICA

LEGAL BASIS FOR RETURN ON INVESTMENT

	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
A- INVESTMENT											
1- New Construction Completed last year											
1.1- Mascarenhas, units 1 & 2	-	-	-	-	-	27,503	-	-	-	-	-
1.2- Mascarenhas, unit 3	-	-	-	-	-	-	4,382	-	-	-	-
1.3- Transmission lines	-	5,241	173	2,468	671	125	-				
1.4- Substations	-	-	-	2,672	1,998	-	269	-	269	-	-
1.5- Distribution	-	737	937	891	715	325	-	-	-	-	-
1.6- Frequency Conversion	-	45	140	93	80	-	-	-	-	-	-
1.7- Provision for Aditional circuits	-	-	-	-	-	575	1,000	1,100	1,200	1,300	1,400
TOTAL (Fixed Asset's Increase)	-	6,023	1,250	6,124	3,464	28,528	5,651	1,100	1,469	1,300	1,400
Former Fixed Assets	-	4,625	10,648	11,898	18,022	21,486	50,014	55,665	56,765	58,234	59,534
Current Fixed Assets	4,625	10,648	11,898	18,022	21,486	50,014	55,665	56,765	58,234	59,534	60,934
2- Working Capital	531	658	816	1,012	1,255	1,556	1,929	2,392	2,966	3,678	4,561
TOTAL (1 + 2)	5,156	11,306	12,714	19,034	22,741	51,570	57,594	59,157	61,200	63,212	64,955
B- DEPRECIATION & AMORTIZATION											
End of previous year	743	1,113	1,965	2,917	4,359	6,024	10,030	14,483	19,024	23,683	28,446
Present year (8%)	370	852	952	1,442	1,719	4,001	4,453	4,541	4,659	4,763	4,875
End of year	1,113	1,965	2,917	4,359	6,078	10,025	14,483	19,024	23,683	28,446	33,321
C- LEGAL BASIS FOR RETURN ON INVESTMENT	4,043	9,341	9,797	14,675	16,663	41,545	43,11	40,133	37,517	34,766	31,634

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ANNEX III
Table 4

CCHE - COMPANHIA CENTRAL BRASILEIRA DE FÔRÇA ELÉTRICA

UNIT SALES PRICES

US$ 1,000

	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
COST OF SERVICE											
1. Depreciation and Amortization (10^3 US$)											
At 8%	370	852	952	1,442	1,719	4,001	4,453	4,541	4,659	4,763	4,875
2. Return on Capital (10^3 US$)											
At 10% of Legal Value	404	934	900	1,463	1,666	4,155	4,311	4,013	3,752	3,477	3,163
3. Operation & Maintenance (10^3 US$)											
Production (present plant) except fuel	109	109	109	109	109	109	109	109	109	109	109
Fuel Oil (diesel Vitória-Cachoeiro)	-	-	-	-	365	-	-	-	-	-	-
Production (Mascarenhas)	-	-	-	-	-	97	118	118	118	118	118
Transmission (Cemig - Mascarenhas)	-	25	25	25	30	30	30	30	30	30	30
Transmission (Carapina-Cachoeiro)	-	-	-	14	14	14	14	14	14	14	14
Subtransmission & Distribution	297	333	373	418	468	524	587	657	736	825	924
Administration	177	186	195	205	215	226	237	249	261	274	288
Purchased power (ESCELSA)	1,063	900	864	824	778	728	671	607	536	456	366
Purchased power (CEMIG)	-	602	2,067	3,522	4,818	-	-	-	-	-	-
TOTAL	1,646	2,155	3,633	5,117	6,797	1,728	1,766	1,784	1,804	1,826	1,849
4. TOTAL (1 + 2 + 3) (10^3 US$)	2,420	3,941	5,565	8,027	10,182	9,884	10,530	10,338	10,215	10,066	9,887
5. TOTAL SALES (MWh)	98,913	134,180	253,794	372,429	555,260	575,009	595,928	620,430	646,670	676,057	708,971
6. Unit Sales Price (US$/MWh)											
(Average Rate: 4 : 5)	(24.5)[x]	29.4	21.9	21.6	18.3	17.2	17.7	16.7	15.8	14.9	13.9
7. (Three Year Average) US$/MWh	(24.5)	23.1	23.1	23.1	17.7	17.7	17.7	15.8	15.8	15.8	13.9
8. Purchased Power in MWh											
ESCELSA	96,663	81,854	78,567	74,886	70,762	66,144	60,978	55,178	48,690	41,423	33,284
CEMIG	-	54,691	187,893	320,179	438,000	-	-	-	-	-	-
TOTAL	96,663	136,545	266,460	395,065	508,762	66,144	60,978	55,178	48,690	41,423	33,284

(x)- If calculated in the basis of previous year, US$27, with a deduction of 15%, due to a delay in monetary correction combined with inflation, the probable value for 1966 would be US$ 23.60 which is close enough from the value indicated in table .

ANNEX III
Table 5

CCBFE - COMPANHIA CENTRAL BRASILEIRA DE FÔRÇA ELÉTRICA

MASCARENHAS PROJECT

INVESTMENT

US$ 1,000

	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	Total
1- MASCARENHAS PROJECT												
1.1- Generating Plant, units number 1 and 2												
a)- Construction	-	5,171	6,396	7,050	4,209	-	-	-	-	-	-	22,826
b)- Interest	-	259	837	1,509	2,072	-	-	-		-	-	4,677
c)- TOTAL	-	5,430	7,233	8,559	6,281	-	-	-	-	-	-	27,503
1.2- Generating Plant, unit number 3												
a)- Construction	-	-	-	667	1,297	1,959	-	-	-	-	-	3,923
b)- Interest	-	-	-	33	131	295	-	-	-	-	-	459
c)- TOTAL	-	-	-	700	1,428	2,254	-	-	-	-	-	4,382
TOTAL MASCARENHAS PROJECT	-	5,430	7,233	9,259	7,709	2,254	-	-	-	-	-	31,885
2- TRANSMISSION LINES												
2.1- CEMIG-Mascarenhas-Carapina (1st. circuit) 138 kV	3,864	-	-	-	-	-	-	-	-	-	-	3,864
2.2- Mascarenhas-Carapina (2nd.circuit) 138 kV	-	-	336	270	119	-	-	-	-	-	-	725
2.3- Carapina-Alto Laje, 138 kV	90	180	132	-	-	-	-	-	-	-	-	402
2.4- Alto Laje-Cachoeiro, 138 kV	200	1,002	450	-	-	-	-	-	-	-	-	1,652
2.5- Secondary Lines (7),69 to 34.5kV	320	173	135	-	-	-	-	-	-	-	-	628
SUB-TOTAL	4,474	1,355	1,053	270	119	-	-	-	-	-	-	7,271
2.6- Interest During Construction (2.1 to 2.4)	283	88	194	47	67	-	-	-	-	-	-	679
TOTAL TRANSMISSION LINES	4,757	1,443	1,247	317	186	-	-	-	-	-	-	7,950
3- SUBSTATIONS												
3.1- Carapina - 138 kV	-	775	772	135	-	269	-	269	-	-	-	2,220
3.2- Alto Laje - 138 kV	90	263	129	-	-	-	-	-	-	-	-	482
3.3- Guarapari - 138 kV	-	52	61	-	-	-	-	-	-	-	-	113
3.4- Cachoeiro - 138 kV	144	704	45	-	-	-	-	-	-	-	-	893
3.5- Secondary Substations (5) 69 to 34.5 kV	521	250	21	-	-	-	-	-	-	-	-	792
SUB-TOTAL	755	2,044	1,028	135	-	269	-	[illegible]	-	-	-	4,500
3.6- Interest	38	178	331	161	-	-	-	-	-	-	-	708
TOTAL SUBSTATIONS	793	2,222	1,359	296	-	269	-	269	-	-	-	5,208
4- DISTRIBUTION												
TOTAL Distribution	737	937	891	715	325	-	-	-	-	-	-	3,605
5- FREQUENCY CONVERSION												
TOTAL Frequency Conversion	45	140	93	80	-	-	-	-	-	-	-	358
6- Provision for Aditional Substation, Substransmission & Distribution	-	-	-	-	575	1,000	1,100	1,200	1,300	1,400	1,500	8,075
TOTAL CAPITAL OUTLAYS	6,332	10,172	10,823	10,667	8,795	3,523	1,100	1,469	1,300	1,400	1,500	57,081

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ANNEX III
Table 6

CCBFE-ESCELSA SYSTEM REQUIREMENTS - POWER & ENERGY - GWH

	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
1. CCBFE (except large industrial)	98.91	110.78	124.07	138.96	155.64	174.31	195.23	218.66	244.90	274.29	307.20
2. Large Industrial											
(a) CVRD	14.15	23.39	129.72	233.47	235.62	236.70	236.70	237.77	237.77	237.77	237.77
(b) CFAV	21.00	38.00	38.00	38.00	38.00	38.00	38.00	38.00	38.00	38.00	38.00
(c) MBR	-	-	-	-	164.00	164.00	164.00	164.00	164.00	164.00	164.00
Total Large Industrial	35.15	61.39	167.72	271.47	437.62	438.70	438.70	439.77	439.77	439.77	439.77
3. ESCELSA (except large industrial)	24.46	27.40	30.68	34.36	38.49	43.11	48.28	54.07	60.56	67.83	75.97
4. Total sales	158.52	199.57	322.47	444.79	631.75	656.12	682.21	712.50	745.23	781.89	822.94
5. Transmission & Distribution Losses	30.50	35.12	45.42	55.39	65.44	75.24	80.75	87.02	93.92	101.65	110.32
6. Total Energy Requirement (4 + 5)	189.02	234.69	367.89	500.18	697.19	731.36	762.96	799.52	839.15	883.54	933.26

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ANNEX III
Table 7

CCBFE – COMPANHIA CENTRAL BRASILEIRA DE FÔRÇA ELÉTRICA

CCBFE – ESCELSA SYSTEM REQUIREMENTS – POWER & ENERGY SOURCES

SYSTEM DEMAND MW

	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
1 – CCBFE (existing Fruteiras and Jucu)	4	4	4	4	4	4	4	4	4	4	4	4
2 – Mascarenhas	–	–	–	–	–	–	77	116	116	116	116	116
3 – CEMIG (transfer from CEMIG system)	–	–	14	50	50	55	–	–	–	–	–	–
4 – ESCELSA (Rio Bonito and Suiça)	47	47	47	47	47	47	47	47	47	47	47	47
5 – TOTAL Hydro Plus CEMIG	–	51	65	101	101	106	128	167	167	167	167	167
6 – Diesel (CCBFE 8, CVRD 6, CFAV 3)	11	17	17	17	17	17	17	17	17	17	17	17
7 – TOTAL Capacity	62	68	82	118	118	123	145	184	184	184	184	184
8 – Less Total Reserves	21	17	27	42	22	–	16	48	39	31	21	10
9 – Net System Demand – MW	41	51	55	76	76	123	129	136	145	153	163	174

UNCLASSIFIED
ANNEX III
Table 2

CCBFE - COMPANHIA CENTRAL BRASILEIRA DE FÔRÇA E LUZ

CCBFE - ESCELSA SYSTEM REQUIREMENTS - POWER & ENERGY SOURCES

ENERGY SOURCES MWh

	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
1. CCBFE													
a) Existing hydro (Jucu-Fruteiras)	31.496	25.000	25.000	25.000	25.000	25.000	25.000	25.000	25.000	25.000	25.000	25.000	25.000
b) Existing diesel (Vitória-Cachoeiro)	17.211	-	-	-	-	-	46.340	-	-	-	-	-	-
c) Mascarenhas plant	-	-	-	-	-	-	-	551.360	582.960	619.520	659.150	703.540	753.260
d) TOTAL	48.707	25.000	25.000	25.000	25.000	25.000	71.340	576.360	607.960	644.520	684.150	728.540	778.260
2. PURCHASED FROM OTHER SYSTEMS													
CEMIG (new transmission line)	-	-	-	54.691	107.890	320.180	438.000	-	-	-	-	-	-
3. ESCELSA													
a) Hydro (Rio Bonito-Suiça)	71.609	112.184	139.873	155.000	155.000	155.000	155.000	155.000	155.000	155.000	155.000	155.000	155.000
b) Hydro small independent	10.000	10.000	10.000	-	-	-	-	-	-	-	-	-	-
c) TOTAL	81.609	122.184	149.873	155.000	155.000	155.000	155.000	155.000	155.000	155.000	155.000	155.000	155.000
4. AUTO-PRODUCERS													
a) Companhia Vale do Rio Doce (CVRD)	2.513	2.000	14.147	-	-	-	-	-	-	-	-	-	-
b) Companhia Ferro e Aço de Vitória (CFAV)	3.888	4.000	-	-	-	-	-	-	-	-	-	-	-
c) TOTAL	6.401	6.000	14.147	-	-	-	-	-	-	-	-	-	-
5. TOTAL ENERGY AVAILABLE	136.717	153.184	189.020	234.691	367.890	500.180	697.190	731.360	762.960	799.520	839.150	883.540	933.260

ANNEX III
Table 9

MASCARENHAS HYDROELECTRIC PROJECT

Three 38.5 Mw Units with Provisions for One Additional Unit

	Costs in Local Currency Cr x 1000				Costs in Foreign Currency US$				Total Cost as Dollars		
	Equipment	Services	Material & Construction	Total for Item	Equipment	Indirect	Services	Total	Foreign Exchange	Local	Total
115.5 Mw Hydroelectric Plant											
A. DIRECT COSTS											
1. Land and Land Rights			118,900	118,900						53,559	53,559
2. Structures and Improvement			5,774,150	7,040,430						3,171,365	3,171,365
250T Gantry Crane	951,200										
Lift	59,450										
Aux. equipment	255,630										
3. Reservior, Dam & Water-Ways			9,317,070	14,025,510						6,317,797	6,317,797
Ten Taintor Gates	2,972,500										
15T Gantry Crane	71,340										
Intake headgate & stoplog	1,545,700										
30T Gantry Crane	118,900										
4. Turbines				2,339,120			2,375,000	2,375,000	1,278,853	3,653,853	
Two-53,000hp Kaplin					1,800,000						
One-53,000hp Kaplin	1,911,700					265,000					
Transportation	214,020				250,000						
Erection	713,400				60,000						
5. Generators				2,913,400			1,780,000	1,780,000	1,312,342	3,092,342	
Two - 39MVA - 97RPM					1,400,000						
One - 39MVA - 97RPM	2,200,000					180,000					
Transportation	178,350				140,000						
Erection (Taxes-Local)	535,050				60,000						
6. Acessory Elect. Equip.	166,460			166,460	400,000		400,000	400,000	74,982	474,982	
7. Misc. Power Plant Equip.	107,010			107,010	130,000		130,000	130,000	48,203	178,203	

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ANNEX III
TABLE 10, p. 1 of 7

	Costs in Local Currency Cr x 1000				Cost in Foreign Currency US$				Total Costs as Dollars		
	Equipment	Services	Construction	Total	Equipment	Indirect	Services	Total	Local Cost	Foreign Exchange	Total
8. Step-up Substation											
Substation structure	124,350		178,350	683,680				388,975	388,975	307,964	696,939
Two-40MVA, 13.8/132Kv Trans.						299,978	35,000				
One-40MVA, 13.8/132Kv Trans.	332,920										
Transportation (Taxes Local)	11,890				38,997						
Erection	35,670				15,000						
9. H.V. Control & Protection					390,000			390,000		390,000	390,000
10. Auxiliary Substation Equipment	89,180			89,180	70,000			70,000	70,000	40,171	110,171
11. General Installation Supervision	178,350			178,350	130,000			130,000	130,000	80,338	210,338
Direct Costs	12,773,570		15,388,470	28,162,040	5,183,975	480,000		5,663,975	5,663,975	12,685,604	18,349,579

MASCARENHAS HYDROELECTRIC PROJECT

Three 38.5 MW Units with Provisions for One Additional Unit

	Costs in Local Currency Cr x 1000				Costs in Foreign Currency US$				Total Costs as Dollars		
	Equipment	Services	Construction	Total	Equipment	Indirect	Services	Total	Local Cost	Foreign Exchange	Total
B Indirect Costs											
1 Construction Equipment & Plant	1,426,800			1,426,800	2,000,000			2,000,000	642,793	2,000,000	2,642,793
2 Camp & Maintenance			594,500	594,500					267,793		267,793
3 Insurance		237,800		237,800					107,117		107,117
4 Social Charges & Related expenses			594,500	594,500					267,793		267,793
5 Legal & Taxes		142,680		142,680					64,270		64,270
6 Administration		118,900		118,900					53,559		53,559
7 Investigations		237,800		237,800					107,117		107,117
8 Engineering				1,785,500				1,700,000	804,279	1,700,000	2,504,279
Design & Inspections		1,189,000					800,000				
Purchasing		239,800					100,000				
Field Supvr. (Mgt)		356,700					800,000				
9 Omissions & Contingencies	1,412,300	252,300	1,657,800	3,322,400	718,400	48,000	170,000	936,400	1496,577	936,400	2,432,977
Total Indirect	2,839,100	2,774,980	2,846,800	8,460,880	2,718,400	48,000	1,870,000	4,636,400	3,811,207	4,636,400	8,447,607
D Total Power Plant	15,612,670	2,774,980	18,235,270	36,622,920	7,902,375	528,000	1,870,000	10,300,375	16496,810	10,300,375	26,797,185
Interest During Const.		11,401,950		11,401,950					5,136,014		5,136,014
E Total Cost Power Plant		15,612,670	18,235,270	48,024,870	7,902,375	528,000	1,870,000	10,300,375	21,632,824	10,300,375	31,933,199
Rounded	$15.6 bil.	$14.2 bil.	$18.2 bil.	$48.0 bil.	$7.9 mil.	$0.6 mil.	$1.9mil.	$10.3 mil.	$21.6 mil.	$10.3 mil.	$31.9 mil.

MASCARENHAS HYDROELECTRIC PROJECT

Project Cost Estimates Table 10

	Item	Local Financing 1000 Cr$	Foreign Financing US$	Total as US dollars
Transmission Lines				
1	Mascarenhas-Carapina 138 Kv-120 Km, add second circuit	1,264,536	155,400	730,189
2	Carapina-Alto Laje 138 Kv-25 Km, double circuit-one initially	893,006		405,911
3	Alto Laje-Cachoeiro 138 Kv, 110 Km single circuit	3,442,933	100,650	1,665,619
4	Areinha-Juca 69 Kv, 16.6 Km single circuit	318,940	7,475	152,447
5	Cachoeiro-Entronc Itabira 34.5 Kv, 13 Km, double circuit	330,873	7,436	157,834
6	Vitoria-Praia 34.5 Kv, 5 Km single circuit	104,638	4,575	52,138
7	Alta-Laje-Areinha 34.5 Kv, 7.5 Km double circuit	197,507	4,733	94,509
8	Cachoeiro-Fab. Itabira 34.5 Kv, 18 Km single circuit	279,596	5,148	132,236
9	Alto Laje-Vitoria 34.5 Kv, Improvements	56,069	4,200	29,684
10	Miscl. improvements other lines	29,700	1,500	15,006
	Subtotal Transmission	6,917,796	291,117	3,435,567

	Item	Local Financing 1000 Cr$	Foreign Financing US$	Total as US dollars
Substations				
11	Carapina Synchronous Cond Add 50 MVA and Improvements	1,736,837	899,584	1,689,056
12	Alto Laje-New 138 Kv and 34.5 Kv feeders and 5 MVA 34.5/69 Kv transformers	644,756	191,680	484,750
13	Guarapari Switching station (New)	158,649	41,835	113,948
14	Cachoeiro (New) two 12/15, 138/34.5/11.4 Kv	1,140,034	379,750	897,967
15	Praia-(New) 34.5 Kv feeder	58,379	10,254	36,790
16	Vitoria-add 7.5 MVA	437,516	74,150	273,020
17	Paul-add 3.75 MVA and Improvements	76,119	127,951	17,960
18	Campo Grange (New) 5 MVA 34.5/11.4 Kv	186,240	15,760	100,414
19	Fruteiras-(New) two 5 MVA 69/34.5Fv	455,856	63,600	270,867
20	Miscl. Improvements in other substations	44,000	20,000	40,000
	Subtotal Substations	4,990,218	1,714,573	3,982,871

	Item	Local Financing 1000 Cr$	Foreign Financing US$	Total as U.S. dollars
	Distribution Installations			
2[illegible]	Vitoria Vila Velha Cariacica - New Feeders Primary Network Improvements	473,931	116,094	333,540
22	Cariacica-Serra and Cariacica-Penha Primary Feeders	523,002	137,655	377,655
23	Vitoria-Vila Velha-Cariacica, Expand distribution network	707,670	125,583	447,291
24	Serra-Di[illegible] Primary Network Improvements	271,177	42,075	166,137
25	Cariacica & Itapemirim distribution network expansion	25,144	75,272	116,880
26	Vitoria-Vila Velha-Cariacica, Distribution network improvements	1,462,300	113,499	778,180
27	Cariacica & Itapemirim distribution network improvements	280,509	51,582	179,086
28	Vitoria, Vila Velha and Cariacica, transformers, capacitors, accessories	902,332	78,356	488,507
29	Serra, transformers and accessories	76,063	7,972	42,544
30	Cariacica & Itapemirim transformers and accessories	238,355	24,863	133,177
31	Meters	1,337,380		607,900
	Subtotal Distribution	6,394,649	725,623	3,632,249

		Local Financing 100 Cr$	Foreign Financing US$	Total as US dollars
Frequency Change				
32	Generation Installations	535,000		243,181
33	Transmission Installations	75,000		34,091
34	Engineering and design	185,000		84,091
	Subtotal-Frequency Change	795,000		361,363
Management and Operations				
35	Lab Equipment		75,608	75,608
36	Operations and Maintenance Equipment		150,000	150,000
37	Training		50,000	50,000
	Subtotal Management and Operations		275,608	275,608
	Total Distribution and Transmission	19,097,663	3,006,921	11,687,538
	Rounded	19 billion	$3.0 million	$11.7 million

Benefit Cost Analysis

I. Lower Grande Power

A. Porto Colombia Capital Cost Summary

	Item	Life in Years	Local Costs as dollars	Imports	Total Cost as dollars
1.	Land and damages, dam, intake, spilling	50	20,220,000	-	20,220,000
2.	Structures and Improvements Powerplant, penstocks, operator's village	50	5,430,000	-	5,430,000
3.	Turbines, generators and accessories, powerplant equipment	35	3,180,000	11,110,000	14,290,000
4.	Railroads, roads, bridges	50	400,000		400,000
5.	Contingency	-	3,360,000	950,000	4,310,000
	Total		32,590,000	12,060,000	44,650,000

Installed Capacity 270 Mw
Cost per Kw US$165

B. Transmission Cost Summary

	Life in Years	Total Cost as US$	Cost per Kw
1. 345 KV transmission Circuit Jaguara to Belo Horizonte with terminals	50	14,190,000	
Unit Cost at 400 MW			35.50
2. 230 KV transmission, Belo Horizonte to Illascarenhac with terminals	50	7,500,000	
Unit Cost at 150 Mw			50.00
3. Compensation and Syncronos Cendenser	25	1,500,000	
Unit Cost at 150 Mw			10.00
4. Step-up Sub at Porto Colombia	25	-	5.60
Unit Cost 150 Mw			
5. 345/230 Sub at Belo Horizonte	25	-	3.52
Unit Cost transmission and Subs			$104.52
Unit Cost Subs only			$ 13.27

Output Mascarenhas with three 38.5 Mw (115.5 Mw) units, average water year = 817 GWH
Transmission losses at 14% equivalent capacity from Lower Grande = 132 Mw

Share of Porto Colombia Investment 132 Mw @ $165/Kw = $21,400,000

Benefit Cost Analysis (Continued - 3)

C. Annual Cost Lower Grande Power

	Item	Annual Cost US x 1000
1.	Operation and Maint. $1.13/Kw x 132 Mw	149
2.	Replacement of generating equipment in 35 years (9% amortized in 50 years)	26.3
3.	Amortization of Capital in remaining life. (50 years from 1971)	2,096
	Annual Cost Lower Grande Generation	2,271.3
	Investment in share of transmission and Substations - Incremental Cost Jaguara - Ipatinga and Strengthening lines to Mascarenhas 132 Mw @ $104.52/Kw $13,800,000	
4.	Operation and Maintenance 132 Mw @ $1.90	251.0
5.	Replacement of Sub & Switching Equipment in 25 years	19.0
6.	Amortization of Capital	1,240.0
	Transmission Cost	1,510.0
	Cost Lower Grande Capacity Gen & Trans.	3,781.3
	Cost of Energy from Lower Grande- 3781.3/817 GWH	4.63 mills/kwh

Benefit Cost Analysis (Continued - 4)

II.

A. Mascarenhas Project Capital Cost (Adjusted to include same cost as Porto Colombia)

	Item	Life in Years	Total Costs as dollars	Imports	Total Cost as dollars
1.	Land and Indemnities railway relocation, resources, dam, spillway and waterways	50	7,720,000	-	7,720,000
2.	Powerplant, misc. equipment, operator's village, other structures	50	4,093,000	197,000	4,290,000
3.	Substation Equipment	25	903,000	1,010,000	1,913,000
4.	Turbines, generators and Accessory electrical equipment	25	2,590,000	7,120,000	9,710,000
5.	Contingencies		1,684,000	565,000	2,249,000
	Total Project Cost		16,990,000	8,892,000	25,882,000

Benefit Cost Analysis (Continued - 5)

B. Annual Cost Mascarenhas Power

Item	Annual Cos. US x $1,000
1. Operation and Maintenance 116 Mw @ $1.13	131,0
2. Replacement of Generating equipment in 35 years 9% amortized in 50 years	43.5
3. Replacement Substation equipment in 25 years 9% amortized in 50 years	20.2
4. Amortize of Capital in 50 years at 9%	2360.0
Cost Mascarenhas Power	$2,554.7
Cost of energy from Mascarenhas 2554.7/817 GWH	3.13 mills/KWH

$$\text{Benefit to Cost} = \frac{\text{Lower Grande Power}}{\text{Mascarenhas Power}} = \frac{4.63 \text{ mills/kwh}}{3.13 \text{ mills/kwh}} = 1.48$$

ANNEX IV

EXHIBITS

1.) Letter from CVRD

2.) Letter from MBR

MINERACOES BRASILEIRAS REUNIDAS S/A - "MBR"

Rio de Janeiro
April 19th 1966

CF-40/56

Mr. Leo Amaral Penna
President
Cia Auxiliar de Empresas
Eletricas Brasileiras
Av. Rio Branco, 135
Rio de Janeiro, GB

Mr. President:

In August last year we consulted ELETROBRAS regarding the possibility of your local subsidiary in the area of Vitoria (Espirito Santo) supplying the demand of our industrial enterprise of pelletizing iron ore. We are enclosing a copy of this inquiry but are certain that you have been informed by ELETROBRAS to whom, at that time, we addressed the inquiry, since we were in doubt regarding the entity which would supply the electric energy to the industrial area of the Tubarao port.

We take this opportunity to confirm and bring our inquiry up to date, having in view the position assigned to CAEEB in elaborating the electrification plan of the Espirito Santo State.

Our plans have now reached a stage where we are considering the construction of a pelletizing plant having a capacity of 2,750,000 tons annually. We are now in a position to give you more precise details regarding the supply of electric energy which we desire to receive from CCBFE, since we have concluded our negotiations which we had been conducting with the Cia Vale do Rio Doce.

These understandings led to locating the plant on a site to be placed at our disposal by them close to the railway terminal of the Tubarao port. The plant is to be constructed during the years 1967 and 1968 and should be placed in operation during the year of 1969.

The technology of the pelletizing process has already been selected and will result in a maximum demand of electric energy of 22,000 kwh/h at an estimated load factor of 85%, or an annual consumption of about 164,000,000 kwh.

The following enterprises are interested to participate, as shareholders, in this enterprise:

1.) Industria e Comercio de Minerios S.A. (ICOMI) (Manganese mining) in Amapa.
2.) Mineracoes Brasileiras Reunidas S. A. (MBR) (iron mining)
3.) Acos Anhanguera S. A., Sao Paulo, of the Grupo Cia Auxiliar de Empresas de Mineracao - CAEMI.

We would like to mention that our group is studying, although in preliminary form, a second enterprise in the area of the Tubarao port, consisting of a Steel Plant for exportation of iron ingots with a capacity of 2,000,000 tons production of steel per year.

Should the negotiations with regard to this enterprise be successful, we will communicate with you with regard to the possibility of a substantial increase in the electric power supply starting in 1971.

We hope that the present clarification will be sufficient for you to reach a decision with regard to the possibility of CCBFE supplying the above mentioned demand, and we take the liberty of stressing the importance of reaching a solution of the problem of electric power supply to the area of the Tubarao port so that the projects of the new enterprises may materialize.

We remain at your disposal to supply any additional information.

Truly yours,

Elieser Batista da Silva
(President)

Rio de Janeiro
May 27th 1966

A
Cia Vale do Rio Doce
Presidencia
Av. Graca Aranha, 26-2°and.
Rio de Janeiro - GB

P/E-291/66

Dr. Leo Amaral Penna
Presidente - Cia Auxiliar
de Empresas Eletricas Brasileiras

Dear Sir:

In accordance with the decisions reached at the meeting of May 24th 1966 in the office of ELETROBRAS, we are formalizing our request for the supply of electric energy at 60 cycles per second for the installations of CVRD at the port of Tubarao.

As established in this meeting, the supply will be made from the Carapina Substation at 132 kV, over a double circuit transmission line, which will be constructed by CAEEB up to the main substation at Tubarao.

The demand, already defined, of the system at the "Ponta de Tubarao", will be as follows:

6,000 kW starting April 1966
24,000 kW starting March 1968

with a probable annual consumption of 28,000,000 kwh between April 1966 and March 1968 after which, with the placing in service of the pelletizing plant for 2,000,000 tons annual production, the probable annual consumption will reach 128,000,000 kwh. The above time limit was specified because the delivery contract of the pelletizing plant, costing about US$ 10,000,000, was signed on

March 23d 1966 with the Austrian firm VOEST and stipulates initial operation after 24 months from this date.

However, although we have indicated above energy consumption as probable, we can guarantee a minimum consumption of 70,000,000 kwh between March 1968 and March 1969 and a minimum consumption of 100,000,000 kwh per year after this date.

We would like to point out that the short range expansion plans of CVRD contemplate the expansion of the pelletizing plant up to an annual production of 4,000,000 tons, which will increase the demand of 42,000 kW and the probable annual consumption to 228,000,000 kwh. The long range plan of CVRD includes the expansion of the pelletizing plant to a limit of 12,000,000 tons a year.

Based on the above, as well as in accordance with previous discussions, we request you to take the necessary steps so that in March 1968 we may count on a supply of 24,000 kw or 42,000 kW at the "Ponta de Tubarao", Espirito Santo.

Awaiting your early confirmation we remain,

Yours truly,

Oscar de Oliveira
President

LOAN AUTHORIZATION

Provided From: Alliance for Progress Funds
BRAZIL: CCFBE: (Mascarenhas Hydro-Electric)

Pursuant to the authority vested in the Administrator, Agency for International Development (hereinafter "A.I.D.") by the Foreign Assistance Act of 1961, as amended, and the delegations of authority issued thereunder, I hereby authorize the establishment of a loan pursuant to Part I, Chapter 2, Title VI, Alliance for Progress, of said Act to Companhia Central Brasileira Forca Electrica ("Borrower") of not to exceed thirteen million three hundred thousand United States dollars ($13,300,000) to assist in financing the United States dollar costs of a project for the construction of a hydro-electric plant at the Borrower's site on the Doce River in the State of Espirito Santo, the construction of transmission lines and sub-stations, the improvement of related electrical distribution facilities, and related engineering services. This Loan shall be subject to the following terms and conditions:

1. Interest and Terms of Repayment.

(a) Borrower shall repay the loan to A.I.D. in United States dollars within twenty-four (24) years from the first disbursement under the loan, including a grace period of not to exceed four (4) years. Borrower shall pay to A.I.D. in United States dollars on the disbursed balance of the loan interest of five and one-half (5½%) percent per annum.

(b) If prior to the end of the grace period the Government of Brazil ("Government") so elects, the Borrower shall fulfill its dollar obligation under the loan by paying to Government in currency of Brazil the equivalent, determined as of a time and in a manner satisfactory to A.I.D., of the United States dollar amounts payable to A.I.D. under (a) above and in such event Government shall pay to A.I.D.:

(i) the equivalent in United States dollars, determined as of the time and in a manner calculated to obtain repayment of all dollars disbursed plus interest, of all amounts paid to Government as follows:

(a) all interest immediately upon receipt subject to Government's right to retain all payments in excess of one percent (1%) per annum during a grace period of not to exceed ten (10) years from the first disbursement under the loan ("Government grace period") and all payments in excess of two and one-half percent (2½%) per annum thereafter.

(b) principal within forty (40) years, including the Government grace period.

(ii) interest in United States dollars of one percent (1%) per annum during the Government grace period, and two and one-half percent (2½%) per annum thereafter on all amounts of outstanding principal paid by Borrower to Government from the respective dates of such payments of principal.

2. Other Terms and Conditions:

(a) Equipment, material, and services financed under the loan shall be procured from the United States of America.

(b) The loan shall be guaranteed by a guarantor satisfactory to A.I.D.

(c) Borrower shall employ qualified technical consultants satisfactory to A.I.D., to advise and assist in carrying out the Project.

(d) Prior to first disbursement under the loan for other than engineering services, Government shall provide to the Borrower such approvals or permits for the importation of goods and services from the United States, as Borrower or A.I.D. may deem necessary.

(e) The loan shall be subject to such other terms and conditions as A.I.D. may deem advisable.

Deputy U.S. Coordinator
Alliance for Progress

Date