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OED Report: Electric Power - Ch. 12 - CVC/Chidral - Colombia

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CHAPTER XII - CVC/CHIDRAL - COLOMBIA

I. Introduction

1.01 The Central Hidroelectrica del Rio Anchicaya Ltda. (CHIDRAL) was organized under Colombian law in 1944[1/] and was given full rights to the power development of the Anchicaya River, near Cali. The power entity was established as a commercial company of limited liability with the national, departmental, and municipal governments as the only shareholders and holding, respectively, 51%, 23%, and 26% of the original share capital. In 1955, the Corporacion Autonoma Regional del Cauca (CVC) was established as a regional development agency, set up along the lines of the U.S. Tennessee Valley Authority, to coordinate the overall development of the natural resources of the Cauca Valley (including Cali). As this overall development naturally included development of power resources, it was logical that the efforts of the two entities, CVC and CHIDRAL, should be themselves as closely coordinated as possible. In practice, however, consolidation of the two entities has proved quite difficult. In 1958, the National Government transferred its majority shareholding in CHIDRAL to CVC, but the two affiliates still maintain their own boards of directors, general managers, and financial accounts. Under the present system CVC carries out the planning of new projects, enters into contracts for their construction, and upon completion turns them over to CHIDRAL for operation. The difficulty in differentiating between fixed assets under construction and in operation, and the recurrent inconsistencies between the financial statements prepared by

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1/ Reorganized on the same basis in 1950.

the two entities have made it hard to evaluate the performance of the CVC/CHIDRAL complex; for the purposes of this study the performance of CHIDRAL is defined to include all joint CVC-CHIDRAL power development programs, and exclude CVC's own (negligible) separate electric power operations.

1.02 Shortly after CHIDRAL was organized it began construction of the Anchicaya hydroplant with a planned ultimate capacity of 90 MW, but construction had to be halted in 1948 due to unsatisfactory foundation conditions which rendered the original design unsuitable. By the end of 1950, the dam had been redesigned and a loan application for financing by the Bank had been approved; the first two 12.0 MW units came into operation in July, 1955. This was the first of five IBRD loans to CHIDRAL which, by 1970, had helped to finance 217 MW (or 87.5%) of CHIDRAL's total 248 MW of installed capacity.

1.03 All power generated by CHIDRAL is sold in bulk to retail distributors, by far the most significant of which is the Empresas Municipales de Cali (EMCALI), serving the city of Cali. CHIDRAL has also sold a smaller portion of its energy since 1961 to CVC, which, in addition to coordinating CHIDRAL's expansion program and executing major parts of it, has itself a small retail electric energy distribution operation covering smaller towns in the Cauca Valley. Since 1964, CVC's purchases have comprised about 20% of CHIDRAL's total sales. In addition, the Corporacion de Electricidad Colombiana (COEDEC) has purchased in recent years, through CVC, about 3% of CHIDRAL's bulk energy.

1.04 Cali is the third largest city in Colombia, and the surrounding Valle Department is considered to be the country's richest agricultural region. In 1968, the Valle Department (including Cali) accounted for about 23% of the country's total industrial value added and consumed in 1970 about 828 million Kwh of electricity or about 14% of Colombia's total electricity consumption. For various reasons discussed below, CHIDRAL (and CVC) has been unable to meet the demand for energy in the region. The company has had to rely upon expensive thermal generation and energy purchases from other systems to a greater extent than the other three major systems of the country (EEEB, EPM and CHEC). It is therefore likely that CHIDRAL will be a prime beneficiary of the expected operating economies resulting from interconnection of the four major systems under Interconexion S.A., which is scheduled to occur in late 1971.

II. The Association between the Bank and CHIDRAL

2.01 CHIDRAL was the first power utility in Colombia to receive an IBRD loan. The loan (38-CO), which was extended in 1950, was also the second loan to Colombia. This indicates the Bank's early recognition of the urgent need for developing electric power resources in order to increase the electricity supply to Cali and the overall Valle Department. Four additional loans were made to CHIDRAL (and CVC) between 1955 and 1963, demonstrating the Bank's continuing concern for this area. The five IBRD loans made to CHIDRAL (including the loans jointly made to CVC) are as follows:

Loan No.	Date of Loan Agreement	Effective Date	Closing Date	Amounts ($ mln) Committed	Amounts ($ mln) Disbursed	Interest %	Period (years) Grace	Period (years) Term
38-CO	11/50	2/51	3/55	3.53	3.53	4	4	20
113-CO	3/55	6/55	12/58	4.50	4.50	4 3/4	4	20
215-CO	12/58	1/60	4/63	2.80	2.80	5 3/4	2	20
255-CO	5/60	10/60	3/66	25.00	25.00	6	3	25
339-CO	6/63	10/63	12/65	8.80	8.80	5 1/2	3	20
TOTAL				44.63	44.63			

2.02 By the end of World War II the power supply situation in Cali was critical -- the Empresas Municipales de Cali owned a few small hydro and diesel units which by 1944 were already inadequate to meet the growing power demand of the city. For this reason, as mentioned previously, CHIDRAL was established to develop the electric power resources of the Anchicaya river and began to build the Anchicaya hydroplant. A preliminary loan request for aid in financing the project was presented to the Bank in 1948; due to difficult geological conditions, however, CHIDRAL was forced to redesign the dam and the project was not actually ready for Bank consideration until 1949. Late in 1949 the Bank's General Survey Mission to Colombia confirmed the priority of the project. In early 1950 the company was notified that, prior to any loan agreement, (a) adequate measures should be taken to raise the company's share capital by approximately Ps. 6 million to cover the local currency amount required to complete the project, and (b) satisfactory contracts should be agreed upon by CHIDRAL

and the Municipality covering the terms and conditions under which electricity would be sold to the city. Under this agreement, CHIDRAL would acquire two old municipally-owned diesel plants so as to become the only supplier of electric energy to the city of Cali, while EMCALI would remain responsible for distribution. The loan for US$ 3.53 million was signed on November 2, 1950 although it did not become effective until the previous two conditions were met in February 1951.

2.03 The first two 12 MW units at Anchicaya, however, were not commissioned on schedule and the critical electricity shortage in Cali grew increasingly worse, particularly as Cali was by that time the fastest growing city in Colombia. By 1954 a rather considerable backlog of demand had built up due to the fact that CHIDRAL had been forced by the circumstances to refuse new residential and commercial connections and industrial enterprises had been forced to install their own generating plants. The interim report on the Colombian National Electrification Plan[1/] in 1954 recommended the immediate expansion of the generating facilities of CHIDRAL's system by at least 32.5 MW, in addition to the expeditious completion of the first (24 MW) stage of Anchicaya.

2.04 In April 1954, the Bank was requested to finance the foreign exchange costs of CHIDRAL's proposed expansion program which called for the installation of a third 20 MW[2/] unit at Anchicaya and the construction

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1/ Power survey made by Gai Pan American Corporation (GAIPAN), a subsidiary of Gilbert Associates of New York, and by the Colombian Technical Mission, a combination of Gibbs and Hill of New York and Electricite de France.

2/ Due to a favorable option from the supplier, EMCALI decided to purchase from its own funds a fourth unit (20 MW) which was also installed.

of a 12.5 MW thermal plant at Yumbo, an industrial suburb of Cali. After consultation with the National Planning Department on the immediate necessity of building the thermal plant, the Bank decided to go ahead with the project as presented. Negotiations were completed shortly thereafter and Loan 113-CO for US$4.5 million was signed on March 24, 1955, but a verbal agreement was reached that the company would negotiate for higher tariffs in the near future, and loan effectiveness was made conditional on two steps:

(a) CHIDRAL was to obtain from the Municipality of Cali assurances satisfactory to the Bank that the municipal electric distribution system would be expanded "to a capacity sufficient to distribute all energy generated by the borrower".

(b) Arrangements satisfactory to the Bank would have to be made to secure the local currency needed for expenditures in 1955 and 1956.

2.05 In October 1954, at the Bank's recommendation, the President of Colombia established CVC as a regional development agency for the Cauca Valley, and its charter was approved in June 1955. By the end of that year, CVC had made its first request for a Bank loan to cover the foreign exchange costs of the proposed Calima Hydroelectric Plant, while CHIDRAL had simultaneously requested Bank financing for a second unit (12.5 MW) to be added to the Yumbo plant already under construction under Loan 113-CO.

However, the Bank's two-year suspension of consideration of new loans to Colombia, due to the country's deteriorating economic and political situation, precluded further consideration of either project until 1958.

2.06 After the resumption of normal relations between the Bank and Colombia in that year, CVC had changed its position, in view of modification to its initial Calima scheme, and now supported early construction of Yumbo 2, but with the important qualification that --to establish its position in the power field firmly-- it be the loan recipient rather than CHIDRAL. The complexity of the negotiations between the Bank, CVC, and CHIDRAL in this regard is indicative of the generally difficult relations between the two companies, especially with regard to the transfer of assets and operating responsibility.

2.07 Since, however, CVC had as yet little experience in the power field, and since the transfer of the Government's share in CHIDRAL to CVC had been effected satisfactorily, indicating possibly improved coordination between the companies in the future, the loan for Yumbo 2 (215-CO) was ultimately extended to CHIDRAL. The project consisted of a second 10 MW addition to Yumbo, enlargement of substations in Cali and Yumbo, a dredge for the Anchicaya reservoir, studies on a possible third unit at Yumbo, and $550,000 to be re-lent to EMCALI for improvement of the distribution system. There were three conditions to effectiveness placed upon the US$2.8 million loan as follows:

(a) EMCALI was to agree to furnish all funds, local and foreign, in excess of the amount provided above to complete the distribution program. 1/

(b) Authorization of an "appropriate" increase in tariffs (not less than 30%) for both CHIDRAL and EMCALI by the Government.

(c) Debts of CHIDRAL to the Colombian Stabilization Fund and the Bank of the Republic were to be assumed by CVC. 2/

2.08 The last two IBRD loans for development of the power resources of Cali and the Cauca Valley (255-CO and 339-CO) were made to CVC and CHIDRAL jointly on the understanding that CVC would be the planning, design, and construction supervisor, while CHIDRAL would be the operating entity. Conditions were specified under which the facilities financed by the loans were to be transferred to CHIDRAL. Projects included in the first of the two joint loans (255-CO) consisted of:

(a) addition of a 33 MW unit to the existing Yumbo Thermal plant (Yumbo 3) to meet immediate demand requirements.

(b) construction of the 120 MW Calima I hydroplant with the initial installation of two 30 MW units.

1/ Construction of a distribution ring about Cali.

2/ This was accomplished by act of Law 25 of May 1959 in which CVC assumed these debts (some Ps. 7.7 million) in return for a like increase in its share of CHIDRAL's share capital.

(c) expansion of the distribution networks in Cali, and also in 9 smaller towns and 16 villages which were the responsibility of CVC.

(d) construction of a 154 kilometer 115 kv transmission line through the central part of the Cauca Valley between Yumbo and Cartago, which would connect the CVC-CHIDRAL system with that of CHEC. 1/

The amount of the loan was US$25.0 million of which Yumbo Unit 3 was to represent $4.4 million and Calima I (including Units 1 and 2) was to represent $14.5 million.

2.09 Conditions and covenants included in the loan, aside from that dealing with transfer of assets previously mentioned, were principally aimed at encouraging CHIDRAL to raise sufficient funds to finance the projects' local currency costs. The two financial covenants were that (1) CHIDRAL should seek to maintain its tariff rates at a level adequate to provide a reasonable operating surplus to finance new investments, and (2) that in the event CHIDRAL was unable to do so, CVC would provide the funds necessary to carry out the project. In addition, it was agreed that CHIDRAL would have its accounts audited annually by an outside source, and that whether or not a new loan was granted, the company would not incur new debt without the Bank's consent if at the time of considering such borrowing the company's actual revenues of the previous twelve months were less than 1.3 times the size of its current plus proposed debt service. This understanding replaced earlier agreements that the

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1/ The Central Hidroelectrica de Caldas, serving Manizales.

company's debt/equity ratio should not exceed 50/50 because this previous arrangement had proved to be unrealistic.

2.10 While construction of the third unit at Yumbo was carried out efficiently [1/] and operation began as scheduled, many difficulties arose in connection with the construction of Calima which ultimately delayed the plant's commissioning by about two years and resulted in total cost overruns of some 46%. For this reason a new loan, 339-CO, for US$8.8 million, was negotiated between CVC/CHIDRAL and the Bank to finance the foreign exchange costs of completing Calima I (expanded to include Units 3 and 4 of 30 MW each), associated distribution expansion, and construction of a 115 kv transmission line between the Anchicaya power station and the seaport of Buenaventura. Covenants were essentially the same as under the previous loan except that they were more specific, providing that: (1) tariff rates should be raised as soon as possible and, in any case, not later than August 31, 1963; (2) CHIDRAL was expected to finance, from internally generated funds, a significant portion of its power expansion program, increasing from 10% in 1963-65 to 30% by 1968-70.

2.11 Since Loan 339-CO, the Bank has not participated actively in financing CVC/CHIDRAL's expansion program, although it was approached in 1964 to cover further overruns on Calima I and a fourth unit at Yumbo, in 1965 to participate in building the proposed Calima II hydroplant, and in 1967 to finance the Alto Anchicaya project. Although the Bank refused to consider loans on the first two projects because it was dissatisfied with the National Government's policies toward necessary tariff increases and had some doubt about the feasibility of the projects,

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1/ Even involving savings of some US$0.7 million below the forecast cost.

it probably would have financed the Alto Anchicaya hydroplant now under construction had the IDB not expressed its desire to do so.

III. Major Issues

Coordination of Investment in the Sector

3.01 Public electricity in Colombia is almost entirely supplied by four entities: EEEB serving Bogota, EPM serving Medellin, CVC/CHIDRAL serving Cali and the Cauca Valley, and the Instituto Colombiano de Energia Electrica (ICEL), a government holding company which controls 15 subsidiary power companies serving 20 of the 29 Departments not served by the aforementioned three major companies. The isolated nature and overly-emphasized independence of the various systems, coupled with inadequate delineation between the jurisdiction of the power companies, have led to creation of a social and financial gap between the large companies serving privileged markets, on the one hand, and the numerous small entities serving areas of generally uneconomic size [1/] on the other. This gap has, in turn, led to misallocations and inefficient uses of resources.

3.02 In concentrating its lending on the four main population centers, the Bank has contributed to widening this gap -- of the 17 loans representing US$294.1 million to the sector, 13 loans representing US$216.4 million have gone to the companies serving these four areas. This may have been unavoidable given the power sector's set-up in Colombia at the time. One of the major reforms introduced in recent years, however, has been the creation of two new companies, Interconexion Electrica S. A. (ISA) and Corporacion

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1/ Basically, the subsidiaries of ICEL with the notable exception of CHEC (Central Hidroelectrica de Caldas) serving Manizales.

Electrica de la Costa Atlantica (CORELCA), for the purpose of interconnecting major parts of the national electric network. The role of the Bank was quite important on this issue, particularly with regard to ISA; by refusing to consider lending for new power projects in Colombia after 1963, except those planned within the framework of interconnection, the Bank was able to exert the necessary pressure to bring the major parties (EEEB, EPM, CVC/CHIDRAL, CHEC) to agreement. CHIDRAL is expected to be one of the major beneficiaries of the improved electric service and nationally coordinated expansion planning these organizations promise.

Tariffs

3.03 Rate adjustments in Colombia are authorized by the National Government which for political reasons has often been most reluctant to grant them. For this reason electricity tariffs in Colombia have traditionally been among the lowest in the world. The situation is further complicated in the case of CHIDRAL since EMCALI has control over CHIDRAL's Board of Directors in matters regarding tariff policies, and it has been exceedingly difficult for CHIDRAL even to submit applications to the National Government for tariff increases. 1/

3.04 The difficulties encountered by CHIDRAL in connection with tariff increases are partly responsible for the poor financial performance of the company, especially in 1955, 1958-59, 1963-64 and 1966. Over the last twenty years, the Bank has firmly insisted that adequate tariff increases be regularly implemented, but only on the occasion of the

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1/ EMCALI, the city-owned distributor, has always been reluctant to increase its own tariffs because of feared local political repercussions such as the street riots of 1969.

third loan (Loan 215-CO) was such an increase made a condition of loan effectiveness. In the first loan (38-CO) no covenant at all[1/] regarding tariff increases was made and in the second loan (113-CO) simple verbal assurances by CHIDRAL that an appropriate tariff increase was to become effective shortly were accepted (in fact, however, no increase came about until a Bank staff member was sent to Cali to discuss the matter -- one year later). More than a year elapsed between signature and effectiveness of the third loan as a result of delay on tariff action. The last two loans (255-CO and 339-CO) did include conditions specifying that CHIDRAL should seek to maintain an adequate level of tariffs, but on the whole it seems that the Bank has taken a rather easier position on the tariff issue with CVC/CHIDRAL than with EEEB or EPM. Given the institutional set-up of electric power in Cali, the Bank should probably not have hesitated to deal directly with EMCALI on the tariff issue.

3.05 Although adequate financial statistics regarding the self-financing ability of CVC/CHIDRAL are not available and no definite conclusions on this matter can be drawn, it is possible to observe that, in view of the substantial National Government subsidies the complex has received, CVC/CHIDRAL's own contribution to its expansion program has been quite low and the company has not been able to achieve the self-sufficiency and independence of EPM and EEEB. This is largely due to the aforementioned difficulties the company has had in securing tariff increases. Some improvement in securing tariff increases and consequently

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1/ The contract between CHIDRAL and EMCALI included a provision for tariff adjustments to reflect the devaluation of the peso in relation to the dollar, and financial projections in the appraisal were based on this, but it was not a Bank covenant as such.

in the company's financial performance, has occurred in recent years; CHIDRAL's average revenue per kwh sold was only US¢0.7 equivalent in 1966 compared to US¢1.1 for EEEB and US¢0.9 for EPM, but rose to US¢1.1 by 1969 -- identical with the levels of EEEB and EPM. Furthermore, the recent creation of the governmental tariff regulatory agency, the Junta Nacional de Tarifas de Servicios Publicos, implies that more objective criteria may be used in determining the level of tariffs for CHIDRAL and other Colombian utilities by the Government in the future.

Project Financing

3.06 The financial difficulties of CHIDRAL and, later on CVC/CHIDRAL, stemmed partly from the high cost of power development in the Cauca Valley. Most hydrosites there proved difficult and expensive to harness. The two hydrosites developed to date, i.e. Anchicaya and Calima I, have yielded unit capital costs per KW installed of $387 equivalent[1/] and $378 equivalent[1/] respectively, as against a range of $160 to $250 for hydroplants in the case of EEEB and EPM. CHIDRAL had to include expensive thermal plants to complement its generating system. Such high investments have necessitated extensive borrowing. Between 1950 and 1968, when the IDB extended a loan to finance the Alto Anchicaya hydroelectric plant, the Bank remained CVC/CHIDRAL's sole source of foreign financing with a total disbursed amount of $44.63 million. Local currency financing was especially problematic, for there were long delays in securing additional

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1/ Including transmission.

capital contributions from the stockholders and adequate tariff increases.

3.07 Local expenditures on CHIDRAL's expansion program were mainly financed through repeated increases in share capital subscribed by the three shareholders, namely CVC,[1/] the Department of Valle and the Municipality of Cali. CHIDRAL's original paid in share capital was Ps. 1.5 million in 1950, increasing to Ps. 64 million in 1960 and Ps. 105 million by 1969 (or Ps. 18 million in 1950 prices). Ever since its first loan to CHIDRAL in 1950, the Bank has taken a firm position on the necessity for the Company to regularly increase its share capital to cover local expenditures on its investment program: effectiveness of the first four loans was conditioned upon such an increase. In connection with the last two loans, it was agreed that CVC would provide CHIDRAL with the necessary funds to carry out the project if funds available to CHIDRAL became inadequate. Despite these measures, the Company found itself short of funds on many occasions during project implementation. In 1953, during the construction of Anchicaya, CHIDRAL had to borrow Ps. 4 million on a medium term basis from the Government Fondo de Estabilizacion; the first repayment on that loan had to be postponed by one year because of the Company's tight financial situation. At the end of 1953, the Bank turned down the Company's request for permission to accept a new loan from the same Fondo de Estabilizacion, for it considered that the resultant debt load would be more than could

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1/ In 1957, the shares held by Electraguas on behalf of the National Government had been transferred to CVC which now holds about 65% of CHIDRAL's share capital.

be considered prudent under the circumstances. The Bank kept insisting that actual expenditures be met from increased share capital and additional share subscriptions were obtained at the end of 1954 totalling Ps. 11.4 million, about Ps. 4.9 million above the most recent estimate of remaining expenditures to be made on Anchicaya.[1/]

3.08 In spite of a new Ps. 1.7 million increase in share capital and an additional amount of Ps. 15.0 million secured from local banking institutions, CHIDRAL found itself in a critical financial situation during the implementation period of its second expansion program (Loan 113-CO). The main reasons for this were: (a) the accumulation of expensive short term borrowing; (b) the construction and ordering of equipment for Yumbo 2 on a cash basis because financing could not be secured;[2/] (c) the devaluation of the peso in 1957, which nearly tripled the service of the foreign debt; and (d) the continued inflationary increase in operating costs.

3.09 Medium and short term debts reached a point where CHIDRAL could no longer carry them even with a substantial increase in tariffs and with the forthcoming Bank loan (Loan 215-CO). For this reason the Bank required that, as a condition of effectiveness to the new loan the debts then owed to the Fondo de Estabilizacion and the Banco de la Republica should be

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1/ In December of 1954, the Municipality of Cali had transferred to the ownership of CHIDRAL the last of its diesel plants in exchange for shares to the value of Ps. 1.5 million; the same procedure was followed later on when the Municipality decided to contribute US$510,000 for the purchase of the fourth unit at Anchicaya (which had not been provided for in Loan 113-CO).

2/ The unit was financed the following year through Loan 215-CO.

discharged or assumed by others. CVC agreed to take over some Ps. 7.7 million of CHIDRAL's debt[1/] in return for additional shares and also to extend a new Ps. 5.5 million medium term loan.

3.10 The financial situation of CHIDRAL, although it had improved substantially by 1960, remained somewhat fragile. As a condition to Loan 255-CO (May 1960), the Bank required once again that all debts currently owed by CHIDRAL to CVC be converted into equity. During negotiations, it was also agreed that local currency needs, other than those met from internal generation, would be met by equity contributions or non-interest bearing advances from CVC. CHIDRAL found itself once more in financial straits in 1964 and 1965 as a result of the large cost overrun on Calima; the debt/equity ratio which rose to 72/28 in 1964 has remained high ever since, reaching 78/22 in 1968. Also, the Colombian Government failed to live up to its agreement to permit rates to be raised and provide adequate local currency financing for the project. Finally, CVC found its revenues from land taxes to be less than had been expected at the time when Loan 255-CO was made, because the properties on which this tax was assessed were revalued more slowly than anticipated by the responsible agency of the Central Government. The Bank refused to provide additional funds to cover the cost overruns on Calima and the financing of new power developments proposed by CVC, in order to urge the Government to fulfill its obligations under the existing loans. The rigid attitude

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1/ The actual amount taken over by CVC was reduced to Ps. 7.0 million and was matched by a corresponding reduction in the amount of its equity share increase.

adopted by the Bank forced CVC to secure foreign currency funds necessary to complete Calima from other sources; credits secured from suppliers and contractors were especially expensive, however, and the corresponding debt was paid off only recently.

Financial Performance

3.11 For the many reasons discussed above, CHIDRAL's financial performance has been disappointing on the whole and no improvement seems to have taken place over the years. The table below presents a summary of some of the most relevant financial indicators:

Table 12.1

CVC/CHIDRAL - EVOLUTION OVER TIME OF SOME FINANCIAL INDICATORS

Year	Average Cost per kwh sold (1968 centavos) a/	Average Revenues per kwh sold (1968 centavos) a/	Average Profit per kwh sold (1968 centavos)	Rate of Return on non-revalued Assets %	Rate of Return on revalued Assets b/ %	Debt/ Equity Ratio
1955	9.2	17.1	7.9	n.a.	n.a.	34/66
1956	6.9	14.8	7.9	6.6	6.4	35/65
1957	9.0	13.3	4.3	7.8	3.4	55/45
1958	10.6	11.4	0.8	4.4	0.6	53/47
1959	9.7	10.2	0.5	3.4	0.4	48/52
1960	8.4	15.0	6.6	12.8	6.3	46/54
1961	8.4	13.8	5.4	10.5	5.6	48/52
1962	7.7	13.0	5.3	11.1	6.5	63/37
1963	9.3	10.7	1.4	6.3	2.0	68/32
1964	8.6	9.2	0.6	4.1	0.9	72/28
1965	9.3	12.2	2.9	9.6	3.7	70/30
1966	11.6	10.6	-1.0	6.5	neg.	69/31
1967	10.0	12.9	2.9	5.7	2.5	77/23
1968	9.6	14.3	4.7	7.6	3.7	78/22
1969	10.2	17.0	6.8	9.2	4.2	69/31

a/ Including revalued depreciation. See footnote b/.
b/ For Revaluation of Assets see Annex 1.

3.12 The table indicates that average revenues per kwh in real terms have experienced considerable fluctuations over the years, following the general inflationary trends in the economy and reflecting the several tariff increases implemented at various times. It is only after 1967 that a clear upward trend of such revenues began to appear. Fluctuations in the average unit costs were much less marked and the variations in the average rate of profit therefore mainly reflect the variations in revenues. Between 1960 and 1965, the increases in total costs were almost entirely due to rising expenditures on fuel: the share of such expenditures in total costs rose from 4.5% to 42% over the period. Fuel cost per kwh generated in thermal plants rose steadily from 5 centavos[1/] in 1960 to 8 centavos[1/] by 1965, a trend probably attributable entirely to the rising costs of coal and diesel fuel. Total expenditures on fuel dropped in 1966, following the commissioning of the first two units at Calima; in that year, the share in total costs held by depreciation reached 52%, as against 27% in the previous year.

3.13 Until 1965, the operating costs of CHIDRAL were directly related to fuel consumption, indicating the limited level of economies of scale in the system. Average cost per kwh rose after 1965, reflecting both the high depreciation provision for Calima, as well as the need to supplement local generation with purchases from elsewhere, and established itself at 10.2 centavos[1/] in 1969, a value comparable to that which had prevailed in 1958.

1/ In 1968 prices.

3.14 All the financial indicators appearing in Table 12.1 suggest that CHIDRAL has been operating at the limit of financial viability. The rate of return on revalued assets has remained very low, being generally less than 5% except for a brief period in the early 1960s, less than 1% in several years, and even negative in 1966. Between 1962 and 1967, financial performance bore the print of the high expenditures on Calima and it appears that the financial efficiency of the Company today is more or less comparable to that existing in 1955, not accounting for the heavy debt load which has built up since 1962. The debt/equity ratio rose from 34/66 in 1955 to 78/22 in 1968, despite major increases in share capital over the period. A slight recovery seems now to be taking place in this connection. Figures on debt service coverage are only available until 1962 and, from the figures shown (See Table I at end of chapter), it appears clearly that CHIDRAL has not been able to cope with the debt incurred to cover the high investments that have been necessary for the expansion of its system. Between 1950 and 1959, about 75% of local currency expenditures were met by contributions from the Company's shareholders and the balance by internal cash generation, yielding an average self-financing rate over the period of only about 14%.

Delays and Cost Overruns

3.15 Although delays in the commissioning of the three Yumbo thermal units have been negligible, considerable problems were encountered by CHIDRAL in commissioning its hydroplants, Anchicaya and Calima I.

3.16 The delay of nearly two years in commissioning the first two units of Anchicaya was mainly due to technical difficulties caused by a landslide at the site. This, in connection with difficulties encountered in importing equipment for the second stage of the Anchicaya program, contributed to substantial cost overruns for the project as a whole. A detailed breakdown of the forecast and actual project costs is presented below, but it was impossible to make a distinction between the foreign exchange and local currency components:

Table 12.2

CVC/CHIDRAL: LOANS 38-CO, 113-CO AND 215-CO - FORECAST AND ACTUAL COST OF PROJECTS (IN US$ EQUIVALENT)

Loan 38-CO[a]	FORECAST	ACTUAL	OVERRUN[b]
Anchicaya hydro plant	6.27	12.32	6.05
Cali Substation	0.19	0.20	0.01
Transmission Lines	0.61	0.25	(0.36)
Interest during Construction	0.27	0.80	0.53
Others	0.59		
Contingencies	0.17		
Total	8.10	13.57	

Loan 113-CO	FORECAST	ACTUAL	OVERRUN[c]
Third Anchicaya hydro unit	2.10	5.16	3.06
Substation expansion	0.63	1.72	1.09
First Yumbo thermal unit	2.91	4.37	1.46 [d]
Interest during Construction	0.56	0.63	0.07
Contingencies	0.63		
Total	6.83	11.88	

Loan 215-CO	FORECAST	ACTUAL	OVERRUN
Second Yumbo thermal unit	1.24	1.29	0.05
Enlargement of substations	0.23	0.25	0.02
Dredge and auxiliary equipment	0.40	0.39	(0.01)
Completion of distribution ring for Cali[e]	0.55	0.55	-
Miscellaneous studies and services	0.54	0.24	(0.03)
Contingencies	0.17		
Total	3.13	2.72	

a/ Additions to projects already under construction.
b/ Overruns were financed by an increase of share capital of Ps. 6.0 million (3.5 million to Electraguas and 2.5 million to the Department of Valle), an Electraguas loan of Ps. 3.0 million and three short term loans from the Stabilization Fund amounting to Ps. 2.5 million.
c/ Local currency costs were about 300% over original estimates due to substantial increases in labor costs and prices of materials.
d/ Partly due to enlargement of Yumbo's coal facilities over original plan.
e/ Foreign exchange costs only -- local currency costs met by EMPRESAS MUNICIPALES DE CALI, the distributor.

Source: CVC/CHIDRAL, IBRD.

3.17 Major problems arose in connection with the last two loans, 255-CO and 339-CO, principally due to technical and financial difficulties encountered during the construction of the Calima hydroplant. In fact, Loan 339-CO was largely made for the purpose of covering part of the cost overruns on the project as well as to expand the plant to four units instead of the originally planned two.

3.18 There were four main reasons for delays on the Calima plant: (a) a two-month strike organized by the labor union against the project contractor in April-May 1962, (b) the contractor's poor organization and inadequate equipment at the start of construction, (c) technical problems in connection with the poor quality of the bedrock and the deficient supply of raw materials for the dam core, (d) time consuming negotiations with the National Government and various financing institutions (including the IBRD) in order to cover the cost overruns occasioned by the first three items. Overall delay in the construction of the plant amounted to about two years[1/] and the total cost overrun reached about US$16.5 million equivalent,[2/] i.e., 46% over the amount forecast by the two loans, including contingencies. A detailed breakdown of the forecast and actual cost of items covered by the last two loans to CVC/CHIDRAL is presented below:

1/ Resulting in power shortages in 1964 and 1965.

2/ Excluding Transmission.

Table 12.3

CVC/CHIDRAL -- Loans 255 CO and 339 CO -- Forecast and Actual Construction Costs

	Foreign Exchange Component ($ million)			Local Currency Component ($ million equiv.)			Total Project Cost ($ million equiv.)		
Loan 255 CO	Forecast	Actual	Overrun	Forecast	Actual	Overrun	Forecast	Actual	Overrun
Third Yumbo thermal unit	4.19	3.70	(0.49)	1.04	2.77	1.73	5.23	6.47	1.24
Calima I hydro plant	13.18	16.01	2.83	6.65	8.19 c/	1.54	19.83	24.20	4.37
Transmission and substations	4.36	4.71	0.35	2.47	9.39	6.92	6.83	14.10	7.27
Distribution	0.91	1.20	0.29	-	2.73	2.73	0.91	3.93	3.02
Unallocated	0.30			-			0.30		
Contingencies									
- for Yumbo	0.21			0.20			0.41		
- for Calima	1.32			1.33			2.65		
- for Transmission	0.44			0.50			0.94		
- for Distribution	0.09			-			0.09		
Total a/	25.00	25.62		12.19	23.08		37.19	48.70	

Loan 339 CO	Forecast	Actual	Overrun	Forecast	Actual	Overrun	Forecast	Actual	Overrun
Completion of Calima I with 4 units	4.00	5.64	1.64	1.82	12.35 d/	10.53	5.82	17.99	12.17
115 Kv Anchicaya -- Buenaventura Transmission line	0.35	0.28	(0.07)	0.16	0.11	(0.05)	0.51	0.39	(0.12)
Cali Distribution b/	1.00	0	(1.00)	0.20	n.a.	n.a.	1.20	n.a.	n.a.
Coal mine equipment	0.42	0.50	0.08	-	-	-	0.42	0.50	0.08
Engineering and power planning studies	1.85	2.10	0.25	-	1.61	1.61	1.85	3.71	1.86
Interest during construction	0.40	0.28	(0.12)	-	-	-	0.40	0.28	(0.12)
Contingencies									
- for Calima I	0.40			0.18			0.58		
- for Transmission line	0.05			0.04			0.09		
- for coal mine equipment	0.08			-			0.08		
- for engineering and power planning studies	0.25			-			0.25		
Total	7.80	8.80		2.20	14.07		10.00	22.87	

a/ Forecasts for interest during construction are not given not being provided for in the loan; the corresponding actual figures is US$2.72 million.

b/ The $1.00 million foreign currency amount was to be relevant to EMCali. It appears, however, that this amount was used to cover part of the cost overruns on Calima.

c/ 1958 - 63 only.

d/ 1964 - 69 only.

Source: CVC/CHIDRAL
IBRD

tional reinforced concrete support walls and arches. For the same reason, structural steel supports had to be installed in the downstream reach of the outlet tunnel and in the Bravo River diversion tunnel. The outlet tunnel had to be extended to avoid a slide area. In addition, although the river had been diverted by April 17, 1963, all structures were demolished by an unprecedented flood on April 29, 1963. Finally, great difficulties were encountered in obtaining a satisfactory source of sand and gravel for the shell of the dam; this problem was solved after a high quality clay quarry was opened. At a later stage, after the first two generating units had been erected, the alignment between the Hitachi turbines and the Toshiba generators was discovered to be unsatisfactory and the lower bearings had to be re-set.

Overall delay in the construction of the plant amounted to about two years[1/] and total cost overrun reached about US$16.5 million equivalent, i.e. 46% of the aggregate forecast amounts (local and foreign), including contingencies, shown for Calima in the two loans. Table 5.4 presents in detail the forecast and actual project costs.

Foreign exchange cost overruns on Calima eventually totalled US$ 2.75 million (or US$ 4.47 million including the provisions for contingencies in the loans), raising the final foreign cost of the project to US$ 21.65 million. CVC had major difficulties in securing the necessary financial resources to cover these overruns and applied for additional assistance from the Bank. After the 1963 loan the Bank, however, made it clear that no additional financing would be made available, in view

1/ Resulting in power shortages in 1964 and 1965.

3.19 Foreign exchange cost overruns on Calima eventually totalled US$ 2.75 million (or US$ 4.47 million including the provisions for contigencies in the loans), raising the final foreign cost of the project to US$ 21.65 million. CVC had major difficulties in securing the necessary financial resources to cover these overruns and applied for additional assistance from the Bank. After the 1963 loan the Bank, however, made it clear that no additional financing would be made available in view of the Government's failure to provide its agreed upon contribution to local expenditures on the project and its failure to grant adequate rate increases. The attitude of the Bank was also geared toward exerting pressure on CVC to agree to Interconnection (see Chapter XIII). The Bank took it upon itself to convince U.S. AID, which was ready to make a loan to cover the foreign exchange overrun on Calima, to withdraw its proposal. It seems that transmission and distribution system expansion was the principal victim of the overruns on Calima; the funds originally allocated under the loans for this purpose being transferred to the hydroplant. The US$ 1 million included in Loan 339-CO for relending to EMCALI to finance the expansion of the Cali distribution ring actually was finally transferred to Calima.

3.20 Local currency cost overruns were even higher than those for the foreign exchange component, amounting in the end to some US$ 12.1 million equivalent, or 142% above the anticipated amount. CVC/CHIDRAL had to struggle to secure the necessary additional funds from local banks, contractors' credits, and through painful tariff increases, but mainly the overruns had to be covered by National Government subsidies. The finances

of the company still bear today the "scars" inflicted by Calima.

3.21 Despite the good intentions which may have induced the Bank to adopt a rigid position on Calima, it seems that more support should have been given to CVC in these difficult circumstances, especially for a project which had been warmly recommended in the National Electrification Plan of 1955 and had received early support from the Bank. There are probably less harsh means which could have been used to push interconnection and convince the Government to live up to its obligations, i.e., providing the agreed upon financial support and granting the required tariff increases. Furthermore, it should be recalled that, in the case of Calima, the Bank had relied entirely on the cost estimates prepared by CVC's consultants, without really affirming their validity; this was partly due to the fact that the Bank had not anticipated major difficulties in the construction of the project.

IV. Load Forecasting, Investment Planning and System Development

4.01 CHIDRAL has always had extreme difficulty in meeting the demand requirements of its service area. Until 1955 when the first two units of the Anchicaya hydroplant began operation, actual system peak load and sales in Cali had been determined entirely by the limitations of the inadequate generating capacity available, and strict electricity rationing had to be imposed. That a backlog of demand had built up by then is evident when one realizes that peak demand during 1955 rose from 12.5 MW to 32 MW because of the additional 24 MW Anchicaya provided. The system attained adequate capacity in 1957 with the addition of the two 20 MW units at Anchicaya.

4.02 Thereafter, load growth followed a steady and considerably slower growth rate, increasing at an average rate of about 14% between 1958 and mid-1962. But the growth was more than had been foreseen at the time of the 1958 loan. Deficiency of capacity was temporarily avoided by the commissioning of Yumbo 3 (33 MW) in June 1962, but the load grew nearly 40% in 1963 and shortages began. They became severe in 1964 and especially 1965, with the two-year delay in commissioning of Calima. Purchases of peaking energy from the Central Hidroelectrica de Caldas (CHEC) which serves Manizales (Colombia's eighth largest city) helped to keep power deficits at a low level, but some shedding still occurred.

4.03 The 1964-65 shortage period caused unsatisfied demand to build up once more so that the eventual commissioning of Calima in 1966 and 1967 was closely followed by a rapid growth in demand. By December 1970, the nameplate reserve capacity of CVC/CHIDRAL was only 20 MW,[1/] the capacity of the largest unit being 33 MW. Moreover, actual effective capacity was considerably below the nameplate rating owing to the severe drought which crippled operation of Calima and an explosion in Yumbo 3 which resulted in recurrent forced outages. As a result, CHIDRAL has had to rely upon purchases of energy from CHEC and recently EEEB. Total purchases from these other sources represented in 1969 and 1970 12% and 21%, respectively, of CHIDRAL's actual sales.

4.04 In general CHIDRAL's system expansion has been characterized by lack of long-term planning, which has been reflected in Bank appraisal

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1/ Installed capacity in 1970 was 248.1 MW, peak demand was 228.0 MW, and the effective peak spare capacity was -16.5 MW.

load forecasts. The first loan to CHIDRAL (38-CO) was mainly designed to help complete the Anchicaya hydroplant, which had been started by CHIDRAL several years before. The Bank therefore was not involved in the planning of this unit, but the failure to foresee any necessity for installation of new plants over the succeeding ten years (see Table II-A.1) seems a deficiency on the part of the Bank. As a result of the Bank's lack of foresight,actual peak demand was, within five years, 37% above the forecast level; a trend which was progressively accentuated in subsequent years.

4.05 In the second loan (113-CO) demand forecasts were more optimistic and were fairly close to actual developments, but again the absence of any attempt at long-term planning is apparent; by 1960, five years after the forecast was made, a 2.5 MW deficit was predicted. While in actuality a 28.5 MW gross reserve occurred, this simply indicates that the appraisal of Loan 113-CO did not allow for the fourth (20 MW) unit at Anchicaya or the second emergency thermal unit which had to be installed at Yumbo. This is particularly surprising since Yumbo unit 1 financed under the loan was itself an emergency thermal plant which had to be built because of the lack of long-range planning in the system.

4.06 By 1958, as a result of the financial crisis of 1956/57 and consequent pessimism about Colombia's development prospects, peak demand forecasts for Loan 215-CO (see Table II-A.3) were rather underestimated, although system capacity forecasts were quite accurate. It should be noted, however, that the forecasts extended for only four years so that in effect no long-term plans were considered. It is probably significant to mention

that inasmuch as the loan was made to finance a second Yumbo emergency thermal unit and preceded a loan (255-CO) to cover yet another, apparently neither CHIDRAL nor the Bank profited very much from previous experience.

4.07 The fourth loan (255-CO) to CVC/CHIDRAL, consisting of US$ 25.0 million to cover, among other things Yumbo 3 and Calima I units 1 and 2, was by far the largest and most important Bank loan to the company. One of the major features of the loan was the construction of the Yumbo-Cartago transmission line which connected CHIDRAL's system to that of CHEC which was favored by a large surplus of hydro-energy. This was a turning point in CHIDRAL's system expansion, because in allowing the utility to purchase cheap peaking energy when required, it eliminated the necessity of building expensive emergency thermal plants such as the Yumbo 4 plant later proposed by the company. The US$ 14.1 million equivalent[1]/ line was also quite important in that it allowed several smaller municipalities (9 towns and 16 villages along the line's route) to become connected to the larger, more efficient CVC/CHIDRAL system. Hence the Yumbo-Cartago transmission line also constitutes one of the Bank's relatively rare contributions to rural electrification. Energy consumed by these rural areas accounts for the increasing portion of CHIDRAL's generation purchased by CVC and the growing influence of CVC as a power supplier in the Valle.

4.08 Table II-A.4, which shows the load forecast underlying the loan for Calima reflects the continued inadequacy of long-term planning, in the

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1/ Of which US$ 4.71 million was in foreign exchange. Total estimated cost was US$ 6.83 million equivalent.

capacity deficit foreseen for 1963, the failure to allow for any capacity addition after Calima and the inadequate levels of capacity (and doubtless, in this case, energy) reserve provided in later years. The load forecast turned out somewhat overoptimistic but, due to the delays in completion of Calima, capacity deficits occurred in 1964 and 1965, as pointed out; gross reserve capacity was more adequate than expected in later years, but this is somewhat misleading due to the difficulties encountered in filling Calima, acute energy shortages there and the outages at Yumbo 3 during much of 1969 and 1970. The capacity deficiencies have been met by purchases of energy from CHEC (and recently EEEB) which have risen from 7.3 Gwh in 1963 to 382.7 Gwh by 1970. Since this purchased energy was peaking energy, it is difficult to evaluate the actual extent to which CHIDRAL's system has had to be overloaded, but the fact that plant utilization factors have not increased appreciably over the years tends to indicate that peaking capacity deficits are the only limitation of the system.

4.09 The load forecast which underlay the last loan to CVC/CHIDRAL, Loan 339-CO of 1963, is depicted in Table II-A.5. It has proved excessive by a wide and increasing margin. This forecast did reflect for the first time adoption of a longer term view, allowing for construction of Calima II following completion of Calima I; provision was also made in this loan, for the first time, for financing studies of future system expansion. However, this load forecast was not of great operational significance, since the decision at the time was only to complete Calima I and install the last two units. It, and the related plans, were completely superseded subsequently by changed load prospects, interconnection discussions and the eventual decision to undertake Alto Anchicaya.

Economics of Calima

4.10 The heavy cost overruns on Calima and the lengthy delays in its completion raise a serious question as to whether it was in retrospect the most economic means to meet the growth of demand on the CHIDRAL system. Calima can be considered the most problematic project in the history of Bank involvement in Colombia's power sector. Apart from the two-year delay in completion and the 46% cost overrun (nearly 60% when allowance is made for the transmission link between the plant and the Cauca Valley transmission line) the plant has also suffered from hydrological difficulties. Calima was always envisaged as a peaking plant; the mean flows used in planning the project were considered sufficient to generate about 315 million kwh per year from the 120 MW installed capacity, equivalent to a capacity factor of only about 30%. Generation has not yet approached this level due to delays in filling the reservoir and poor hydrological years experienced, but it is still expected to do so -- and probably will this year or next, with the heavy rains of 1970 and 1971.

4.11 The feasibility study for the Calima project, on which the Bank based its decision to support it, indicated a rate of return of at least 15% on the extra investment required to build it, as opposed to a coal-fired thermal plant. We ran a comparison between Calima and a coal-fired plant of equivalent capacity, assuming a capital cost of US$ 200 per KW installed and a fuel cost equal to that currently experienced at the Yumbo station, or about US¢ 60 per million BTU. We found that if Calima's costs had been as originally forecast, then the return to the incremental investment would have been about 15%. With the cost overruns, on the other hand,

the return to the actual incremental investment (of some US$ 20 million) was about 9%, using the official foreign exchange rate, and 6%, using a scarcity foreign exchange rate (including allowance for import tariffs, other premia and quantitative restrictions on imports) of twice the official rate. If the coal-fired alternative is assumed to have a capital cost of US$ 230 per kilowatt installed, the internal rate of return, using the official exchange rate, rises to 10%. None of these calculations makes allowance for the important fact that a coal-fired plant should have been built more quickly, hence avoiding at least part of the load shedding in 1964 and 1965 that resulted from the long delays in Calima. Considering that the opportunity cost of capital in Colombia is probably in the range of 10-12%, the figures seem clearly to indicate that Calima was a marginal investment.

4.12 These calculations depend in part on the assumption that there was sufficient coal available in the Cauca Valley to support a thermal plant of the type adopted as the alternative. There is some doubt about this and there may have been more doubt in 1959-60 when the Calima decision was made, although, as mentioned, CVC used a coal-fired plant as the alternative in its analysis. A survey in 1964 identified three potential new sources of coal capable of producing together some 350,000 tons a year and the hypothetical plant adopted as an alternative would have required only some 250,000 tons a year -- and possibly less in later years when advantage could be taken of cheaper hydroelectricity from the interconnected system. Moreover, another alternative would have been an oil-fired plant fed with

oil brought up from Buenaventura -- perhaps from the neighboring Putumayo field -- and total costs for this alternative would probably not have been greatly different from those used in this analysis for the coal plant.

4.13 Calima appears to have been the only hydroelectric project ready for construction in 1960; it had been studied following the recommendations of the consulting group which had drawn up the 1954 National Electrification Plan and was especially favored by CVC. The Bank, in spite of its early contributions to CHIDRAL's development program, does not seem to have materially encouraged the initiation of planning studies before 1963; it was not until that year, as mentioned, that it participated in financing engineering and power planning studies, mainly in connection with the Calima II and Salvajina projects. This should be considered a shortcoming on the part of the Bank, especially in view of the fact that it had very actively promoted the initial establishment of CVC in 1955 as a multipurpose regional agency and that some of the alternative hydroprojects to Calima would, in adddition to providing electricity, have yielded other benefits in the form of flood control and irrigation.

Projects Turned Down

4.14 The role of the Bank in system planning was in some ways more important for Cali than for Bogota and certainly for Medellin. The actual contribution of the Bank was, in fact, largely a restraint upon CVC's enthusiasm to build additional plants. On several occasions, the Bank refused to consider various projects presented by CVC/CHIDRAL, including the Yumbo 4 thermal plant and the Calima II, Timba and Salvajina hydroplants. The Bank's reluctance to finance such projects was dictated by

several factors, among which the fragile financial situation of CVC/CHIDRAL was one. The Bank had insisted that consideration of possible loans for such projects would be subject to the Government's actual contribution of its agreed upon share of financing the cost overruns of Calima, and to its approval of satisfactory tariff increases. Secondly, the Bank was far from convinced of the technical and economic soundness of some of these projects (mainly Salvajina and Timba). Finally, the Bank's strong position was intended to coax CVC toward agreement on Interconexion.

4.15 In 1965-66 CVC tried to persuade the Bank to finance the Yumbo 4 thermal unit. It appears, in retrospect, that the only useful effect of this additional unit would have been to bridge the six-month power gap which occurred as a result of the breakdown of the Yumbo 3 thermal unit late in 1969 and simultaneous lack of energy available from Calima. The Bank proposed an alternative scheme, consisting in the extension of the single-circuit 115 kv line then under construction between Bogota, Ibague and Armenia to the Buga-Cartago section of the CVC-CHEC line. This was the solution finally adopted, involving a cost in foreign exchange of only US$ 1.5 million; the line was commissioned in 1969. Energy purchases from EEEB's system amounted to 43 and 161 Gwh in 1969 and 1970, respectively, providing a useful complement to imports from the CHEC system.

V. Forecasting the Financial Aspects

5.01 Financial forecasts prepared by the Bank have been quite optimistic on the whole (as can be seen in Tables II-A.1-5), the most notable discrepancies being between the forecast and actual operating income and in the rates of return. Operating income, which determines the extent to which

the company is able to finance its own expansion program as well as service its debt, has generally been overestimated because costs have always been underestimated. Even in the few cases when operating income was greater than forecast or grew at a faster annual rate than forecast (see Table II-A.3) this was a result of the fact that revenues grew at a faster rate than expected (in non-inflated terms) and overrode the increases in costs. Generally, however, revenues were overestimated as well, and the company's financial picture is comparatively even worse. As has been mentioned before, the fact that CHIDRAL's revenues were lower than expected has largely been due to the inadequate level of tariffs maintained over the years, but it is also significant that, in most loan forecasts, the company's annual kwh sales figures were themselves overestimated.

5.02 Despite the fact that the price level in Colombia has increased six-fold in the past twenty years, no real effort was made by the power utilities to accordingly revalue their assets, which were recorded in historic pesos. In the case of CHIDRAL, the only attempt made at revaluation seems to have been the inclusion of a "revaluation adjustment" of some Ps. 24.6 million in their balance sheets after 1957, which is hardly satisfactory in view of the true inflationary conditions in the country. For the purposes of this study a systematic revaluation of the company's assets was undertaken (see Annex 1) in order to determine the true rate of return.

5.03 This revaluation further emphasized the existing discrepancies between forecast and actual return figures, which in the last loan (339-CO) was expected to average 13 or 14% over the 1963-69 period but which in reality never exceeded 4.2% and were in one case even negative. It should

also be observed that even in the absence of such an asset revaluation, performance was considerably below the forecast; the highest rate of return on non-revalued assets over the 1963-70 period was 9.6% in 1965 and the rate of return was generally much lower, for reasons discussed previously in this Chapter.

VI. Institutional Development

6.01 When CHIDRAL was incorporated as a company in October 1950, 51% of its shares were held by the Instituto de Aprovechamiento de Aguas y Fomento Electrico "Electraguas" (an agency of the National Government), 23% by the Department of Valle, and 26% by the municipality of Cali. After the creation of CVC, CHIDRAL's ownership was redistributed between CVC - 65%, the municipality of Cali - 18%, and the municipality's agency EMCALI - 17%. In short, CVC has almost two-thirds of equity participation in CHIDRAL and Cali the other third.

6.02 CHIDRAL's statutes provide that CVC appoint three of the five members of CHIDRAL's Board, the municipality of Cali appoint one and EMCALI appoint another. Since decisions, including those affecting tariffs, require affirmative votes by four directors, the municipality together with its agency EMCALI have a veto power over CHIDRAL's decisions. The Board also maintains tight financial control; it must approve contracts for amounts exceeding Ps. 60,000 which is a very small amount indeed (equivalent to some US$ 3,000). Cali also exercises another form of control over CHIDRAL through the city's Chief Engineer who participates in the planning commission of CHIDRAL.

6.03 EMCALI is CHIDRAL's major retail distributor, and is significant mainly because it is a major factor in setting the level of tariffs. The Bank has strongly recommended over the years that EMCALI administer and

maintain separate accounts for its public water, sewerage, telephone, and electricity services with a view to making each division self-supporting. The agreement in 1950 that CHIDRAL should purchase the existing municipal power generating facilities in Cali and that it would sign a contract with the municipality whereby CHIDRAL would become the exclusive supplier of electric power (and EMCALI the sole distributor) was an important step toward rationalizing the power institutions in the Valley at the time. But in retrospect it might have been better had the Bank insisted that the generating company take over distribution as well (as it did in the two other loans made at the time) or else that EMCALI take over CHIDRAL.

6.04 In the middle 1950s, the Bank was a staunch proponent of the creation of a TVA-type regional development agency for the Cauca Valley, but the Bank's early enthusiasm for CVC and its exhortation for a regional approach later waned. When five years later the time for acting came, the Bank's approach was traditional -- one project at a time, and for power only. One explanation for that is that CVC had never submitted to the Bank a request for financing of a regional program. The Bank itself was hardly geared to finance such a program had it been submitted. In any case, the ultimate result of the establishment of two power generating agencies in the Cauca Valley was the agreement that CVC would plan, design, and build future plants while CHIDRAL would operate them. While this has resulted in some confusion over the ownership of assets and management responsibility, it was initially expected that by means of this arrangement, certain undesirable provisions of prior long-term contractual arrangements between CHIDRAL and EMCALI could be avoided. Specifically, EMCALI has a preferential right to power produced by CHIDRAL: such a preference was conceivable during a period of scarcity and considering that Cali was a shareholder of CHIDRAL, but it could not have been acceptable in the context of a regional system.

CVC, as the contractor, thought, or at least hoped, that the transfer of Calima, when completed, to CHIDRAL would give it enough leverage to have the preference removed from the EMCALI contract. CVC also had as a future objective the purchase of the Cali investment in CHIDRAL in order that CVC might become CHIDRAL's sole owner. CHIDRAL would have then become fully a branch of CVC for power generation and transmission. Both expectations failed to materialize.

6.05 Under the Loan Agreement (255-CO) CVC was committed to transfer to CHIDRAL the Calima project as soon as it was completed. CVC, in violation of the Agreement, continues to own Calima and appears reluctant to transfer it to CHIDRAL. It argues against the desirability of the transfer as long as EMCALI has a virtual veto over CHIDRAL. As to the matter of purchasing EMCALI's shares in CHIDRAL, at present, for political reasons, the municipality of Cali is not inclined to sell, and due to shortage of funds, CVC is not able to buy. Meanwhile, CVC has to live with a discriminatory agreement between the parties under which no matter how much CVC invests in CHIDRAL, its share in the equity, and hence voting power, is frozen. The Bank itself may have erred in not initiating a loan to EMCALI to improve its distribution system -- a tactic which would have established some sort of Bank-EMCALI dialogue. Over the years the Bank repeatedly complained about the anomalous organizational set-up instead of trying to build in-roads into the municipality of Cali in general and EMCALI in particular.

6.06 The Bank also missed a chance to clear up the CVC-CHIDRAL-EMCALI organizational monstrosity in the months immediately preceding negotiations on Loan 339-CO to cover the cost overruns on Calima. At this time CVC was

in an extremely tight financial situation and the Bank might have been able to exert considerable leverage. But when the loan was negotiated, it was argued in the Bank that the disentangling could not be done in short order but that it should be a prerequisite for any further Bank loans for power in the Valley. This was an untenable argument because the Bank had already committed itself to working towards interconnection of the separate power systems in Colombia in order to considerably reduce, if not completely eliminate, the need for further loans to individual power systems. What is important is that the solution of important organizational problems was left for the future, and the opportunity to seize upon CVC's difficulties to rationalize the organizational structure was lost.

6.07 Seen purely from the institutional prism, the record and performance of the Bank were characterized by inconsistency and a lack of determination and foresight.

VII. Conclusion

7.01 The overall development of CHIDRAL over the 1950-70 period has not been spectacular nor even particularly satisfactory to the Bank. The company has managed to increase the public generating capacity serving the city of Cali and parts of the Cauca Valley from some 12.5 MW to about 250 MW, but there have been repeated shortages of electricity and the quality of supply has been relatively poor. The expansion path followed does not appear to have been particularly economic, with a series of emergency thermal plants and some relatively high cost hydroelectric plants, of which the largest, Calima, today appears in retrospect a dubious investment from the economic point of view. The company has suffered from a complex and quite inefficient

institutional set up, has constantly been subjected to political pressures and as a result has had a particularly poor financial performance record.

7.02 The Bank has probably not been as helpful as it might have been to the CVC/CHIDRAL complex. Firstly, it did not materially encourage initiation of expansion planning studies until 1963, and even so seems to have confined its role to that of a "pragmatic sponsor" concerned with retarding the influence of excessive enthusiasm or backstage political pressures. Secondly, the IBRD has apparently not attempted to reform the financial set up of the two affiliates at all, and has been unsuccessful in reforming the organizational set up of the power supply for Cali -- which is particularly disappointing since the Bank was instrumental in the creation of CVC and in establishing CHIDRAL's relationship with CVC and EMCALI in the first place. Thirdly, by taking an inflexible position on Calima, for whatever good reasons, the Bank imposed a considerable financial hardship on CVC which eventually forced the company to obtain large-scale support from the National Government. Finally, no IBRD appraisal report has ever mentioned or questioned the quality of the financial management of CVC/CHIDRAL, while this was an important issue in the case of EEEB; there is no indication, however, that the former was more efficient than the latter.

7.03 There are, on the other hand, many ways in which the Bank has been quite helpful, the most important of which include its prevention of several uneconomic projects, support for the transmission developments in the Valle, the realization of Interconexion, and creation of the tariff regulatory agency. In recent years CHIDRAL's revenues have been at par

with those of EEEB and EPM, and while the company may not as yet operate as efficiently as the former two, the general financial picture has improved somewhat. The commissioning of Interconexion, scheduled to take place shortly, promises to cope with CHIDRAL's peaking capacity deficiencies and allow the company to share the benefits of the more economic hydroplants in existence and under construction in other parts of the country. In addition, CVC/CHIDRAL has under construction the 340 MW Alto Anchicaya hydroplant, financed under favorable conditions by the IDB. The plant should be in operation by 1974.

7.04 From 1950 to 1968, when the IDB agreed to finance the US$ 60 million equivalent loan for Alto Anchicaya, the IBRD remained virtually the sole source of foreign currency for CVC/CHIDRAL. This is probably due to the fact that when the original Anchicaya loan (38-CO) was negotiated, the IBRD was the only multilateral lending agency CHIDRAL could apply to. By 1959 when the IDB was created the IBRD had nine years of experience with the company and had already made three loans to it; it was therefore logical for the company to continue to seek the Bank's help rather than involve the IDB. The request for financing the Alto Anchicaya project, in fact, was originally addressed to the IBRD, but in view of the IDB's interest in the project and the more favorable terms it could offer, it was decided that the latter agency should finance it. The IBRD has not actively participated in CVC/CHIDRAL's expansion program since the 1963 loan (339-CO), (except indirectly through encouraging the entity to join Interconexion) and any further financing role for the Bank would have to be in distribution or possibly, eventually, in any multi-purpose projects in the area that might prove worthwhile.

TABLE I

COLOMBIA: CENTRAL HIDROELECTRICA DEL RIO ANCHICAYA LTDA. (CHIDRAL)

		1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	Average Annual Increase Rate (%) i/ 1955/1960	1960/1965	1965/1970
OPERATIONS																				
1. Installed Capacity (yr.-end)																				
Hydro	MW	26.1	26.1	66.1	66.1	66.1	66.1	66.1	66.1	66.1	66.1	96.1	126.1	186.1	186.1	186.1	186.1	20.0	7.8	14.1
Thermal	MW	-	-	-	10.0	10.0	20.0	20.0	53.0	53.0	53.0	53.0	53.0	53.0	53.0	53.0	53.0	-	21.5	-
Diesel	MW	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	-	-	-
Total	MW	35.1	35.1	75.1	85.1	85.1	95.1	95.1	128.1	128.1	128.1	158.1	188.1	248.1	248.1	248.1	248.1	22.0	10.7	9.4
Total as % of country a/	%	8.0	7.1	12.6	13.4	13.0	14.2	13.9	15.1	12.3	11.5	12.2	13.2	14.8	13.9	12.9	12.0			
2. Peak Demand	MW	32.0 c/	35.0 c/	49.2	54.0	60.5	66.6	83.7	95.2	129.1	138.1	143.8	174.3	185.3	200.3	201.6	228.0	15.8	16.6	9.7
3. Gross Reserves (1 - 2)	MW	3.1	0.1	25.9	31.1	24.6	28.5	11.4	32.9	-1.0	-10.6	14.3	13.8	62.8	47.8	46.5	20.1			
Gross Reserves as % of Peak Demand	%	9.7	0.3	52.6	57.6	40.5	42.8	13.6	34.6	-0.8	-7.6	9.9	7.9	33.9	23.9	23.1	8.8			
4. Effective Peak Spare Capacity b/	MW	n.a.	n.a.	n.a.	26.6	24.5	25.3	11.4	4.4	(3.7)	(10.6)	(22.2)	(15.7)	7.2	42.8	13.5	(16.5)			
5. Gross Generation	Gwh	n.a.	n.a.	n.a.	n.a.	273.57	314.52	363.37	485.11	566.54	635.62	641.90	748.28	800.53	873.92	773.92	735.74		15.3	2.8
Total as % of country a/	%	n.a.	n.a.	n.a.	n.a.	10.5	10.7	11.6	13.8	13.9	13.9	12.8	13.6	13.5	13.2	10.9	9.4			
6. Energy Purchases from Other Systems d/	Gwh	-	-	-	-	-	-	-	-	7.34	27.19	43.86	53.59	60.08	51.14	182.51	382.7			55.0 i/
7. Total Sales	Gwh	59.61	156.71	195.45	223.36	264.85	301.38	348.19	463.04	563.00	649.82	671.51	788.75	846.06	907.94	942.36	1066.80	38.0	17.4	9.7
of which: EMCALI (%)	%	100	100	100	100	100	100	99	88	85	81	82	79	77	78	80	78			
CVC (%)	%	-	-	-	-	-	-	1	12	15	19	18	21	23	19	17	19			
COEDEC (%)	%	-	-	-	-	-	-	-	-	-	-	-	-	-	3	3	3			
FINANCES																				
8. Sales Revenues e/	Ps.mln.	2.50	6.13	8.08	9.00	10.11	18.38	21.24	28.25	34.71	40.26	60.14	70.99	99.92	130.00	173.77	n.a.	35.0	12.6	18.2 i/
9. Operating Costs f/	Ps.mln.	1.35	2.88	4.32	6.25	7.56	8.08	10.68	14.71	25.17	32.80	40.07	49.33	64.28	75.75	104.42	n.a.	29.5	22.5	15.2 i/
10. Average revenue/kwh sold (current prices)	Pesos	0.04	0.04	0.04	0.04	0.04	0.06	0.06	0.06	0.06	0.06	0.09	0.09	0.12	0.14	0.18	n.a.			
11. Average revenue/kwh sold (constant 1968 prices)	Pesos	0.17	0.15	0.13	0.11	0.10	0.15	0.14	0.13	0.11	0.09	0.12	0.11	0.13	0.14	0.17	n.a.	-1.3	-4.6	9.1 i/
12. Average cost/kwh sold based on revalued assets h/ (constant 1968 prices)	Pesos	0.09	0.07	0.09	0.11	0.10	0.08	0.08	0.08	0.09	0.09	0.09	0.12	0.10	0.10	0.10	n.a.	-2.4	2.4	2.7 i/
13. Average Revenue/kwh sold	US¢ g/	1.07	0.94	0.82	0.69	0.63	0.94	0.88	0.82	0.69	0.57	0.75	0.69	0.82	0.88	1.07	n.a.	-1.3	-4.6	9.1 i/
14. Average Cost/kwh sold	US¢ g/	0.57	0.44	0.57	0.69	0.63	0.50	0.50	0.50	0.57	0.57	0.57	0.75	0.63	0.63	0.63	n.a.	-2.4	2.4	2.7 i/
15. Net Revenues (8 - 9)	Ps.mln.	1.15	3.25	3.76	2.75	2.55	10.30	10.56	13.54	9.54	7.46	20.07	21.66	35.64	54.25	69.35	n.a.	40.0	1.5	23.5 i/
16. Net Revenues based on Revalued assets h/	Ps.mln.	1.15	3.23	2.09	0.64	0.52	8.02	8.42	11.44	4.55	2.75	14.41	-6.94	22.40	42.24	50.00	n.a.	33.0	-0.1	23.5 i/
17. Gross Fixed Investment in Current prices	Ps.mln.	n.a.	12.47	37.95	11.82	6.29	13.54	16.67	55.76	125.19	69.31	122.12	118.15	151.80	37.19	81.24	n.a.			
18. Gross Fixed Investment in Constant 1968 prices	Ps.mln.	n.a.	47.14	122.20	33.57	16.79	33.31	37.84	118.78	216.58	103.27	166.08	139.42	165.46	37.19	74.7	n.a.		38.0	-25.0 i/
19. Average Revalued Net Fixed Assets in Operation h/	Ps.mln.	n.a.	49.35	48.19	62.07	75.38	80.72	100.55	121.47	152.34	181.54	196.52	356.84	604.07	714.85	729.22	n.a.		6.1	26.0 i/
MANAGEMENT INDICATORS																				
20. Rate of Return k/																				
(a) non-revalued assets	%	n.a.	4.3	7.8	3.2	2.5	10.1	8.3	11.1	6.7	4.5	9.9	4.5	5.7	7.0	9.2	n.a.			
(b) revalued assets h/	%	n.a.	6.4	3.4	0.6	0.4	6.3	5.6	6.5	2.0	0.9	3.7	neg.	2.5	3.7	4.2	n.a			
21. Self-Financing Rate	%	n.a.	24.8	15.2	neg.	3.8	neg.	28.6	10.6	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.			
22. Debt Service Coverage	times	n.a.	3.1x	0.9x	0.8x	1.0x	-	1.4x	1.4x	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.			
23. Debt/Equity Ratio	./.	34/66	35/65	55/45	53/47	48/52	46/54	48/52	63/37	68/32	72/28	70/30	69/31	77/23	78/22	69/31	n.a.			
24. Transmission Losses $(\frac{5+6-7}{5+6})$	%	n.a.	n.a.	n.a.	n.a.	3.2	4.2	4.2	4.5	1.9	2.0	2.1	1.6	1.7	1.9	1.5	n.a.			
25. Average Capacity Out of Service as % of Installed Capacity	%	-	-	-	-	-	-	-	0.7	2.0	-	1.6	3.9	2.7	2.0	7.0	5.2			
26. CHIDRAL's investments as % of Total Gross Fixed investments of country	%	n.a.	0.4	1.2	0.4	0.2	0.3	0.3	0.9	1.8	0.8	1.3	1.0	1.1	0.2	0.4	n.a.			
27. Accounts Receivable as % of Total Sales Revenues	%	16.4	15.4	12.6	10.3	10.1	20.2	18.3	18.8	14.3	12.6	12.9	7.6	14.3	22.9	15.6	n.a.			

a/ Excluding captive plants.
b/ Figures in brackets indicate negative reserves which were covered by purchases of energy from other systems (see line 6) and shedding.
c/ Source: IBRD
d/ Consists of purchases from Empresa de Energia Electrica de Bogota (EEEB) and Central Hidroelectrica de Caldas (CHEC).
e/ In historic pesos.
f/ Including depreciation but excluding interest and direct taxation, in historic pesos.
g/ Calculated by applying the National GDP deflator to bring figures in historic prices to constant 1968 prices, and then converting into US$ using the 1968 exchange rate of Ps. 15.90 = US$ 1.00.
h/ Revaluation of assets computations as calculated by IBRD in Annex I.

i/ Average Annual Increase Rate for 1965-69 only.
j/ Rates of Increase for figures in historic prices have been calculated using National GDP deflator to obtain real growth rates based on constant prices.
k/ Same as Financial Rate of Return, as company pays no taxes.

Source: CHIDRAL

COLOMBIA: CENTRAL HIDROELECTRICA DEL RIO ANCHICAYA LTDA (CHIDRAL)
Loan 38-CO (November 1950)

Table II - A.1

		1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	AVERAGE ANNUAL INCREASE RATE (%) (1955-60)
	LOAD FORECASTS (MW)												
1.	Installed Capacity	11.1	11.1	11.1	35.1	35.1	35.1	35.1	35.1	35.1	35.1	35.1	0.0
2.	Annual Peak Demand	na	na	na	19.4	21.5	23.4	25.4	27.6	29.3	31.0	32.9	7.0
3.	Gross Reserve Capacity (1-2)	na	na	na	15.7	13.6	11.7	9.7	7.5	5.8	4.1	2.2	
	ACTUAL LOAD (MW)												
4.	Installed Capacity	11.1	11.1	11.1	11.1	11.1	35.1	35.1	75.1	85.1	85.1	95.1	22.0
5.	Annual Peak Demand	na	na	na	na	12.5	32.0	35.0	49.2	54.0	60.5	66.6	20.0
6.	Gross Reserve Capacity (4-5)	na	na	na	na	-1.4	3.1	0.1	25.9	31.1	24.6	28.5	
7.	Effective Peak Capacity a/	na	na	na	na	na	na	na	na	75.1	85.1	85.1	
8.	Effective Peak Demand a/	na	na	na	na	na	na	na	na	48.5	60.5	59.8	
9.	Effective Peak Spare Capacity (7-8)	na	na	na	na	na	na	na	na	26.6	24.6	25.3	
	LOAD FORECAST ACCURACY b/												
10.	Installed Capacity	100	100	100	316	316	100	100	47	41	41	37	
11.	Annual Peak Demand	na	na	na	na	172	73	73	56	54	51	49	
12.	Gross Reserve Capacity	na	na	na	na	*	377	*	29	19	17	8	
	SALES FORECAST (GWh)												
13.	Sales	na	68	na	77	81	86	91	97	103	109	115	6.0
	ACTUAL SALES (GWh)												
14.	Sales	na	na	na	na	na	60	157	196	223	265	301	38.0
	SALES FORECAST ACCURACY b/												
15.	Sales	na	na	na	na	na	143	58	49	46	41	38	
	RETURN FORECAST (Col. Pesos mln) c/												
16.	Operating Revenues	na	na	na	0.9	2.1	2.2	2.4	2.5	2.7	2.8	3.0	6.0
17.	less: Operating Costs	na	na	na	0.4	0.8	0.8	0.9	0.9	0.9	1.0	1.0	3.8
18.	Operating Income	na	na	na	0.5	1.3	1.4	1.5	1.6	1.8	1.8	2.0	7.3
	ACTUAL RETURN (Col. Peso mln) e/												
19.	Operating Revenues	na	na	na	na	na	1.9	4.3	4.9	4.8	5.3	8.6	34.5
20.	less: Operating Costs d/	na	na	na	na	na	1.0	2.1	2.6	3.4	3.8	3.8	30.5
21.	Operating Income	na	na	na	na	na	0.9	2.2	2.3	1.4	1.5	4.8	39.5
	RETURN FORECAST ACCURACY b/												
22.	Operating Revenues	na	na	na	na	na	116	56	51	56	53	35	
23.	less: Operating Costs	na	na	na	na	na	80	43	35	26	26	26	
24.	Operating Income	na	na	na	na	na	156	68	70	129	120	42	

a/ Effective Peak = peak load at the critical time in the year when margin between demand and available capacity was least or load shedding greatest (excluding short-term outages).
b/ Defined by the ratio Forecast/Accuracy.
c/ Converted from figures given in US $ by the 1950 official rate of Ps 1.96 = US $1.00.
d/ Including non-revalued depreciation but excluding interest.
e/ All current or historic pesos have been converted to 1950 constant pesos for the purpose of comparison with the loan 38-CO Appraisal Report forecasts, using the National GDP deflator.

TABLE II-A.2

COLOMBIA: CENTRAL HIDROELECTRICA DEL RIO ANCHICAYA LTDA. (CHIDRAL)
Loan 113-CO((March 1955)

		1955	1956	1957	1958	1959	1960	Average Annual Increase Rate (%) (1955-60)
	LOAD FORECASTS (MW)							
1.	Installed Capacity	35.0	55.0	55.0	67.5	67.5	67.5	14.0
2.	Annual Peak Demand	23.0	40.0	55.0	58.0	64.0	70.0	25.0
3.	Gross Reserve Capacity (1 - 2)	12.0	15.0	0	9.5	3.5	-2.5	
	ACTUAL LOAD (MW)							
4.	Installed Capacity	35.1	35.1	75.1	85.1	85.1	95.1	22.0
5.	Annual Peak Demand	32.0	35.0	49.2	54.0	60.5	66.6	15.8
6.	Gross Reserve Capacity (4 - 5)	3.1	0.1	25.9	31.1	24.6	28.5	
7.	Effective Peak Capacity a/	n.a.	n.a.	n.a.	75.1	85.1	85.1	
8.	Effective Peak Demand a/	n.a.	n.a.	n.a.	48.5	60.5	59.8	
9.	Effective Peak Spare Capacity (7 - 8)	n.a.	n.a.	n.a.	26.6	24.6	25.3	
	FORECAST ACCURACY b/							
10.	Installed Capacity	100	157	73	79	79	71	
11.	Annual Peak Demand	72	114	112	107	106	105	
12.	Gross Reserve Capacity	387	*	0	31	14	*	
	SALES FORECAST (Gwh)							
13.	Sales	63	202	304	329	354	383	43.5
	ACTUAL SALES (Gwh)							
14.	Sales	60	157	200	223	265	301	38.0
	FORECAST ACCURACY b/							
15.	Sales	105	129	152	148	134	127	
	RETURN FORECAST (Col. Pesos mln.)							
16.	Operating Revenues	2.2	5.7	7.8	8.4	9.1	9.8	35.0
17.	less: Operating Costs	1.4	3.0	3.2	3.6	4.5	4.8	28.0
18.	Operating Income	0.8	2.7	4.6	4.8	4.6	5.0	44.5
	ACTUAL RETURN (Col. Pesos mln.) c/							
19.	Operating Revenues	2.5	5.7	6.4	6.3	7.0	11.2	35.0
20.	less: Operating Costs d/	1.3	2.7	2.5	4.4	5.0	4.9	30.5
21.	Operating Income	1.2	3.0	3.9	1.9	2.0	6.3	39.5
	RETURN FORECAST ACCURACY b/							
22.	Operating Revenues	88	100	122	133	130	88	
23.	less: Operating Costs	108	111	128	82	95	98	
24.	Operating Income	67	90	118	253	230	79	

a/ Effective Peak = peak load at critical time in the year when margin between demand and available capacity was least or load shedding greatest (excluding short-term outages).
b/ Defined by the ratio Forecast/Actual.
c/ All current or historic pesos have been converted to 1955 constant pesos for the purposes of comparison with the Loan 113-CO Appraisal Report forecasts, using the National GDP deflator.
d/ Including non-revalued depreciation but excluding interest.

COLOMBIA CENTRAL HIDROELECTRICA DEL RIO ANCHICAYA LTDA. (CHIDRAL)
Loan 215-CO (December 1958)

TABLE II -A.3

	1958	1959	1960	1961	1962	1963	AVERAGE ANNUAL INCREASE RATE (%) 1958-61	1958-63
LOAD FORECASTS (MW)								
1. Installed Capacity	86.5	96.5	96.5	96.5	n.a.	n.a.	3.7	
2. Annual Peak Demand	50.0	57.0	65.0	75.0	n.a.	n.a.	14.4	
3. Gross Reserve Capacity (1-2)	36.5	39.5	31.5	21.5	n.a.	n.a.	-19.5	
ACTUAL LOAD (MW)								
4. Installed Capacity	85.1	85.1	95.1	95.1	128.1	128.1	3.8	8.5
5. Annual Peak Demand	54.0	60.5	66.6	83.7	95.2	129.1	15.7	19.0
6. Gross Reserve Capacity (4-5)	31.1	24.6	28.5	11.4	32.9	-1.0	-39.5	
7. Effective Peak Capacity a/	75.1	85.1	85.1	95.1	85.1	118.1	8.2	9.5
8. Effective Peak Demand a/	48.5	60.5	59.8	83.7	80.7	121.8	19.9	20.5
9. Effective Peak Spare Capacity (7-8)	26.6	24.6	25.3	11.4	4.4	-3.7	-33.0	
LOAD FORECAST ACCURACY b/								
10. Installed Capacity	102	113	101	101	n.a.	n.a.		
11. Annual Peak Demand	93	94	98	90	n.a.	n.a.		
12. Gross Reserve Capacity	117	161	111	189	n.a.	n.a.		
SALES FORECAST (GWh)								
13. Sales	226	265	310	362	362	362	17.0	9.9
ACTUAL SALES (GWh)								
14. Sales	223	265	301	348	463	563	16.0	20.5
SALES FORECAST ACCURACY b/								
15. Sales	101	100	103	104	78	64		
RETURN FORECAST (Col. Pesos mln.)								
16. Operating Revenues	9.1	12.2	16.1	18.8	18.8	18.8	27.0	15.6
17. less: Operating Costs	5.9	8.4	9.6	11.0	11.5	12.0	23.0	15.3
18. Operating Income	3.2	3.8	6.5	7.8	7.3	6.8	34.5	16.3
ACTUAL RETURN (Col. Pesos mln.) c/								
19. Operating Revenues	9.0	9.9	17.2	16.9	21.2	21.1	23.0	18.6
20. less: Operating Costs d/	6.3	7.1	7.5	8.5	11.3	15.1	10.5	19.1
21. Operating Income	2.7	2.8	9.7	8.4	9.9	6.0	46.0	17.3
RETURN FORECAST ACCURACY b/								
22. Operating Revenues	101	123	94	111	89	89		
23. less: Operating Costs	94	118	128	129	102	79		
24. Operating Income	119	136	67	93	74	113		

a/ Effective Peak = peak load at the critical time in the year when margin between demand and available capacity was least or load shedding greatest (excluding short-term outages)
b/ Defined by the ratio Forecast/Actual
c/ All current or historic pesos have been converted to 1958 constant pesos for the purpose of comparison with the Loan 215-CO Appraisal Report forecasts, by using the National GDP deflator.
d/ Including non-revalued depreciation but excluding interest.

TABLE II-A.4

COLOMBIA: CENTRAL HIDROELECTRICA DEL RIO ANCHICAYA LTDA. (CHIDRAL)
LOAN 255-CO (May 1960)

		1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	Average Annual Increase Rate (%) (1960-69)
	LOAD FORECASTS (MW)											
1.	Installed Capacity a/	102.0	102.0	135.0	135.0	195.0	195.0	225.0	225.0	255.0	255.0	10.7
2.	Annual Peak Demand	84.0	102.0	131.0	147.0	162.0	179.0	197.0	219.0	242.0	277.0	14.2
3.	Gross Reserve Capacity (1 - 2)	18.0	0.0	4.0	-12.0	33.0	16.0	28.0	6.0	13.0	-22.0	
	ACTUAL LOAD (MW)											
4.	Installed Capacity	95.1	95.1	128.1	128.1	128.1	158.1	188.1	248.1	248.1	248.1	11.2
5.	Annual Peak Demand	66.6	83.7	95.2	129.1	138.7	148,8	174.3	185.3	200.3	201.6	13.1
6.	Gross Reserve Capacity (4 - 5)	28.5	11.4	32.9	-1.0	-10.6	14.3	13.8	62.8	47.8	46.5	
7.	Effective Peak Capacity b/	85.1	95.1	85.1	118.1	128.1	118.1	125.1	183.1	243.1	215.1	10.9
8.	Effective Peak Demand b/	59.8	83.7	80.7	121.8	138.7	140.3	140.8	175.9	200.3	201.6	14.5
9.	Effective Peak Spare Capacity (7 - 8)	25.3	11.4	4.4	-3.7	-10.6	-22.2	-15.7	7.2	42.8	13.5	
	LOAD FORECAST ACCURACY c/											
10.	Installed Capacity	107	107	105	105	152	123	120	91	103	103	
11.	Annual Peak Demand	126	122	138	114	117	124	113	118	121	137	
12.	Gross Reserve Capacity	63	0	12	-	*	112	203	10	27	*	
	SALES FORECAST (Gwh)											
13.	Sales	313	358	540	616	688	770	856	905	1015	1130	15.3
	ACTUAL SALES (Gwh)											
14.	Sales	301	348	463	563	650	672	789	846	908	943	13.5
	SALES FORECAST ACCURACY c/											
15.	Sales	104	103	117	109	106	115	108	107	112	120	
	RETURN FORECAST (Col. Pesos mln.)											
16.	Operating Revenues	19.1	21.8	32.9	37.6	42.0	47.0	52.2	55.2	61.9	68.9	15.3
17.	less: Operating Costs	10.7	12.3	17.6	19.9	20.3	23.3	24.9	24.0	24.3	26.1	10.4
18.	Operating Income	8.4	9.5	15.3	17.7	21.7	23.7	27.3	31.2	37.6	42.8	19.8
19.	Financial Rate of Return on Average Net Fixed Assets in Operation(%) g/	7.7	7.3	9.1	9.5	8.3	7.1	8.4	9.7	11.7	14.0	
	ACTUAL RETURN (Col. Pesos mln.) d/											
20.	Operating Revenues	18.5	19.6	24.4	24.4	24.4	33.2	34.1	44.3	52.9	65.0	15.0
21.	less: Operating Costs e/	8.1	9.9	13.0	17.4	19.5	21.5	25.9	28.7	30.8	39.0	19.1
22.	Operating Income	10.4	9.7	11.4	7.0	4.9	11.7	8.2	15.6	22.1	26.0	10.7
23.	Financial Rate of Return on Average Net Fixed Assets in Operation g/											
	a. Non-revalued assets (%)	12.8	10.5	11.1	6.3	4.1	9.6	6.1	5.7	7.6	9.2	
	b. Revalued Assets (%) f/	6.3	5.6	6.5	2.0	0.9	3.7	neg.	2.5	3.7	4.2	
	RETURN FORECAST ACCURACY c/											
24.	Operating Revenues	103	111	135	154	172	142	153	125	117	106	
25.	less: Operating Costs	132	124	135	114	104	108	96	84	79	67	
26.	Operating Income	81	98	134	253	443	203	233	200	170	165	

a/ In addition, 14 MW were available from the COMPANIA COLOMBIANA DE ELECTRICIDAD (CCE).
b/ Effective Peak = peak load at critical time in the year when margin between demand and available capacity was least or load shedding greatest (excluding short-term outages).
c/ Defined by the ratio Forecast/Actual.
d/ All current or historic pesos have been converted to 1960 constant pesos for the purposes of comparison with the Loan 255-CO Appraisal Report forecasts, using the National GDP deflator.
e/ Including non-revalued depreciation and direct taxation but excluding interest.
f/ Revaluation of assets computations as calculated by IBRD in Annex I.
g/ Net revenues as % of average net fixed assets in operation.

TABLE II - A.5

COLOMBIA: CENTRAL HIDROELECTRICA DEL RIO ANCHICAYA LTDA (CHIDRAL)
Loan 339-CO (June, 1963)

		1963	1964	1965	1966	1967	1968	1969	1970	AVERAGE ANNUAL INCREASE RATE (%) (1963-1970) g/	
	LOAD FORECASTS (MW)										
1.	Installed Capacity	135.0	165.0	255.0	255.0	310.0	370.0	490.0	490.0	20.5	
2.	Annual Peak Demand	141.0	166.0	191.0	215.0	258.0	289.0	319.0	356.0	14.1	
3.	Gross Reserve Capacity (1-2)	-6.0	-1.0	64.0	40.0	52.0	81.0	171.0	134.0		
	ACTUAL LOAD (MW)										
4.	Installed Capacity	128.1	128.1	158.1	188.1	248.1	248.1	248.1	248.1	9.9	
5.	Annual Peak Demand	129.1	138.7	143.8	174.3	185.3	200.3	201.6	228.0	8.5	
6.	Gross Reserve Capacity (4-5)	-1.0	-10.6	14.3	13.8	62.8	47.8	46.5	20.1		
7.	Effective Peak Capacity a/	118.1	128.1	118.1	125.1	183.1	243.1	215.1	205.1		
8.	Effective Peak Demand a/	121.8	138.7	140.3	140.8	175.9	200.3	201.6	221.6		
9.	Effective Peak Spare Capacity (7-8)	-3.7	-10.6	-22.2	-15.7	7.2	42.8	13.5	-16.5		
	LOAD FORECAST ACCURACY b/										
10.	Installed Capacity	105	129	161	136	125	149	198	198		
11.	Annual Peak Demand	109	120	133	123	139	144	158	156		
12.	Gross Reserve Capacity	-	*	448	290	83	169	368	667		
	SALES FORECAST (GWh)										
13.	Sales	670	791	918	1023	1199	1365	1586	1805	15.2	
	ACTUAL SALES (GWh)										
14.	Sales	563	650	672	789	846	908	943	1067	9.6	
	SALES FORECAST ACCURACY b/										
15.	Sales	119	122	137	130	142	150	168	169		
	RETURN FORECAST (Col. Pesos mln) c/										
16.	Operating Revenues	46.9	63.3	73.4	92.0	107.9	122.8	142.8	162.5	20.0	
17.	less: Operating Costs	19.0	22.6	28.7	37.1	34.5	31.4	35.9	44.1	11.2	
18.	Operating Income	27.9	40.7	44.7	54.9	73.4	91.4	106.9	118.4	25.0	
19.	Financial Rate of Return on Average Net Fixed Assets in Operation (%) d/	13.8	14.0	12.3	11.6	15.1	14.3	14.2	12.1		
	ACTUAL RETURN (Col. Pesos mln) e/										
20.	Operating Revenues	34.7	40.3	60.1	71.0	99.9	130.0	173.8	na	17.8 h/	30.5 i/
21.	less: Operating Costs f/	24.8	32.2	39.3	53.9	64.7	75.6	104.4	na	14.4 h/	27.0 i/
22.	Operating Income	9.9	8.1	20.8	17.1	35.2	54.4	69.4	na	24.5 h/	38.0 i/
23.	Financial Rate of Return on Average Net Fixed Assets in Operation d/										
	a. Non-Revalued Assets	6.3	4.1	9.6	6.1	5.7	7.6	9.2	na		
	b. Revalued Assets j/	2.0	0.9	3.7	neg.	2.5	3.7	4.2	na		
	RETURN FORECAST ACCURACY b/										
24.	Operating Revenues	135	157	122	130	108	94	82	na		
25.	less: Operating Costs	77	70	73	69	53	42	34	na		
26.	Operating Income	282	502	214	321	209	168	154	na		

a/ Effective Peak =peak load at critical time in the year when margin between demand and available capacity was least or load shedding greatest (excluding short term outages).
b/ Defined by the ratio Forecast/Actual.
c/ Includes an estimated inflation factor.
d/ Net revenues as % of average net fixed assets in operation.
e/ In current prices.
f/ Including non-revalued depreciation but excluding interest.
g/ Forecast and Actual Return growth rates are for 1963-69 only.
h/ Real growth rates have been deflated based upon the National GDP deflator.
i/ Non-deflated growth rate.
j/ Revaluation of Assets computations as calculated by IBRD in Annex I.

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COLOMBIA: CENTRAL HIDROELECTRICA DEL RIO ANCHICAYA LTDA. (CHIDRAL)
PROJECTS IMPLEMENTATION

TABLE III

		Start Construction	Commission Date	Construction period	Project Scope a/		Construction Cost b/ (US $ million) L.C.	F.X.	Total	Cost/ KW US $
LOAN 38-CO (US $ 3.53 million) (signed Nov., 1950)										
Anchicaya Units 1 and 2	Forecast	1951 c/	August 1953	30 c/	2 x 12 MW	Hydro	8.14 d/	3.89 d/	12.03 d/	501.3 d/
	Actual	1951 c/	Mid 1955	54 c/	2 x 12 MW	Hydro	n.a.	n.a.	n.a.	n.a.
Anchicaya Units 1 and 2 (including associated transmission)	Forecast	1951 c/	August 1953	30 c/	2 x 12 MW	Hydro	8.48 d/	4.32 d/	12.80 d/	533.3 d/
	Actual	1951 c/	Mid 1955	54 c/	2 x 12 MW	Hydro	n.a.	n.a.	15.33 d/	638.8 d/
LOAN 113-CO (US $1.50 million) (signed March, 1955)										
Anchicaya Units 1, 2, and 3	Forecast	Early 1955 f/	November 1956	20 f/	44 MW e/	Hydro	9.06 d/	5.30 d/	14.36 d/	326.2
	Actual	Early 1955 f/	June 1957	27 f/	44 MW e/	Hydro	n.a.	n.a.	n.a.	n.a.
Anchicaya Units 1,2, and 3 (including associated transmission)	Forecast	Early 1955 f/	November 1956	20 f/	44 MW e/	Hydro	9.38 d/	5.76 d/	15.14 d/	343.9
	Actual	Early 1955 f/	June 1957	27 f/	44 MW e/	Hydro	n.a.	n.a.	17.01 d/	386.7
Yumbo Unit 1	Forecast	Early 1955	End 1958	45	1 x 12.5 MW	Thermal	2.13	1.10	3.23	258.4
	Actual	Early 1955	May 1958	38	1 x 10.0 MW	Thermal	n.a.	n.a.	4.37	437.0
Yumbo Unit 1 (including associated transmission)	Forecast	Early 1955	End 1958	45	1 x 12.5 MW	Thermal	n.a.	n.a.	n.a.	n.a.
	Actual	Early 1955	May 1958	38	1 x 10.0 MW	Thermal	n.a.	n.a.	n.a.	n.a.
LOAN 215-CO (US $2.8 million) (signed December 1958)										
Yumbo Units 1 and 2	Forecast	Dec. 1958 h/	Feb. 1960	15 h/	22.5 MW i/	Thermal	3.41	1.42	4.83	214.6
	Actual	Dec. 1958 h/	Feb. 1960	15 h/	2 x 10 MW	Thermal	n.a.	n.a.	5.66	283.0
Yumbo Units 1 and 2 (including associated Transmission)	Forecast	Dec. 1958 h/	Feb. 1960	15 h/	22.5 MW i/	Thermal	n.a.	n.a.	n.a.	n.a.
	Actual	Dec. 1958 h/	Feb. 1960	15 h/	2 x 10 MW	Thermal	n.a.	n.a.	n.a.	n.a.
LOAN 255-CO (US $ 25.0 million) (signed May, 1960)										
Yumbo unit 3 (no transmission costs)	Forecast	Mid 1960 f/	Mid 1962	24 f/	1 x 33 MW	Thermal	1.24	4.40	5.64	170.9
	Actual	Mid 1960 f/	June 1962	24 f/	1 x 33 MW	Thermal	2.77	3.70	6.47	196.1
Calima Units 1 and 2	Forecast	Mid 1960	Early 1964	45	2 x 30 MW	Hydro	7.98	14.50	22.48	374.7
	Actual	Mid 1960	Jan. 1966	67	2 x 30 MW	Hydro	8.19	16.01	24.20	403.3
Calima Units 1 and 2 (including associated transmission) j/	Forecast	Mid 1960	Early 1964	45	2 x 30 MW	Hydro	8.44	16.28	24.72	412.0
	Actual	Mid 1960	Jan. 1966	67	2 x 30 MW	Hydro	10.70	17.27	27.97	466.1
LOAN 339-CO (US $8.8 million) (signed June, 1963)										
Calima Units 1,2,3,and 4	Forecast	June 1963 k/		18 k/	4 x 30 MW	Hydro	9.80	18.90	28.70	239.2
	Actual	June 1963 k/	Aug. 1967	50 k/	4 x 30 MW	Hydro	20.54	21.65	42.19	351.6
Calima Units 1,2,3, and 4 (including associated transmission) j/	Forecast	June 1963 k/	Dec. 1964	18 k/	4 x 30 MW	Hydro	10.60	19.79	30.39	253.3
	Actual	June 1963 k/	Aug. 1967	50 k/	4 x 30 MW	Hydro	22.42	22.91	45.33	377.8

LOAN DISBURSEMENT PATTERN

			1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
LOAN 38-CO	Forecast:	None l/																	
	Actual:	Amount (US $mln)		0.72	1.56	0.74	0.50	0.01											
		% of Total		20.4	44.2	21.0	14.1	0.3											
		Cumulative %		20.4	64.6	85.6	99.7	100.0											
LOAN 113-CO	Forecast:	Amount (US $ mln)						1.21	1.90	0.88	0.51								
		% of Total						27.0	42.3	19.5	11.2								
		Cumulative %						27.0	69.3	88.8	100.0								
	Actual:	Amount (US $ mln)						0.96	1.91	1.38	0.25								
		% of Total						21.3	42.4	30.7	5.6								
		Cumulative %						21.3	63.7	94.4	100.0								
LOAN 215-CO	Forecast: k/	Amount (US $ mln)										1.80	0.45						
		% of Total										80.0	20.0						
		Cumulative %										80.0	100.0						
	Actual:	Amount (US $ mln)										1.72	0.63	0.41	0.04				
		% of Total										61.4	22.5	14.6	1.5				
		Cumulative %										61.4	83.9	98.5	100.0				
LOAN 255-CO	Forecast:	Amount (US $ mln)											6.20	7.59	7.29	2.99	0.93		
		% of Total											24.8	30.3	29.1	12.0	3.8		
		Cumulative %											24.8	55.1	84.2	96.2	100.0		
	Actual:	Amount (US $ mln)											1.72	5.36	4.79	7.35	4.76	0.93	0.09
		% of Total											6.9	21.4	19.2	29.4	19.0	3.7	0.4
		Cumulative %											6.9	28.3	47.5	76.9	95.9	99.6	100.0
LOAN 339-CO	Forecast:	Amount (US $ mln)														3.47	4.53	0.80	
		% of Total														39.4	51.5	9.1	
		Cumulative %														39.4	90.9	100.0	
	Actual:	Amount (US $ mln)														0.59	6.12	2.09	
		% of Total														6.7	69.6	23.7	
		Cumulative %														6.7	76.3	100.0	

a/ Project scope for generation is Megawatts (MW) of installed capacity and source of energy. Data was not available for length in kilometers of transmission or distribution live expansion included in the projects (except the Buenaventina-Anchorage transmission live under loan 339-CO).
b/ Local costs of projects were calculated by changing for each year the Col. Peso expenditures or the projects into 1968 pesos by the National GDP deflator, and then converting the total amount into US Dollars at the 1968 average official exchange rate weighted by volume of imported goods and services (Ps. 15.9 = US $1.00).
c/ Construction period figures include only work done during involvement.
d/ Costs include expenses incurred before Bank participated.
e/ Of which units 1 and 2 each represented 12 MW and unit 3 represented 20 MW
f/ Construction period for third unit.
g/ For plants with more than one unit under construction, date for last unit.
h/ Construction period for second unit.
i/ Of which the first unit was to represent 12.5 MW, and the second 10 MW.
j/ The cost figures covering both generation and transmission include an allowance for the transmission live form Calina to Buga and an arbitrary small share of the line from Buga to Cali; 27% of 115 KV transmission under loan 255 was taken in total.
k/ Construction period for last two units.
l/ No disbursement forecast was made for this early loan.
m/ Exclusive of US $0.55 million originally shceduled to be re-lent to CHIDRAL'S distributor EMCALI.

COLOMBIA

CVC / CHIDRAL - Power

Load and Capacity Development

Actual and Forecast

(1953- 1970)

LEGEND:

Actual Installed Capacity

Effective Capacity 1/

Actual Peak Load

Forecast Installed Capacity

Forecast Loads

Loan 113 Co

Loan 255 Co.

Loan 339 Co.

1/ When different from installed capacity.

2/ Include additional demand of market, supplied by Cali Cartago transmission line.

Load and Capacity (MW)

0

100

200

300

400

Dec.1953

11.1

35.1

Anchicaya nos 1, 2 (24 MW)

Loan 38 Co

Date of Agreement (Loan 38 Co) Nov. 1950

Date of Agreement (Loan 113 Co)

32.0

29

35.0

75.1

52.5

Anchicaya nos 3, 4 (40 MW)

Loan 113 Co.

49.2

54.0

85.1

Yumbo no 1 (10 MW)

Date of Agreement (Loan 215 Co)

60.5

95.1

84

67.0

66.6

(Load Forecast) Loan 113 Co.

Yumbo no 2 (10 MW)

Loan 215 Co.

Date of Agreement (Loan 255 Co.)

83.7

95.2

128.1

131

147

162

Yumbo no 3 (33 MW)

Loan 255 Co

Date of Agreement (Loan 339 Co)

129.1

138.7

143.8

179

197

220

Calima I nos 1, 2 (60 MW)

Calima I nos 3, 4 (60 MW)

Calima I no 1 (30 MW)

Calima I no 2 (30 MW)

188.1

158.1

174.5

185.3

200.3

201.6

Calima I no 3 (30 MW)

Calima I no 4 (30 MW)

Loan 339 Co

248.1

219

218.1

242

277

303.1

363.1

423.1

483.1

Calima II no 1 (60 MW less diesel - 5 MW)

Calima II no 2 (60 MW)

Calima II no 3 (60 MW)

Calima II no 4 (60 MW)

Unrealized Project

Forecast Installed Capacity

Load Forecast (Loan 339 Co) 2/

Load Forecast (Loan 255 Co.) 2/

Actual Installed Capacity

Effective Capacity 1/

228.0

Actual Peak Load

1955 1956 1957 1958 1959 1960 1961 1962 1963 1964 1965 1966 1967 1968 1969 1970 1971 1972

YEARS

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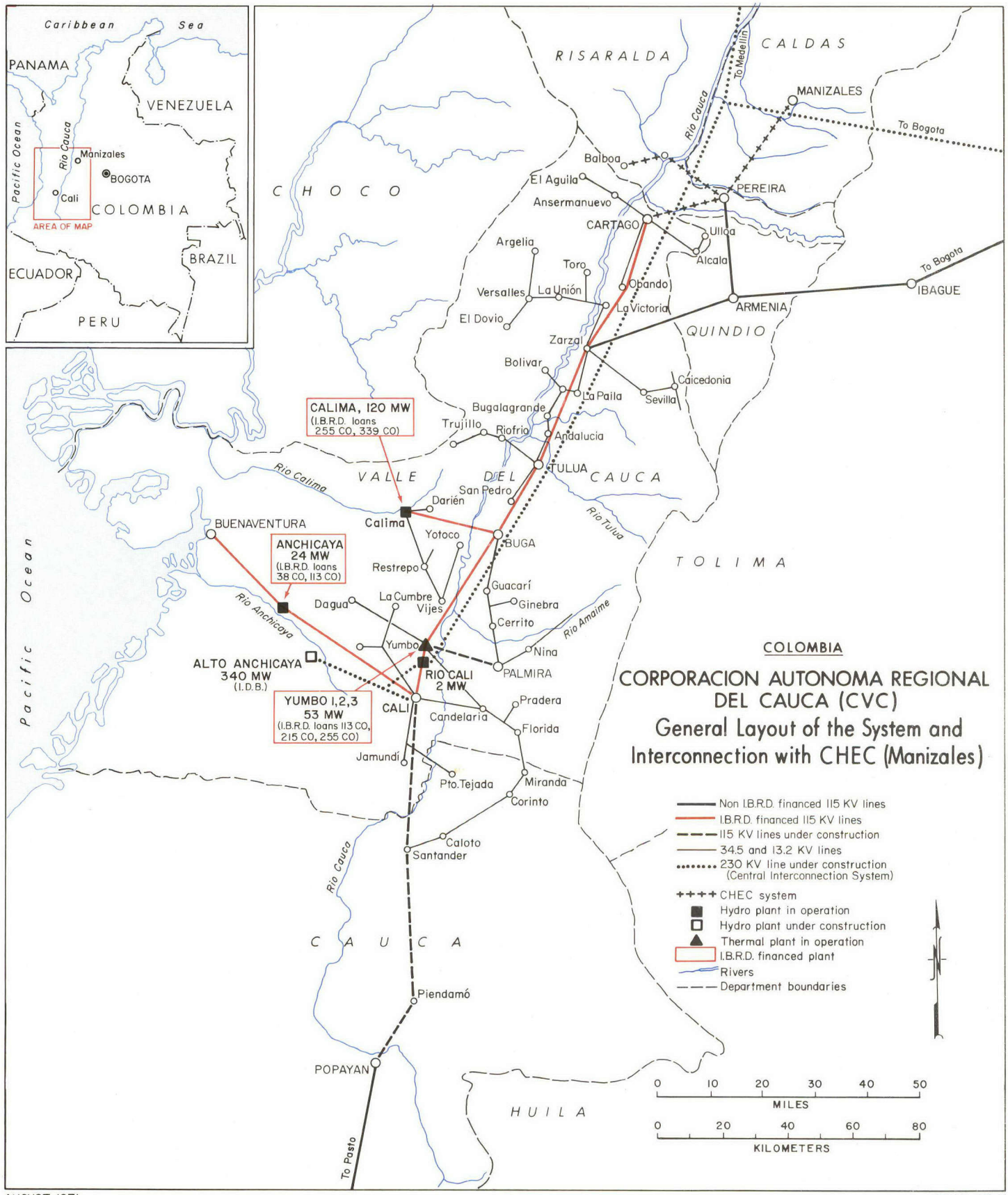

AUGUST 1971

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