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Report No. 10237

PROJECT COMPLETION REPORT

COLOMBIA

SAN CARLOS I AND II HYDRO POWER PROJECTS
(LOANS 1582-CO AND 1725-CO)

DECEMBER 27, 1991

Infrastructure and Energy Operations Division
Department III
Latin America and the Caribbean Regional Office

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ABBREVIATIONS

ISA	-	Interconexión Eléctrica S.A.
EEB	-	Empresa de Energía de Bogotá
EMCALI	-	Empresas Públicas de Cali
EPM	-	Empresas Públicas de Medellín
ICEL	-	Instituto Colombiano de Energía Eléctrica
CVC	-	Corporación Autónoma Regional del Cauca
CORELCA	-	Corporación Eléctrica de la Costa Atlántica
JNT	-	Junta Nacional de Tarifas
FODEX	-	Fondo de Moneda Extranjera
FEN	-	Financiera Eléctrica Nacional
LRMC	-	Long-Run Marginal Cost

CURRENCY EQUIVALENTS

Currency Unit	=	Colombian Peso (Col\$)
Col\$ 433.92 (12/31/89)	=	US\$1

FISCAL YEAR = CALENDAR YEAR

Office of Director-General
Operations Evaluation

December 31, 1991

MEMORANDUM TO THE EXECUTIVE DIRECTORS AND THE PRESIDENT

SUBJECT: Project Completion Report on Colombia
San Carlos I and II Hydro Power Projects
(Loans 1582-CO and 1725-CO)

Attached, for information, is a copy of a report entitled "Project Completion Report on Colombia - San Carlos I and II Hydro Power Projects (Loans 1582-CO and 1725-CO)" prepared by the Latin America and the Caribbean Region Office, and Part II contributed by the Borrower. No audit of this project has been made by the Operations Evaluation Department at this time.



Attachment

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(Loans 1582-CO and 1725-CO)TABLE OF CONTENTS

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SAN CARLOS I AND II HYDRO POWER PROJECTS
(LOANS 1582-CO AND 1725-CO)

PROJECT COMPLETION REPORT

PREFACE

This is the Project Completion Report (PCR) for the San Carlos I and II Hydro Power Projects in Colombia, for which Loans 1582-CO and 1725-CO in the amount of US\$126.0 million and US\$72.0 million were approved on May 5, 1978 and June 12, 1979, respectively. Loan 1582-CO was closed on June 30, 1986, two years behind schedule. It was fully disbursed and the last disbursement was on February 26, 1987. Loan 1725-CO was closed on June 30, 1988, three years behind schedule. It was fully disbursed, except for some US\$26,083 canceled due to misprocurement. The last disbursement was on May 5, 1989.

The PCR was prepared by the Infrastructure Division of the Latin America and the Caribbean Regional Office (Preface, Evaluation Summary, Parts I and III), and the Borrower (Part II).

Preparation of this PCR is based, inter alia, on the Staff Appraisal Report; the Loan, Guarantee, and Project Agreements; supervision reports; correspondence between the Bank and the Borrower; and internal Bank memoranda.

COLOMBIA

SAN CARLOS I AND II HYDRO POWER PROJECTS ^{1/}
(LOANS 1582-CO AND 1725-CO)

PROJECT COMPLETION REPORT

EVALUATION SUMMARY

Project Objectives

1. The main project objectives were: (i) to enhance ISA's role in harnessing the large hydro potential to meet future power requirements; (ii) to coordinate through ISA sound overall sectoral developments; (iii) to enable the efficient and economic operation of the interconnected system; (iv) to encourage the financial viability of the various entities of the sector and to institute operational policies designed to increase efficiency and allow monitoring of performance throughout the sector (para. 3.01).

Implementation Experience

2. San Carlos I, the first stage of the San Carlos Hydro Plant (units 1-4, 620 MW) was completed in February 1984, about eight months behind schedule. San Carlos II, the second stage (units 5-8, 620 MW), was completed in December 1987, three and a half years later than expected at appraisal (para. 5.02). Delay in completing San Carlos II was due to four circumstances: First, severe financial constraints, especially during the 1981-82 period, forced ISA to concentrate its scarce financial resources on completing San Carlos I and delayed San Carlos II (para. 5.03). Second, the penstock passed through a roughly 35-meter fault that required a change in its design and the construction of an intermediate access tunnel. Third, the discharge tunnel collapsed twice. Fourth, geological problems in the portal of the discharge tunnel made it necessary to construct an additional access tunnel (para. 4.04).

3. The Calderas power station, a small hydro plant that was part of San Carlos II, was flooded by the river in mid-1990, which destroyed the generating equipment. At present, ISA is repairing the powerhouse and will replace the generating equipment (para. 4.04).

Project Results

4. The projects achieved most of their objectives. The country's demand for power was met and the reliability of the power service improved when the project was commissioned (para. 6.11). Delays in project completion did not significantly affect the quality of service, because demand did not

^{1/} The San Carlos I and II Hydro Power Projects are parts of the same hydro power plant, the San Carlos Hydro Power Plant. The construction of this plant was divided in two stages which were named San Carlos I and San Carlos II respectively.

grow as forecast at appraisal (para. 6.04). A high economic internal rate of return (20 percent) confirms the economic benefit of the projects compared with Colombia's other generating resources (Part III, Section 7). However, the projects had less effect than anticipated on overall sectoral performance and ISA's role as the prospective executing agency of large hydro developments (para. 6.12). This was due to lack of both mandate to monitor the sector utilities' performance and acceptance of ISA's role by its shareholders (para. 8.02). At the completion of the projects, ISA's financial position was weak, as was that of most of the other power utilities, who were unable to pay their overdue accounts to ISA (para. 6.12).

Project Sustainability

5. It is expected that the facilities, as well as the institutional development, created by the projects will continue to produce benefits. ISA has proved able to maintain its facilities properly and the institution has developed substantial planning, technical, and managerial capabilities (para. 7.01).

Issues Remaining Outstanding

6. The current issues of the power sector in general, and ISA in particular, are financial and institutional. The sector is facing a severe financial crisis that is demanding large government contributions and impairing its expansion. Causes for this crisis have been an over-ambitious and inflexible investment program, the collapse of the program's financing plan because of lack of expected availability of resources from the international capital market as a result of the Latin American debt crisis, major devaluation of the Colombian peso without tariff compensation, high level of accounts receivable and high energy losses (para. 6.03). To remedy this situation, the government should define explicitly the objectives of the sector in the context of macroeconomic policies, strengthen the regulatory body, and delimit accountability of the sector utilities.

6. The role and structure of the sector's institutions should be re-examined realistically, since ISA's role has been controversial and not totally accepted by its shareholders (para. 6.12). Nevertheless, a centralized sectoral planning should be preserved, as much for long-term expansion as for the operation of the interconnected system.

Lessons Learned

7. The most important lessons are the following (para. 13.01).

- (a) Covenants undertaken by companies not directly involved in the project have little chance of being met without specific authority, mechanism and political will to enforce them. In the present case, a strong regulatory body would have helped to establish and oversee the decisionmaking mechanism connecting planning, financing and project implementation.
- (b) An expansion plan should consider potential departures from macroeconomic scenarios and market projections to allow adjustments in the investment program to meet new conditions.

Expansion plans should include a margin of flexibility to allow for periodic revisions.

- (c) A rainfall in the basin where the Calderas powerhouse is located, apparently greater than a hundred year storm, caused the river to flood the powerhouse with a large amount of boulders and destroyed its two generating units. The risk of this kind of events should be taken into account in the selection of the powerhouse site and type.
- (d) Project implementation should not underestimate the risk of delays caused by factors external to the project, such as legal processes for the acquisition of land, obtaining import licenses, and financial constraints of the project owners.

COLOMBIA

SAN CARLOS I AND II HYDRO POWER PROJECTS (LOANS 1582-CO AND 1725-CO)

PROJECT COMPLETION REPORT

PART I. PROJECT REVIEW FROM BANK'S PERSPECTIVE

1. Project Identity

- Project Name: San Carlos I and II Hydro Power Projects
- Loan No.: Loans 1582-CO and 1725-CO
- RVP Unit: Latin America and the Caribbean Region, Country Department III
- Country: Colombia
- Sector: Energy
- Subsector: Power

2. Project Background

2.01 Public electricity services in Colombia are provided by eight major utilities. These include three municipal companies in the main cities: Empresa de Energía de Bogotá (EEB), Empresas Públicas de Medellín (EPM), and Empresas Públicas de Cali (EMCALI); three Government-owned companies: Instituto Colombiano de Energía Eléctrica (ICEL), Corporación Autónoma Regional del Cauca (CVC), and Corporación Eléctrica de la Costa Atlántica (CORELCA); and two companies owned by the other utilities of the sector: Interconexión Eléctrica S.A. (ISA) and Central Hidroeléctrica Betania (CHB).

2.02 ISA was established in 1967 to provide a rational framework for sector development by interconnecting the systems of its shareholders. The intention was to create a national grid capable of sustaining large hydroelectric developments and, by pooling the shareholders' financial resources through ISA, to allow for much larger and more economical projects than would have been feasible for each utility independently.

2.03 At the time of the project appraisal (May 17, 1978), the government had set broad sector development objectives. These consisted of meeting demand within justifiable limits (including compensation for past under-investments), achieving an efficient sector expansion, using resources optimally, and achieving financial self-sufficiency.

2.04 Government strategy to reach the above objectives was to centralize in ISA the planning of sector expansion. It assigned to ISA the construction, ownership, and operation of all plants requiring joint efforts by its shareholders, and responsibility for the studies needed to improve sectoral operating and financial efficiency.

2.05 The projects were consistent with the sector objectives and government strategy. The energy requirements of the interconnected system were expected to grow at an average annual rate of about 10.6 percent. To satisfy these requirements, ISA defined a least-cost expansion plan for the period 1978 to 1985. This plan allowed for new generating power plants,

including the project, with an aggregate installed capacity of 2,133 MW. To improve the sector's efficiency and finances, the project also included two studies: one on energy losses and another on the operation of the interconnected system.

3. Project Objectives and Description

3.01 The specific objectives of the San Carlos I and II Hydro Power Projects were: (i) to enhance ISA's role in harnessing the large hydro potential to meet future power requirements; (ii) to coordinate through ISA sound overall sectoral development; (iii) to facilitate the interconnected system to operate efficiently and economically; this included the CORELCA system where, after completion of the 500-kV line interconnection project, part of the expensive thermal generation was to be replaced by hydro generation available in the Central System; (iv) to encourage the financial viability of the various entities in the sector, and to institute operational policies designed to increase efficiency and allow the monitoring of performance on a common basis, throughout the sector.

3.02 The San Carlos I and II Hydro Power Projects consisted of the following:

San Carlos I

- (a) An earth dam 75 m high; two concrete intake towers connected to two vertical shafts 150 m deep; a power tunnel, 4,500 m long; a surge tank; an inclined pressure tunnel bifurcating into two penstocks; two caverns, one for ten turbine-generators and one for transformers; an access tunnel to the powerhouse; and a discharge tunnel, 1,570 m long;
- (b) four Pelton turbines; four vertical shaft generators rated 183 MVA; two 3-phase banks of single-phase transformers; a 230 kV switchyard; and a control building for operation of the power station and the substation;
- (c) a 244-km double-circuit 230-kV transmission line, and corresponding substations; and
- (d) a study of losses in the systems of ISA and its shareholders.

San Carlos II

- (a) Four Pelton turbines; four vertical shaft generators rated 183 MVA; two 3-phase banks of single-phase transformers; electrical equipment; and expansion of the switchyard;
- (b) 290 km of double-circuit 230-kV transmission lines;
- (c) a study for operating the interconnected system at least cost; a training program for dispatch personnel; and a study of ISA's manpower requirements and execution of a program to train professional staff; and

- (d) the Calderas hydro power plant, a small plant composed of a concrete gravity-type dam 25 m high; pressure tunnels; a surface power station; two turbine-generators of 9.2 MW each; and ancillary equipment including transformers.

4. Project Design and Organization

4.01 The San Carlos Hydro Power Projects were part of the expansion program prepared by ISA in June 1973 and based on a comparison made between thermal and a limited number of hydroelectric options. At the time of the appraisal, not many options had been thoroughly studied, and a study on a hydro survey and long-term expansion plan with assistance from the Federal Republic of Germany was still under way.

4.02 The feasibility studies and conceptual design of the San Carlos Hydro Development were carried out by EPM with the assistance of a local consulting company. Final designs for the projects were carried out by ISA with the assistance of the same local consultant. Final designs were available in time for the appraisal. The Bank engaged an independent consultant to review the project design and participate in the appraisal. This consultant agreed in substance with the project design.

4.03 On the basis of the studies on the projects, favorable geological conditions at San Carlos Power Plant were expected. It was foreseen that the dam, the intakes and the greater part of the pressure tunnels (80-85 percent) would be located on and in sound igneous rocks. The remainder of the pressure tunnels, the power house, and the discharge tunnels would be located in metamorphic rock requiring some supports; only a small portion (5-8 percent) of tunnelling would be done across fault zones. Excavation of the caverns was not expected to present any major problems; however, to minimize the risk of unforeseen situations caused by the huge volume of the excavation work and the width of the galleries, it was proposed that the construction of exploratory tunnels along the caverns would better determine the rock conditions and define the orientation of the caverns. The bidding documents allowed for this contingency and indicated the limits for location of the powerhouse. In contrast with the above, only limited studies on the Calderas small power plant were available at the time of the appraisal.

4.04 In general, the geological conditions found at the San Carlos Power Plant during project construction were consistent with those expected at the design stage, except in the penstock and discharge tunnel, where the conditions were worse than expected. The penstock passed through a fault of about 35 meters in length, which required a change of the penstock design and the construction of an intermediate access tunnel. The discharge tunnel collapsed twice and an additional access tunnel had to be opened. Conditions found at Calderas power plant were very much worse than expected at appraisal and substantial changes were introduced in the design of this plant during project implementation. After a few months of operation, in September 1990, its power station suffered substantive damage caused by an exceptional flooding of the river. A heavy rainfall in the basin where the Calderas powerhouse is located caused the formation of numerous landslides on the surrounding hillsides, overflow of the river and inundation of the powerhouse. The rainfall recorded was apparently greater than a hundred year storm. The river carried a large amount of material including boulders that flooded the

powerhouse and caused damage to the two generating units and other components. At present, ISA is clearing the site to repair the powerhouse, new equipment will be ordered, and protective measures will be taken. Repairs of the power house, and manufacturing and installing equipment are expected to take some two and a half years.

4.05 ISA's assessed the environmental effect of the project at the time of the appraisal, and no major impact was expected. The project area is extremely hilly, with poor soils and high rainfall, making the entire area unsuitable for farming or stock raising. One small village of about seventy families was to be displaced by the project, and an adequate program for acquiring all properties and evacuating residents was submitted to the Bank before appraisal. Completion of evacuation was a condition for loan effectiveness.

4.06 ISA was responsible for the construction of the projects. ISA established a project unit to manage the project and coordinate related activities. This unit had the assistance of the same local consultants that had carried out the project studies. They assisted in the preparation of construction designs and bidding documents, bid evaluation, procurement of equipment and supervision of the project construction.

5. Project Implementation

5.01 Loan Effectiveness and Project Start-up: Loan 1582-CO was approved on May 30, 1978, signed on July 14, 1978, and effective on April 5, 1979. Loan 1725-CO was approved June 12, 1979, signed on November 30, 1979, and effective on June 19, 1981. The long time elapsed between loan signature and loan effectiveness was due, in the case of Loan 1582-CO, to legal difficulties to have the Shareholders' Agreement ratified by the government; and in the case of Loan 1725-CO, to delays in resolving the large size of accumulated arrears in payments to ISA of its shareholders and the Government.

5.02 Implementation Schedule: The San Carlos I Project was completed in February 1984, eight months later than expected at the appraisal. The San Carlos II Project was originally scheduled to be completed by June 30, 1984, but it was commissioned only in December 1987. The Calderas power plant was commissioned in April 1988.

5.03 Financial constraints on ISA and the civil work contractor were the main cause of delay. ISA's shareholders did not pay in their contributions, which were higher than initially expected, on time. At the same time, the civil works contractor was unable to get temporary financing to bridge the delays in ISA's payments. Other delays were caused by (i) adverse geological conditions found in the construction of the penstock and the discharge tunnel (para. 4.04); and (ii) lengthy procedures for acquisition of lands and rights of ways.

5.04 Procurement: In general, procurement actions proceeded satisfactorily and in accordance with Bank guidelines, except in the case of a minor contract. A Bank procurement specialist visited ISA at the beginning of project implementation to assist it in planning the procurement process. A contract for US\$26,083.41 was declared misprocurement by the Bank, and the corresponding amount was canceled. The generators at the Calderas powerhouse failed during commissioning. The supplier remedied the generator defects, but its response to do it was slow due to intricate administrative procedures within the supplier's country.

5.05 Project Costs: At appraisal, the estimated cost of the San Carlos I Hydroelectric Project was US\$367.0 million excluding interest during construction (IDC). The final cost of this project amounted to US\$443.7 million. This final cost includes the cost of the underground works (US\$101.7 million) of the second stage of San Carlos, whose construction was added to San Carlos I by amendment of the Loan Agreement to use the savings obtained in the implementation of San Carlos I. These savings arose from lower than expected unit prices quoted by the civil works contractor.

5.06 Exclusive of the underground works mentioned above, the appraisal estimate of the cost of San Carlos II was US\$156.1 million, while the final cost was US\$166.3 million (excluding IDC). The difference was due to: (i) the higher engineering and supervision costs of the longer project implementation period; and (ii) higher than estimated costs of civil works for the Calderas power plant, due to the substantial modifications to its design. The above cost does not include the cost of repairing the Calderas power station.

5.07 Disbursements: The expected and actual disbursements of Loans 1582-CO and 1725-CO are given in Section 3 of Part III. The disbursements were delayed due to the delays in implementation of the projects. The original closing date for Loan 1582-CO was June 30, 1984, but it was closed on June 30, 1986 after two one-year extensions. The original closing date for Loan 1725-CO was June 30, 1985, but it was closed only on June 30, 1988 after three one-year extensions. Disbursements against commitments were made until May 5, 1989.

5.08 Loan Allocation: The original and revised allocations of the proceeds of both loans are shown in Section 4 of Part III.

6. Project Results

6.01 Project Objectives: The projects achieved most of their objectives. They succeeded in (i) meeting the country's power demand through an efficient expansion of generating capacity; (ii) enhancing ISA's planning and technical capabilities, and achieving substantive institutional development of ISA (para. 8.01); (iii) allowing a more efficient and economic operation of the interconnected system through ISA (para. 6.11); (iv) achieving some sectoral developments, particularly the carrying out of studies applicable to the whole sector; these included the study on tariffs based on marginal costing, and the one on energy losses. However, the projects were not effective in achieving the financial viability of the sector's utilities or in improving operational policies. This was attributed in part to the fact that ISA's shareholders, which are the major utilities of the country, did not have the will to impose themselves financial policies and monitoring.

6.02 Physical Results: The physical targets of the projects were substantially achieved, but in the case of San Carlos II, the completion of the project was achieved some three years later than planned. The destruction of the Calderas power station that occurred in mid-1990 (para. 4.04) will impede its operation until the end of 1993, when commissioning of new equipment is expected.

6.03. Financial Performance. Annex 1 compares the appraisal forecast and actual income statements, sources and applications of funds, balance sheets, and performance indicators for the period 1978 to 1989. ISA's performance was adequate during the period 1978-82; however, from 1983 the sector, and consequently ISA, experienced financial constraints due to an over-ambitious and inflexible investment program, the collapse of the program's financing plan because of lack of expected availability of resources from the international capital market as a result of the Latin American debt crisis, major devaluation of the Colombian peso without tariff compensation, high level of accounts receivable and high level of energy losses. The financial rate of return on revaluated assets was generally close to the covenanted figure during the period (para. 6.07), but the debt-equity ratio, debt-service coverage and self-financing ratio that were generally satisfactory before 1983, deteriorated significantly after this year.

6.04 ISA's internal cash generation was lower than expected and it had difficulties in covering its debt service, even though the average tariff increased substantially in current prices during the period. ISA's income was affected by energy sales lower than forecast at the appraisal and an average tariff between 50 percent and 60 percent of the long-run marginal cost (LRMC) at interconnection level. Sales grew much less than they had been forecast, as a result of the slowdown in the economy. In the 1980s, energy demand grew at a rate of 6 percent per year compared with rates of 10 percent per year during 1970s. If energy purchases are deducted from sales shown in the income statements, sales of ISA's generated energy were only 70 percent of those expected in 1985, the last year forecast in the appraisal (7,445 GWh actual compared with 10,502 GWh forecasted).

6.05 The average tariff for long-term sales, in current prices, increased from Col\$0.52 per kWh in 1978 to Col\$8.5 in 1989. Expressed in end-1989 prices, it raised from Col\$7.35 to Col\$9.66 that represents a 31 percent increase. Average revenues, including long and short-term sales increased from Col\$0.49 in 1978 to Col\$6.48 in 1989. Expressed in end-1989 prices it raised from Col\$6.88 to Col\$7.36 that represents an increase of 7 percent. As ISA operates the interconnected system, all sales and purchases within the power sector are reflected in its statements, and the average income does not represent the tariff of ISA's energy. Until 1988, ISA's tariffs were adopted by its board of directors; now, tariffs are defined by Junta Nacional de Tarifas (JNT). In October 1990, JNT issued Resolution 089, which defines goals for bulk tariffs based on LRMC, and Resolution 091, which adopted a one-time increase of 16 percent for energy prices and an 11 percent increase for the demand charge. ISA's long-term average tariff in April 1991 was Col\$16.04/kWh (US\$0.0265/kWh), that is about 70 percent of the LRMC at the interconnected level. It is expected that for 1994 tariffs will be around 89 percent of LRMC.

6.06 The level of accounts receivable on electricity sales as a percentage of annual sales revenues increased from 42 percent in 1978 to 91.4

percent in 1989, compared with 17 percent established as a performance indicator. The level of this ratio was extremely high during all the years covered by this report (1978-89), and was one of the main reasons for ISA's financial difficulties. Annex 2 shows accounts receivable by shareholder. Expressed in US\$ million, ISA's claims against its shareholders were: 1980, \$77; 1984, \$227; 1987, \$199; and 1989, \$352. Out of the total accounts receivable, 70 percent represented arrears, which were concentrated in EEB, CVC, CORELCA and ICEL, companies that also experienced financial difficulties during the period. Partly due to this situation, ISA had to negotiate loans with the Fondo de Moneda Extranjera (FODEX) and with the government to cover the debt service. The Bank, during the supervision of the project, pressed ISA and the government to solve the problem of overdue accounts receivable, but without success. This problem was also addressed under the Power Sector Adjustment Loan (Loan 2889-CO), where it was agreed that all debts from ISA's shareholders should have been settled by end-1988, but the results were not satisfactory.

6.07 The rate of return on revalued assets (ROA) was somewhat lower than covenanted. Thus, even though the ROA was technically close to the covenanted value, ISA in much of this period barely covered or was unable to cover its debt service and finance an adequate portion of its construction program with internally generated funds. It appears that the ROA was not an adequate revenue covenant and also that rates were overstated, because the method used to revalue assets did not fully reflect their actual value. As Colombia law and accounting practice allow only partial revaluation, the full revaluation process was done on a proforma basis only to determine the ROA indicator for the purpose of the Bank loans. Power sector utilities use the Consumer Price Index (CPI) to calculate asset revaluation. The Bank staff believed that this index did not reflect fully the costs of the sector, and under Loan 2401-CO to FEN, it was agreed with the Colombian government that an appropriate price index for the electricity sector would be prepared. This index was prepared and discussed with the Bank, but it has not yet been used to calculate asset revaluation.

6.08 The covenanted figure of 9 percent ROA reflects ISA's bylaws at the time of appraisal, which required the utility's revenues to cover only its debt service and operating costs. Therefore, a negligible contribution from internal cash generation to the construction program was expected. The construction program was to be financed mainly with the shareholders' contributions. Therefore, the self-financing performance indicator (33 percent average during the period) was defined to include the contributions by the nongovernment shareholders. As the power utilities also suffered financial difficulties during the period, their equity contributions were lower than were needed by ISA to maintain a sound debt level.

6.09 ISA's debt-equity ratio and debt service coverage ratio, which were generally satisfactory before 1983, deteriorated significantly from this year. ISA's high indebtedness level and costly debt service resulted not only from the reduced capitalization from shareholders and internal cash generation, but also from peso's devaluation against the dollar and the dollar's depreciation against other currencies. A higher Colombian peso devaluation against the U.S. dollar than had been expected started in 1983 and extended through the mid-1980s. Although this devaluation corrected for increases in the real value of the peso during the 1970s and early 1980s, the power utilities were not prepared to handle the cost of debt servicing that

come with it. Government did not take any steps to compensate through tariff adjustment or otherwise to smooth out this impact and the utilities, unable to cover their debt service, became debtors of FODEX, who honored the government guarantee.

6.10 Annex 3 presents the appraisal and actual annual level of performance for the period 1978-89 for ISA's shareholders: EEB, EPM, CVC and CORELCA. The performance indicators were generally below those established at appraisal. The power utilities were affected by: (i) reduced sales, as a result of the economic slowdown during this period and their substantial increase in non-technical energy losses; (ii) tariffs that did not reflect the economic cost of service; and (iii) the high devaluation of the Colombian peso and depreciation of the U.S. dollar against other currencies, without a corresponding tariff adjustment. EEB, committed to a large expansion program and unable to reduce its energy losses, ran into financial difficulties to cover its debt service and accumulated arrears in its payments to ISA. EPM was the utility least affected by this situation, but even its indicators fell short of the expectations held at appraisal. CVC and CORELCA were the worst affected and their performance indicators show that, after 1983, they were unable to cover their debt service.

6.11 Impact of Projects: The projects made a major impact by meeting the country's power needs and improving the quality of service. Generation by the project represents over 15 percent of total current demand of the country. The cost of the project energy is very economical compared with the LRMC. Additionally, the projects contributed to a reduction in the operating and maintenance cost of the system, by reducing the use of fuel, and improved the reliability of service. The projects also have made a major institutional impact on ISA. The experience obtained in the construction of the San Carlos facilities and the planning and management tools developed during project implementation strengthened substantially the planning and technical capabilities of ISA.

6.12 On the other hand, the impact on the sector's overall performance and ISA's anticipated role in developing future larger hydro power projects was only limited. This was because ISA's role was not only unclear and controversial from the beginning, but subject to numerous tacit changes during the project. In addition, the lack of a strong regulatory body and more specific and consistent government policies on the sector impaired efforts to achieve financial viability of the sector's utilities. At the completion of the project, ISA's financial position was vulnerable, and all the other power utilities, with the exception of EPM, were in a very weak financial position and unable to pay their overdue accounts to ISA.

7. Project Sustainability

7.01 San Carlos is the largest power plant in the country and its energy production is reliable. Its installed capacity, 1240 MW, represents about 14 percent of the total installed capacity, and its annual generation is consistent with what was expected during its studies. The projects include facilities for the installation of two-155 MW additional units. The facilities built under the projects will continue to produce benefits for both ISA and the country for a long time. They are safe, lasting, productive, and demand low operation costs. Those facilities were designed and built in

accordance with international standards and with the assistance of well-qualified consultants. Their lives will probably extend further than projected. Since the cost of the energy generated by San Carlos is low and will remain almost constant through its life, it will help to keep down the average cost of electricity in the country. The problem presented at the Calderas powerhouse, which is a very small part of the projects, is being addressed satisfactorily and protective measures will be taken to prevent the powerhouse from any further river flooding (para. 4.04).

7.02 As to the institutional issues, the government is now (in 1991) working on the establishment of a regulatory framework for the power sector and reexamining the role of ISA and the other institutions in the sector, as well as options for its financial restructuring.

8. Borrower Performance

8.01 As noted, ISA suffered severe financial constraints after 1983 (para. 6.03). At the same time, its institutional development was substantial. The projects were implemented effectively and efficiently, and their performance indicators, with the exception of the accounts receivable indicator, were very close to the values expected at the time of the appraisal. ISA's installed capacity grew from 1,000 MW to 2,693 MW (about 31 percent of the installed capacity across the country), and ISA's internal structure was significantly strengthened. In 1977, administrative, financial, and operations departments were created, as well as an internal audit unit. In 1979, the Planning Unit was created, which has developed strong technical capabilities and played a decisive role in the development of ISA and the sector as a whole. In 1983, the Dispatch Center was commissioned, and since then, has been decisive in coordinating the systems operated by ISA and the other utilities. Finally, the recently created Environmental Unit has taken a clear leadership in its field within the sector; it has developed a methodology to include the environmental factor in the planning process, prepared guidelines for resettlement and environment protection, and carried out significant studies in these fields for future hydro projects. Implementation of the project's physical components was carried out efficiently and the costs kept within the appraisal estimate. All this is attributable to ISA's effectiveness. Delays in project implementation and the deterioration of the accounts receivable indicator cannot be blamed on ISA. Annex 1, page 4, contains the comparison between forecast and actual performance indicators of ISA.

8.02 However, the severe financial constraints experienced by ISA during project implementation revealed weakness in the power's institutional framework and the lack of adequate mandate for ISA to meet its anticipated dominant role in the sector. These deficiencies were demonstrated mainly in the following ways:

- (a) ISA lacked the mandate to monitor the implementation of the expansion plan by other utilities, and assess the need for corrective measures in a timely manner.

- (b) The system for approving expansion plans was painful and rigid as much for ISA's board as for the government. This made the updating of the plans and adoption of corrective measures difficult.

9. Bank Performance

9.01 Bank participation in the projects was generally satisfactory. During preparation of San Carlos I, the Bank was persistent in discussing conditions not only on the investment programs and the finance of ISA and of its shareholders but mainly on institutional issues. The reach of these conditions explains to an extent the long time it took to agree on them. They included (i) granting to CORELCA membership as a shareholder in ISA; (ii) changing of ISA's bylaws to indicate that (a) all major future expansion of national interest would be owned and operated by ISA; (b) ISA would charge tariffs to cover operating costs, depreciation and achieve 9.0 percent annual return on revalued assets; (iii) the cost of fuel to CORELCA, by the time of completion of the 500 kV line, would be equal to or greater than the delivered cost of energy purchased by CORELCA from ISA; (iv) shareholders of ISA to raise tariffs so to achieve annual return of 9.0 percent each on revalued assets; (v) implementation of Government plans to bring the price of fuels (petroleum and natural gas) in line with the cost of new domestic oil and world prices; (vi) measures to avoid the problem encountered under the Bank loan to ISA for the Chivor Project, namely, that several of the shareholders did not honor their financial obligations to ISA on time; (vii) preparation of a power sector development master plan.

9.02 The Bank exercised a close supervision of the projects. It spent about 125 staff-weeks in supervision, this is about 14 staff-weeks per year. During project implementation, the Bank supported ISA continuously with its shareholders and the government, and supported programs to strengthen ISA's planning and management capabilities. The Bank, through the supervision of its loans to EEB and EPM, kept alive their commitments to contribute and pay ISA for their electricity. Unfortunately, due to their financial difficulties, the utilities' accounts payable to ISA increased substantially (para. 6.06). The Bank showed flexibility by approving the use of savings from Loan 1582-CO to partially finance the civil works of San Carlos II and some local costs. To help to meet ISA's financial needs, the Bank supported the creation of FEN and approved Loan 2401-CO to it. To strengthen ISA's planning and managerial capabilities, the Bank pushed for and acted as executing agency for two technical assistance projects financed by UNDP. One was the Planning System for Power Expansion, and the other was the Design of a Planning and Monitoring System for the Execution of Hydroelectric Projects.

10. Cofinancing Agencies

10.01 In addition to the Bank loans, the projects received financing from the International Development Bank, Eximbank from Japan, Orion Royal Bank and Bank of Tokyo. Relation and interaction between the Bank and the cofinancing agencies during project implementation were very little and no special effect was obtained from joint actions.

11. Consulting Services

11.01 The studies and design of the San Carlos hydro plant, and the inspection of its construction were performed satisfactorily by a local consulting firm, assisted by external independent consultants. The technical assistance to develop a project management system, partially financed under the project, was provided satisfactorily by a foreign consulting firm. The other studies included in the project were performed, also satisfactorily, by local consulting firms.

12. Project Documentation and Data

12.01 The Loan and Shareholders' Agreements were adequate, in general, to the Project objectives, and the Staff Appraisal Report (SAR) provided a useful framework to both the Bank and ISA to review project implementation. However, the SAR did not assess ICEL's financial viability, one of ISA's major shareholders, because at the time of the appraisal there were not suitable information available for the preparation of financial projections. Consequently, the Shareholders' Agreement did not include specific covenants related to ICEL's performance. ISA prepared a project completion report and provided additional information requested.

13. Lessons Learned

13.01 The most important lessons are the following.

- (a) Covenants undertaken by companies not directly involved in the project have little chance of being met without specific authority, mechanism and political will to enforce them. In the present case, a strong regulatory body would have helped to establish and oversee the decisionmaking mechanism connecting planning, financing and project implementation.
- (b) An expansion plan should consider potential departures from macroeconomic scenarios and market projections to allow adjustments in the investment program to meet new conditions. Expansion plans should include a margin of flexibility to allow for periodic revisions.
- (c) A rainfall in the basin where the Calderas powerhouse is located, apparently greater than a hundred year storm, caused the river to flood the powerhouse with a large amount of boulders and destroyed its two generating units. The risk of this kind of events should be taken into account in the selection of the powerhouse site and type.
- (d) Project implementation should not underestimate the risk of delays caused by factors external to the project, such as legal processes for the acquisition of land, obtaining import licenses, and financial constraints of the project owners.

COLOMBIA

SAN CARLOS HYDROELECTRIC PROJECT
(Loans 1582-CO and 1725-CO)

PROJECT COMPLETION REPORT

PART II: PROJECT REVIEW FROM THE BORROWER'S PERSPECTIVE

The Borrower's main comments are summarized below.

Construction Schedule

- The time periods initially defined for civil work construction proved to be very optimistic. A less-optimistic construction schedule should be adopted at the planning stage.
- There were interferences between the erection of electromechanical equipment and the civil works. These interferences showed the necessity of having an integrated schedule available at all times. For the schedule to work, it is necessary to have a tight schedule monitoring and coordination between all the companies involved.

Procurement

- The utilization of standard outlines for bidding documents and contracts made the evaluation of bids and award of contracts easier. As a result, there was an important time saving in procurement activities.

Civil Works

- The development of the main civil works contracts had serious economic problems during the execution stage due mainly to: (i) low financial capacity of contractor, aggravated by the fact that the contractor was carrying out simultaneously the civil works corresponding to four (4) different contracts (Punchina dam, San Carlos I and II underground civil works, and Jaguas project); and (ii) payment delays by ISA. The contractor's financial capabilities should be highly analyzed when selecting and awarding this type of contracts.
- Delays in the acquisition of land and right of ways for the project contributed to the delay of civil works. ISA has no control over the time period required to carry out the legal processes involved on this matter.
- The fact that both supervisory and design activities were carried out by the same consulting company was positive. It facilitated communications and preparation of complementary studies, detail designs and modifications during the construction.

- The material excavated at the spillway that was useful for the dam embankment was 914,000 m³ less than expected due to a large quantity of rock-balls that restricted its utilization. Deeper drill holes during the earlier stages would have provided a better estimate.
- The design of the penstock coating surface was modified, replacing the hydraulic concrete for shotcrete. This meant a project benefit because it avoided important delays on operation starting date. Also, this change meant less construction costs.
- The industrial safety standards included on the bidding documents were unsatisfactory.

Equipment

- The Colombian legislation includes regulations to protect national industry against imported equipment. The duration of the procedures and requirements to import equipment are difficult to predict making it hard to schedule them in advance. To improve scheduling of these activities, a closer links with the governmental departments involved should be established.
- There were two problems affecting the storage of electromechanical equipment: (i) poor storage conditions and (ii) lack of enough storage areas. As a result, it was necessary to replace and repair some damaged equipment. There is a need for a carefully written plan that would outline the special equipment storage requirements on the area of the project.
- ISA had to negotiate advance payments with its contractors in order to get the Bank loans disbursed before the loan closing dates.

Bank and ISA Performance

The Bank and ISA performance met, in general, previous expectations. However, some delays in the disbursement of the loan proceeds occurred due to changes on Bank organization and its payment procedures, and ISA's financial constraints contributed to delays of the civil works.

Recommendations

- A continuous flow of local currency to the project is needed in order to minimize the project's financial problems. This can be obtained through earlier arrangements with FEN, timely payments of the shareholders to ISA, and a higher participation of the Bank and IDB.
- Financing of loan financial charges would minimize the pressure of payments due to contractors and to the Bank, and avoid delays on the project schedule due to delays in payments to contractors.

- The financial conditions of Bank loans, especially duration of grace periods and closing dates, should be adjusted in accordance with the project construction period.

- It would be convenient that the Bank and the borrower monitor jointly the status of payments to contractors during project implementation to identify the cases and causes for payment delays. The Bank should consider to adjust the contract's currency proportion if the macroeconomic conditions changes.

PART III - STATISTICAL DATA

1. Related Bank Loans

Page 1 of 2

Number and Title	Amount (in US\$ million)	Year of Approval	Co- Borrower	Disbursed as of 02/28/81	Purpose
1. 38-CO: Anchicaya Hydro- electric	3.53	1950	CVC/ CHIDRAL	100%	Anchicaya units 1 and 2 (2 x 12) MW hydro)
2. 39-CO: La Insula Hydro- electric	2.6	1950	CHEC	100%	The Insula units 1 and 2 (2 x 10 MW hydro)
3. 54-CO: Labrija Hydro- electric	2.4	1951	LABRIJA	100%	Palmas units 1 and 2 (2 x 4.4 MW hydro)
4. 113-CO: Anchicaya Yumbo Power	4.5	1955	CHIDRAL	100%	Anchicaya unit 3 (20 MW hydro) and Yumbo unit 1 (10 MW thermal)
5. 215-CO: Yumbo Extension	2.8	1958	CHIDRAL	100%	Yumbo unit 2 (10 MW thermal)
6. 217-CO: La Esmeralda	4.8	1959	CHEC	100%	La Esmeralda units 1 and 2 (2 x 13.3 MW hydro)
7. 225-CO: Guadalupe	12	1959	EPM	100%	Guadalupe units 1 and 2 (2 x 45 MW hydro) and Trone- ras unit 1 (18 MW hydro)
8. 246 CO: Bogota Power	17.6	1960	EEEEB	100%	Laguneta unit 4 (18 MW hydro) and Zipaquira unit 1 (33 MW thermal)
9. 255-CO: Yumbo III Calima I Power	25	1960	CVC/ CHIDRAL	100%	Yumbo unit 3 (33 MW thermal) and Calima units 1 and 2 (2 x 30 MW hydro)
10. 282-CO: Second Guadalupe	22	1961	EPM	100%	Troneras unit 2 (18 MW hydro) and Guadalupe units 3, 4 and 5 (3 x 45 MW hydro)
11. 313-CO: Second Expansion	50	1962	EEEEB	100%	Zipaquira unit 2 (37.5 MW hydro) and Colegio units 1,2 and 3 (3 x 50 MW hydro)
12. 339-CO: Power Expansion	8.8	1963	CVC/ CHIDRAL	100%	Calima units 3 and 4 (2 x 30 MW hydro)
13. 347-CO: Cosplique Power	5	1963	ELECTRIBOL	100%	Cosplique units 2 and 3 (2 x 12.5 MW thermal)
14. 369-CO: Nare	45	1964	EPM	100%	Guatape units 1,2,3 and 4 (4 x 70 MW hydro)
15. 537-CO: Third Expansion	18	1968	EEEEB	100%	El Colegio units 4, 5 and 6 (3 x 5) MW hydro) and Canoas (1 x 50 MW hydro)
16. 575-CO: Power Intercon- nection	18	1968	ISA	100%	Central System Intercon- nection (230 kV transmis- sion line and substation)

Number and Title	Amount (in US\$ million)	Year of Approval	Bo- Borrower	Disbursed as of 02/28/91	Purpose
17. 681-CO: Chivor Hydro- electric	52.3	1970	ISA	100%	Chivor I (4 x 125 hydro)
18. 874-CO: Guatapé II Hydroelectric	58	1973	EPM	100%	Guatapé II units 1,2,3 and 4 (4 x 70 MW hydro)
19. 1582-CO: San Carlos I Hydro Power	125	1978	ISA	100%	San Carlos I (4 x 155 MW hydro)
20. 1583-CO: 500 kV Intercon- nection	50	1978	GOVERN- MENT	100%	500 kV Interconnection Central System/ Atlantic System
21. 1628-CO: Mesitas Hydro- electric Power	84	1978	EEEB	100%	Mesitas Hydro (El Paralelo 3 x 90 MW; La Guaca 3 x 100 MW pumping 3 x 10 MHP; Sesquille dam strengthening)
22. 1725-CO: San Carlos II Hydro Power	72	1979	ISA	100%	San Carlos II (4 x 155 MW hydro)
23. 1807-CO: Bogotá Power Distribution	87	1980	EEEB	100%	Bogotá distribution
24. 1868-CO: Guadalupe IV Hydro Power	125	1980	EPM	100%	Guadalupe IV (3 x 71 MW hydro)
25. 1953-CO: Playas Hydro Power	85	1981	EPM	74%	Playas (3 x 67 MW hydro)
26. 1989-CO: Village Electrification	36	1982	CORELCA	84%	Atlantic coast village electrification
27. 2008-CO: Guavio Hydro Power	359	1982	EEEB	100%	Guavio (5 x 200 MW hydro)
28. 2401-CO: Power Develop- ment Finance	170	1984	FEN	100%	Power development finance
	28.2	1984	FEN	100%	Power development finance (Cofinancing)
29. 2449-CO: Rio Grande Multipurpose	184.5	1984	EPM	51%	Rio Grande Hydro (3 x 100 MW hydro)
30. 2834-CO: Bogotá Distribu- tion II	171	1986	EEEB	44%	Bogotá Distribution II
31. 2889-CO: Power Sector Adjustment	300	1988	GOVERN- MENT	75%	Power Sector Adjustment

2. Project Timetable

<u>Item</u>	<u>Date Planned</u>	<u>Date Actual</u>
<u>San Carlos I (Loan 1582-CO)</u>		
Identification		08/76
Preparation		01/77
Appraisal Mission		04/77
Post-Appraisal Mission		09/77
Loan Negotiations		04/04/78
Board Approval		05/30/78
Loan Signature		07/14/78
Loan Effectiveness	09/78	04/05/79
Project Completion	06/30/83	02/84
Loan Closing	06/30/84	06/30/86
<u>San Carlos II (Loan 1725-CO)</u>		
Identification		05/78
Preparation		10/78
Appraisal Mission		11/78
Post-Appraisal Mission		01/79
Loan Negotiations		06/12/79
Board Approval		06/12/79
Loan Signature		11/30/79
Loan Effectiveness	10/79	06/19/81
Project Completion	06/84	12/87
Loan Closing	06/85	06/30/88

3. Loan Disbursements

Cumulative Estimated and Actual Disbursements (Loan 1582-CO)

(In million of US\$)

Bank Fiscal Year and Semester	Estimated Cumulative	Actual Cumulative	Actual as % of Estimated
<u>1978-1979</u>			
December 31, 1978	11.8	0.0	0%
June 30, 1979	23.4	7.0	30%
<u>1979-1980</u>			
December 31, 1979	35.0	12.6	36%
June 30, 1980	54.8	18.5	34%
<u>1980-1981</u>			
December 31, 1980	74.6	24.9	33%
June 30, 1981	85.4	33.6	39%
<u>1981-1982</u>			
December 31, 1981	96.7	46.2	48%
June 30, 1982	106.5	58.2	55%
<u>1982-1983</u>			
December 31, 1982	115.5	74.4	64%
June 30, 1983	123.9	90.4	73%
<u>1983-1984</u>			
December 31, 1983	126.0	105.3	84%
June 30, 1984	126.0	107.6	85%
<u>1984-1985</u>			
December 31, 1984	126.0	120.2	95%
June 30, 1985	126.0	121.1	96%
<u>1985-1986</u>			
December 31, 1985	126.0	123.5	98%
June 30, 1986	126.0	125.3	99%
<u>1986-1987</u>			
December 31, 1986	126.0	125.7	100%
June 30, 1987	126.0	126.0	100%
<u>1987-1988</u>			
December 31, 1987	126.0	126.0	100%
Date of Final Disbursement:		2/26/87	

3. Loan Disbursements

Cumulative Estimated and Actual Disbursements (Loan 1725-CO)

(in million of US\$)

Bank Fiscal Year and Semester	Estimated Cumulative	Actual Cumulative	Actual as % of Estimated
<u>1979-1980</u>			
December 31, 1979	2.4	0.0	0%
June 30, 1980	4.6	0.0	0%
<u>1980-1981</u>			
December 31, 1980	8.2	0.0	0%
June 30, 1981	13.9	0.0	0%
<u>1981-1982</u>			
December 31, 1981	26.3	1.4	5%
June 30, 1982	50.4	4.8	10%
<u>1982-1983</u>			
December 31, 1982	60.6	16.1	27%
June 30, 1983	66.9	27.7	41%
<u>1983-1984</u>			
December 31, 1983	69.8	31.8	45%
June 30, 1984	71.5	40.3	56%
<u>1984-1985</u>			
December 31, 1984	72.0	58.2	81%
June 30, 1985	72.0	61.2	85%
<u>1985-1986</u>			
December 31, 1985	72.0	62.1	86%
June 30, 1986	72.0	62.1	86%
<u>1986-1987</u>			
December 31, 1986	72.0	63.4	88%
June 30, 1987	72.0	66.8	93%
<u>1987-1988</u>			
December 31, 1987	72.0	67.0	93%
June 30, 1988	72.0	68.3	95%
<u>1988-1989</u>			
December 31, 1988	72.0	71.7	100%
June 30, 1988	72.0	72.0 <u>1/</u>	100%
Date of Final Disbursement:		5/5/89	

1/ US\$ 26,083.41 was canceled because of misprocurement

4. Allocation of Loan Proceeds (In US\$)

Category	Original Allocation	Actual Disbursements
<u>Loan 1582-CO</u>		
(1) Civil works for Part B of the Project	54,500,000	75,942,413
(2) Miscellaneous mechanical and electrical equipment for Part A, B and C of the Project	14,500,000	7,737,170
(3) Civil works and erection services for Parts D and E of the Project	2,000,000	0
(4) Equipment and materials for Part E of the Project; and control and communication equipment for Part D and E of the Project	16,800,000	22,819,035
(5) Consultant's services (including laboratory and other equipment, and vehicles therefor)	1,500,000	4,624,382
(6) Interest and other charges on the loan accrued on or before March 14, 1983	24,100,000	14,877,000
(7) Unallocated	12,600,000	0
TOTAL	126,000,000	126,000,000
<u>Loan 1725-CO</u>		
(1) Equipment and materials (including services for their installation) for Parts A and B (excluding turbines and alternators for Part A of the Project) and equipment and materials for Part C	40,900,000	42,081,605
(2) Civil works for Part B of the Project	5,400,000	12,264,258
(3) Civil works and erection services for Part C of the Project	11,500,000	3,600,000
(4) Consultants' services (including equipment and vehicles therefor) and training	6,500,000	9,669,245
(5) Surveys and drilling (Parts B and C of the Project)	600,000	1,039,322
(6) Unallocated	7,100,000	0
(7) Civil works for Part A of the Project		3,319,486
	72,000,000	71,973,916 1/

1/ US\$ 26,083.41 was canceled because of misprocurement

5. Planned and Actual Completion Dates of Components

Project Components	Appraisal Completion	Actual Completion	Months of Delay	Comments
<u>San Carlos Power Station</u>				
<u>Effectiveness of the Loan</u>				
1582-CO	Sep-78	Apr-79		
1725-CO	Oct-79	Jun-81	20	
<u>Access</u>				
Completion evacuation	Jun-79	Jun-79	0	
Road relocalization	Jun-80	NA	NA	
<u>Procurement</u>				
Underground works				
Call for bids	Jun-77	Jun-77		
Award of contract	Apr-78	Apr-78		
Acceptance option 2nd tunnel	Aug-79	Aug-79		
Dam				
Call for bids	Jun-77	Jun-77		
Award of contract	Apr-78	Jul-78		
Power station equipment				
Call for bids	Dec-77			
Award of contract	Sep-78	Nov-78	2	
Transmission lines				
San Carlos - Guatapé				
Call for bids (equipment)	Sep-78	Dec-79	15	
Award of contract (equipment)	Feb-79	Jul-80	17	
Call for bids (erection)	Mar-79	Nov-80	20	
Award of contract (erection)	Aug-79	Mar-81	19	
San Carlos - Bogota				
Call for bids (equipment)	Aug-78	Dec-79	16	
Award of contract (equipment)	Dec-79	Jul-80	7	
Call for bids (erection)	May-80	Nov-80	6	
Award of contract (erection)	Oct-80	Mar-81	5	
Esmeralda - Yumbo				
Call for bids (equipment)	Jun-80	Sep-81	15	Include 200 MVAR of capacitors.
Award of contract (equipment)	Jan-81	Mar-82	14	Additional purchases completed 9/87
Call for bids (erection)	Jun-81	NA	NA	Additional works completed by 9/87.
Award of contract (erection)	Dec-81	May-84	29	Additional equipment delivered by 12/85

<u>Project Components</u>	<u>Appraisal Completion</u>	<u>Actual Completion</u>	<u>Months of Delay</u>
<u>Project Execution</u>			
Dam completion (1582-CO)	Apr-82	Dec-83	20
First tunnel, caverns completion (1582-CO)	Jul-82	Nov-83	16
Second tunnel completion	Jun-83	Jul-86	4
First penstock completion (1582-CO)	Jul-82	Oct-83	52
Second penstock completion (1582-CO)	Jun-83	Jun-86	
Filling reservoir (1582-CO)	Jul-82	Dec-83	
<u>Transmission</u>			
San Carlos - Guatapa Line (1582-CO)	Dec-80	Jan-82	-11
San Carlos - Bogota Line (1582-CO)	Jun-82	Jul-83	13
San Carlos - Medellin	Jun-83	Nov-85	
Esmeralda - Yumbo	Jun-83	May-84	
<u>Generation</u>			
Units 1 - 4 (1582-CO)	Jun-83	May-84 1/	11
Units 5 - 8 (1725-CO)	Jun-84	Dec-87 1/	43
<u>Studies</u>			
<u>Losses</u>			
Terms of reference to IBRD	Jul-78	NA	NA
Invite proposals	Aug-78	NA	NA
Award contract	Oct-78	NA	NA
Discuss proposals with IBRD	Jun-79	NA	NA
<u>Dispatch</u>			
Terms of reference to IBRD	Jul-79	Jul-79	0
Engagement of consultants	Dec-79	May-80	5
Completion	Dec-81	Dec-86	61
<u>Training</u>			
Engage consultant	Dec-79	NA	NA
Program to IBRD	Jun-80	NA	NA
Completion	Jun-83	NA	NA
<u>Calderas Power Station</u>			
<u>Access</u>			
Land acquisition	Dec-80	Dec-81	12
Access road completion	Dec-80	Apr-82	16
<u>Procurement</u>			
Call for bids civil works	Nov-79	Feb-81	15
Award of civil works contract	Jul-80	Jul-81	12
Call for main equipment bids	Jan-80	Aug-81	19
Award of main equipment contracts	Nov-80	Aug-82	21
<u>Execution</u>			
Underground work	Jul-83	Sep-87	51
Civil works power station	Dec-82	May-86	29
Plant commissioning	Sep-83	Apr-86	56

1/ Referred to the last unit

6. Project Costs and Financing (US\$ million)

	Appraisal and Actual Project Costs (Loan 1582-CO)					
				ACTUAL		
	Local	SAR Foreign	Total	Local	Foreign	Total
<u>Engineering, Studies and Administration</u>	27.8	2.4	30.2	47.1	1.5	48.6
<u>Power Station Civil Works</u>						
Infrastructure	24.1	0.7	24.8	21.9	0.3	22.2
Access tunnel	4.3	3.3	7.6	2.7	2.0	4.6
Punchina dam	37.3	48.8	86.0	50.3	28.9	79.2
Underground works	44.9	57.0	101.8	112.0	83.9	195.9
Subtotal	110.5	109.8	220.2	186.9	115.1	301.9
<u>Mechanical Equipment</u>						
Dam	2.2	3.4	5.7	2.1	2.5	4.7
Penstock	0.4	9.3	9.7			0.0
Turbines	2.2	21.8	24.1	1.6	15.4	17.0
Other	3.0	4.6	7.6	0.0	0.0	0.0
Subtotal	7.8	39.2	47.0	3.7	17.9	21.6
<u>Electrical Equipment</u>						
Generators	1.9	16.6	18.5	0.9	14.4	15.2
Transformers	0.6	5.3	5.9	0.3	2.4	2.7
Other	2.8	8.8	11.5	5.3	2.6	7.9
Subtotal	5.2	30.7	35.9	6.4	19.4	25.7
<u>Transmission</u>						
Lines	7.8	17.5	25.3	14.6	8.2	22.9
Substations	1.3	2.7	4.0	4.1	14.0	18.1
Control building	2.2	0.0	2.2	2.3	2.6	4.8
Communications	0.6	1.6	2.1	0.0	0.0	0.0
Subtotal	11.9	21.8	33.7	21.0	24.8	45.8
Total Project Cost	<u>163.1</u>	<u>203.9</u>	<u>367.0</u>	<u>265.1</u>	<u>178.5</u>	<u>443.7</u>
Financial Charges			54.1			40.1
Total Investment			<u>421.1</u>			<u>483.8</u>
<u>Project Financing</u>						
IBRF-1582			126.0			126.0
IBRF-1725						4.2
IBRF-FEN						21.3
IDB			70.0			60.0
Suppliers			40.0			24.1
ISA			185.3			232.8
Commercial Banks (Government)						15.4
GRAND TOTAL			<u>421.3</u>			<u>483.8</u>

8. Project Costs and Financing (millions of US\$)

<u>Appraisal and Actual Project Costs (Loan 1725-CO)</u>						
	<u>SAR</u>			<u>ACTUAL</u>		
	<u>Local</u>	<u>Foreign</u>	<u>Total</u>	<u>Local</u>	<u>Foreign</u>	<u>Total</u>
A. POWER STATION SAN CARLOS II						
<u>Engineering and Administration</u>	15.1	2.0	17.1	31.3	0.4	31.7
<u>Mechanical Equipment</u>						
Penstock	0.5	9.8	10.3	0.5	5.2	5.7
Turbines	2.2	21.3	23.5	0.5	11.4	12.0
Other	1.2	1.7	2.8	0.0	0.0	0.0
Subtotal	3.8	32.8	36.6	1.1	16.6	17.7
<u>Electrical Equipment</u>						
Generators	1.8	18.4	20.0	1.8	13.2	15.0
Transformers	0.3	4.1	4.3	0.1	2.0	2.1
Other	2.0	4.0	6.0	6.5	3.6	10.1
Subtotal	3.8	26.5	30.3	8.4	18.8	27.2
<u>Transmission</u>						
Lines	8.4	20.9	29.4	9.1	20.2	29.2
Substations	3.4	11.2	14.6	0.4	7.1	7.5
Subtotal	11.8	32.2	44.0	9.5	27.3	36.8
Total Cost-San Carlos II	34.8	93.4	127.9	50.3	63.0	113.3
B. POWER STATION CALDERAS						
Engineering, Administration	0.9	1.2	2.1	9.4	0.1	9.5
Civil works	6.2	5.8	12.0	20.1	6.6	26.7
Equipment	2.8	6.0	8.9	3.0	9.0	12.0
Total Cost-Calderas	9.9	13.1	22.9	32.4	15.7	48.1
C. STUDIES						
Dispatch	0.2	1.8	2.0	0.0	3.8	3.8
Training	0.9	2.3	3.2	0.3	0.7	1.0
Total Cost-Studies	1.1	4.1	5.2	0.3	4.5	4.8
Total Project Cost	45.8	110.5	156.1	83.0	83.2	166.3
Financial Charges						71.3
Total Investment			156.1			237.6
<u>Project Financing</u>						
IBRF 1/			72.0			67.8
IBRF - FEN						60.9
Suppliers			30.5			28.2
ISA			53.6			76.5
Commercial Banks (Government)						6.2
GRAND TOTAL			156.1			237.6

1/ US\$4.2 million financed civil works included in the project financed under Loan 1582-CO

7. Project Results

A. Direct Benefits

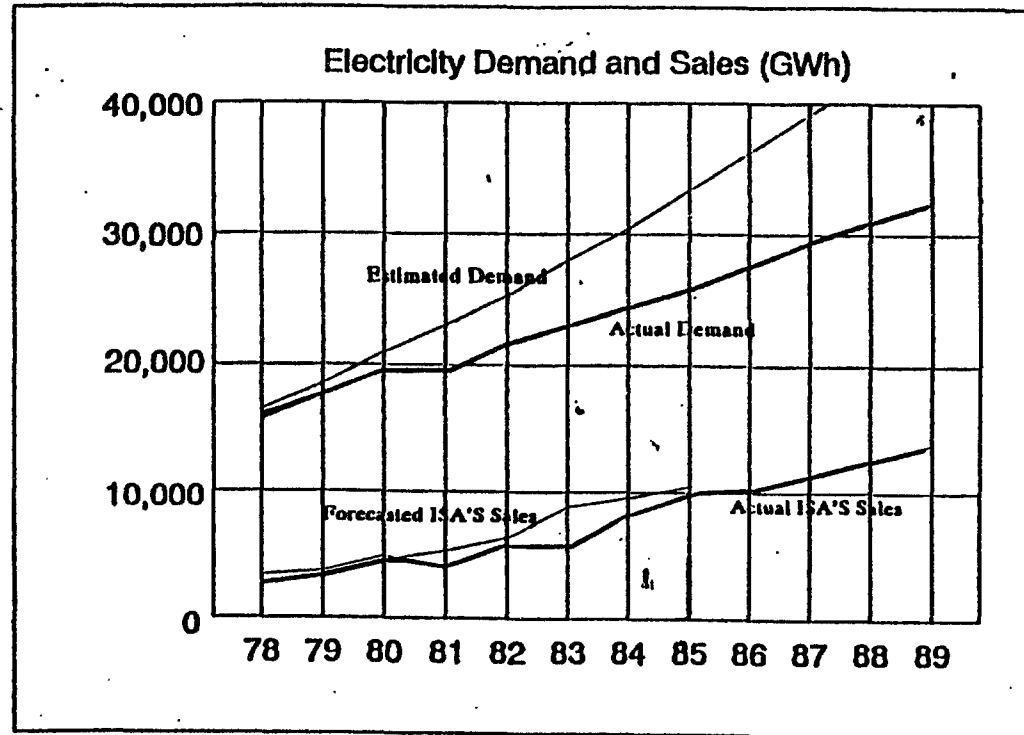
Indicators	Appraisal Estimate	Actual Values
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1. Country's Electricity Demand (GWh):

78	18,515	18,164
79	18,537	17,845
80	20,950	19,448
81	23,053	19,479
82	25,357	21,511
83	28,014	23,034
84	30,423	24,558
85	33,340	25,733
86		27,548
87		29,411
88		30,973
89		32,349

2. ISA's Energy Sales (GWh)

1978	2,632	3,387
1979	3,314	3,676
1980	4,558	4,867
1981	5,294	4,183
1982	6,349	5,846
1983	8,827	5,770
1984	9,595	8,279
1985	10,502	9,977
1986		10,317
1987		11,438
1988		12,555
1989		13,825



B. Economic Impact

	<u>Appraisal Estimate</u>		<u>Actual</u>
		Jaguas + San Carlos I + <u>San Carlos I</u>	S. Carlos I + <u>S. Carlos II</u>
-Economic Rate of Return			20.2%
-Rate of Return with benefits based on tariffs	7.5%	13.5%	14.5%

Underlying Assumptions

1. The actual economic rate of return for the San Carlos I and II Projects is 20.2%. It has been calculated using economic prices expressed in U.S. dollars of end-1987 for costs and benefits. End-1987 was the date when the San Carlos I and II hydropower plant, the major component of the project, was in full operation.
2. The costs considered consist of construction costs of the new facilities and the incremental cost of operating and maintaining the system.
3. The construction costs include the cost of the San Carlos and Calderas power plants, and the transmission facilities associated with those plants. The useful life span of the powerplants was estimated to be fifty years as a whole.
4. The incremental costs of operating and maintaining the system were calculated by estimating the incremental cost of fuel consumption for the power interconnected system with the project plus the cost of operating and maintaining the project.
5. The benefits considered are the value of the additional energy to be supplied to the consumers. For the period 1984-90, the additional energy to the consumers attributable to the project was based on actual values of demand, generation of the project and volume of storage at the beginning and end of the period. For the period 1991-2003, the energy attributable to the project was based on simulations of the system generation. This was calculated as the difference between the average annual energy to be generated by the project and the incremental volume of storage of the system till the commissioning of the next generating plant. Incremental energy was valued using the long-run marginal cost (LRMC) of power at generation level for the whole Colombian interconnected system, which is about US\$0.032 per kWh.
6. The above economic rate of return is not comparable with the rates estimated at appraisals because at them, costs were calculated using economic prices while benefits using actual tariffs. The actual rate of return of the San Carlos I and II Projects calculated as in the appraisals with the actual average tariff of about US 19.5 cents per kWh at interconnection level, is 14.5%.

COLOMBIA

PROJECT COMPLETION REPORT (LOANS 1582-CO AND 1725-CO)

INTERCONEXION ELECTRICA S.A. (ISA)

Rate of Return in Investments 1/
(Thousands of end-1987 US Dollars)

Year	Investments		Additional O & M Costs	Total Costs	Additional Demand GWh	LRMC 2/ Cost per GWh	Total Benefits	NET BENEFITS
	Local	Foreign						
1978	-20280	-20256		-40536				-40536
1979	-18441	-16479		-34920				-34920
1980	-20547	-20138		-40685				-40685
1981	-21503	-57766		-79269				-79269
1982	-30309	-56760		-87069				-87069
1983	-22030	-56446		-78476				-78476
1984	-13902	-19520	-1571	-34993	1230	31.81	39126	4133
1985	-8623	-8626	-1795	-19044	2746	31.81	87350	68306
1986	-6453	-6929	-1795	-15177	3326	31.81	105800	90623
1987	-2083	-2142	-2693	-6918	4316	31.81	137292	130374
1988	-201	-2527	-3591	-6319	5144	31.81	163631	157312
1989			-3591	-3591	5144	31.81	163631	160040
1990			-3591	-3591	5144	31.81	163631	160040
1991			-3591	-3591	5144	31.81	163631	160040
1992			-3591	-3591	5144	31.81	163631	160040
1993			-3591	-3591	5144	31.81	163631	160040
1994			-3591	-3591	5144	31.81	163631	160040
1995			-3591	-3591	5144	31.81	163631	160040
1996			-3591	-3591	5144	31.81	163631	160040
1997			-3591	-3591	5144	31.81	163631	160040
1998			-3591	-3591	5144	31.81	163631	160040
1999			-3591	-3591	5144	31.81	163631	160040
2000			-3591	-3591	5144	31.81	163631	160040
2001			-3591	-3591	5144	31.81	163631	160040
2002			-3591	-3591	5144	31.81	163631	160040
2003			-3591	-3591	5144	31.81	163631	160040
2004			-3591	-3591	5144	31.81	163631	160040
2005			-3591	-3591	5144	31.81	163631	160040
2006			-3591	-3591	5144	31.81	163631	160040
2007			-3591	-3591	5144	31.81	163631	160040
2008			-3591	-3591	5144	31.81	163631	160040
2009			-3591	-3591	5144	31.91	163631	160040
2010			-3591	-3591	5144	31.81	163631	160040
2011			-3591	-3591	5144	31.81	163631	160040
2012			-3591	-3591	5144	31.81	163631	160040
2013			-3591	-3591	5144	31.81	163631	160040
2014			-3591	-3591	5144	31.81	163631	160040
2015			-3591	-3591	5144	31.81	163631	160040
2016			-3591	-3591	5144	31.81	163631	160040
2017			-3591	-3591	5144	31.81	163631	160040
2018			-3591	-3591	5144	31.81	163631	160040
2019			-3591	-3591	5144	31.81	163631	160040
2020			-3591	-3591	5144	31.81	163631	160040
2021			-3591	-3591	5144	31.81	163631	160040
2022			-3591	-3591	5144	31.81	163631	160040
2023			-3591	-3591	5144	31.81	163631	160040
2024			-3591	-3591	5144	31.81	163631	160040
2025			-3591	-3591	5144	31.81	163631	160040
2026			-3591	-3591	5144	31.81	163631	160040
2027			-3591	-3591	5144	31.81	163631	160040
2028			-3591	-3591	5144	31.81	163631	160040
2029			-3591	-3591	5144	31.81	163631	160040
2030			-3591	-3591	5144	31.81	163631	160040
2031			-3591	-3591	5144	31.81	163631	160040
2032			-3591	-3591	5144	31.81	163631	160040
2033			-3591	-3591	5144	31.81	163631	160040

ECONOMIC INTERNAL RATE OF RETURN (EIRR):

20.2%

1/ Cost and benefits are expressed in economic prices
2/ Long-Run Marginal Cost

C. Financial Impact

	Appraisal Estimate	Actual 1985 a/
1. Financial Rate of Return (%):	9.0	8.1
2. Ratio of Total Receivable to Total Billings (%)	16.8	52.6
3. Debt Service Coverage (Times)	1.0	0.8
4. Debt/Equity Ratio	33/67	54/46
5. Sector Self-financing Ratio (%)	32.1	1.4

a/ 1985 is the last year of financial projections in the SAR

D. Studies

	Purpose as Defined at Appraisal	Status	Impact of Study
<u>San Carlos I:</u>			
Study of losses in the systems of ISA and its shareholders	To reduce energy losses.	Completed	Minimal, due to lack of resources allocated to implementation of the recommended program.
<u>San Carlos II:</u>			
Study for operating the interconnected system at least cost, computer programs and training of dispatch personnel.	To reduce operation costs.	Completed	Relevant. Now, ISA has the knowledge, tools and staff to plan the system operation at least cost.
ISA's manpower requirements and specialized training for ISA's professional staff.	To improve planning of human resources.	Completed	Relevant. ISA's training programs are well planned and ISA has very well trained staff.

(File:Covenants)

B. Status of Loan Covenants

Section	Loans		Brief Description	Status of Compliance
	1562	1725		
3.02	x		(b) ISA to carry out by 6/30/79 a study of energy losses	Met. Final report received on 4/80. Second phase received on 11/81.
		x	ISA to employ consultants to carry out:	
		x	(a) ISA and shareholders dispatch functions (Annex 2, Part D (a) (i))	Complied
		x	(b) Dispatch personnel training for ISA and shareholders (Annex 2, Part D(a) (i))	Complied
		x	(c) Study of training requirements for professional personnel	Complied
3.03	x	x	ISA to ensure that the Project is carried out with due regard to environmental factors	Complied
3.04	x	x	ISA to carry out by 12/31/80 a plan for the evacuation of the areas of the Project.	Met on 10/1983.
3.06	x	x	(c) ISA to prepare quarter progress reports.	Complied
3.07	x	x	(a) ISA to acquire by 31/12/1980 the land and the land rights for the construction works of the Project.	Complied
	x	x	(b) ISA to acquire by 31/12/1980 the land and the land rights required for the Project.	Complied
4.03	x	x	ISA to maintain insurance	Complied
	x		(b) ISA to insure Chivor I	Complied
4.03			(a) ISA to furnish terms of reference of study of uniform system of accounts and methodology to revalue assets of ISA and shareholders	Met. Consultant appointed on June 1980
			(b) ISA to carry out the study referred in 4.05 (a) by 3/31/80	Complied
			(c) ISA to furnish draft report referred in 4.05 (a) for comments by 3/31/81	Complied
			(d) ISA to furnish to the Bank the final report referred in 4.05 (a) by 6/31/81	Met in May 1981
5.02	x	x	(i) to have its accounts and financial statements for each fiscal year audited by independent auditors.	Complied
	x		(ii) to furnish to the Bank within four months after the end of each	They were generally timely submitted

Section	Loans		Brief Description	Status of Compliance
	1562	1725		
5.04	x	x	ISA and shareholders to prepare and furnish to the Bank by 12/31/79 a master generation and transmission plan	Complied
5.05	x	x	(a) ISA to prepare by 12/31/80 a basin development and reforestation program	Complied
	x		(b) ISA to establish by 12/31/81 a unit to execute (a)	Complied
	x		(c) ISA to provide the unit referred in (b) with personnel, funds and resources necessary	Complied
5.06	x	x	(a) (i) ISA to inform the Bank any proposal for increasing its power generation by more than 200 MW	Complied
	x		(ii) ISA to afford the Bank a reasonable opportunity to comment on (i)	Complied
	x		(iii) ISA not to commit any capital expenditure unless economically and financially justified	Complied
5.08			(b) ISA to obtain concurrence of the Bank for capital expenditures not included in (a) that exceed 2.5% of the net current value of ISA's fixed assets in operation	Complied
	x	x	(a) ISA to establish and maintain tariffs to generate a rate of return of 8% in 1979, 9% in 1980, 11% in 1981 and 9% thereafter on the average net current value of its fixed assets in operation.	Actual rates of return were 8.1% in 1985 and 8.7% in 1990.
			(b) ISA to review the adequacy of its tariffs during the first two months of each quarter and furnish a report to the Bank	ISA reviewed it and furnished it to the Bank.
5.09			(c) ISA will adjust the tariffs if in the course of the twelve-month period commencing with the quarter it would not earn the rate of return established in (a)	Tariffs were periodically adjusted. Actual rates of return were close to covenanted values.
	x	x	ISA will not incur any debt unless its net revenues are greater than 1.5 times its debt service	ISA requested and obtained Bank approval for new debts.
	Annex 5	x	ISA to furnish to the Bank during the first quarter of each year a report on the revaluation of assets of the preceding year	Complied, although the report was generally submitted late.

Section	Loans		Brief Description	Status of Compliance
	1582	1725		
Shareholders' Agreement				
5.02		x	(a) Shareholders to establish and maintain tariffs to generate a rate of return on net revalue assets as follow: EEEB, 12%; EPM, 6% in 1979 and 9% thereafter; CVC, 9%; and CORELCA, 5% in 1979 and 1980, 6% in 1981, 7% in 1982 and 9% thereafter	EEB met this covenant. EPM's rate of return was generally very close to the covenanted value. CVC's rates in 1988 and 1989 were 6%. CORELCA met the covenant till 1987, but in 1988 and 1989 its rates were 5.9% and 6.3%, respectively.
			(b) Shareholders to review the adequacy of its tariffs during the first two months of each quarter and furnish a report to the Bank	Complied.
			(c) Shareholders will adjust tariffs if in the course of the twelve months period commencing with the quarter, it would not earn the rate of return established in (a)	Partially complied.
5.03		x	Each shareholder will pay to ISA:	
			(a) by 12/31/79, depreciation charges accumulated to 12/31/77	Complied, but very much later than covenanted.
			(b) all other amounts payable, sixty days after the day of the billings	Not met. Accounts receivable amounted to 86.5% in 1987.
5.09		x	Shareholders to prepare by 12/31/79 a distribution master plan	Met
5.10		x	(i) Shareholders to prepare by 12/31/79 a tariff study	Met
			(ii) Shareholders to discuss by 3/31/80 with the Bank and the Government conclusions of the study in (i)	Met
Guarantee Agreement				
3.02		x	(b) The Government to take all actions to ensure shareholders perform obligations under the shareholder's agreement	Tariff levels set by Government have been insufficient to meet the loans' covenants.
3.03		x	Government to take actions, including granting import licenses, to ensure timely procurement for the Project.	Concession of import licenses were generally delayed.

9. Use of Bank Resources

**A. STAFF INPUT (Loan 1582-CO)
(Staff Weeks)**

Bank FY	1974-76	1977	1978	1979	1980	1981	1982	1983	1984-86	Total
Preparation	21.8	17.9								39.7
Appraisal		12.2	22.4							34.6
Negotiations			36.1							36.1
Supervision			0.3	10.1	11.0	6.2	9.9	4.2	11.2	52.8
Total	21.8	30.2	58.8	10.1	11.0	6.2	9.9	4.2	11.2	163.3

**A. STAFF INPUT (Loan 1725-CO)
(Staff Weeks)**

Bank FY	1978	1979	1980	1981	1982	1983	1984	1985	1986-88	Total
Preparation	2.0	25.5								27.4
Appraisal		14.7								14.7
Negotiations		24.4								24.4
Supervision		0.6	9.6	6.4	14.1	12.8	6.2	2.0	20.6	72.4
Total	2.0	65.2	9.6	6.4	14.1	12.8	6.2	2.0	20.6	138.9

B. MISSION DATA (Loan 1582-CO)

Type of Mission	Month/ year	No. of Weeks	No. of Persons 3/	Staff Weeks in Field	Perfor- mance Rating 1/	Type of Problems 2/
Preparation	02/74	1	1 PE, 1 FA	2		
Preparation	09/74	1	1 PE	1		
Preparation	11/75	1	1 FA	1		
Preparation	05/76	1	1 PE, 1 F	2		
Preparation	08/76	1	1 PE	1		
Preparation	01/77	2	1 LO, 1 EC	3		
Preparation	03/77	1	1 FA	1		
Appraisal	05/77	3	1 PE, 1 FA, 1 LO	7		
Appraisal	08/77	3	1 PE, 1 FA, 1 LO	7		
Post-Appraisal	09/77	2	1 FA, 1 LO	3		
Supervision I	05/78	1	1 PE	1	1	
Supervision II	09/78	1	1 E	1		
Supervision III	05/79	1	1 PE	1	1	
Supervision IV	10/79	1	1 E	1		
Supervision V	07/80	1.5	1 PE	1.5	2	F
Supervision VI	10/81	1	2 PE	2	1	F
Supervision VII	11/81	1	1 FA	1	3	F
Supervision VIII	05/82	1	1 PE	1	3	F
Supervision IX	11/82	1	1 PE	1		F
Supervision X	10/83	1	1 PE	1	2	F, T
Supervision XI	05/84	1	1 PE	1	2	F
Supervision XII	03/85	1	1 PE	1		F
Supervision XIII	10/85	1	1 PE, 2 FA	3	2	F
Supervision XIV	09/86	1	1 PE, 1 FA	2	2	F
Supervision XV	11/87	1	1 PE, 1 FA	2	2	F
Total				48.5		

1/ 1 = Problem-free or minor problems; 2 = Moderate problems; and 3 = Major problems.

2/ F = Financial; T = Technical.

3/ PE = Power Engineer; FA = Financial Analyst; E = Economist; LO = Loan Officer

B. MISSION DATA (Loan 1725-CO)

Type of Mission	Month/ year	No. of Weeks	No. of Persons 3/	Staff Weeks In Field	Perfor- mance Rating 1/	Type of Problems 2/
Preparation	05/78	1	1 PE	1		
Preparation	10/78	2	1 PE, 1 FA	4		
Appraisal	01/79	2	1 FA, 1 PE	4		
Supervision I	09/79	0.5	1 PE	0.5		
Supervision II	07/80	1.5	1 PE	1.5	2	F
Supervision III	10/81	1	2 PE	2	2	F
Supervision IV	11/81	1	1 FA	1	3	F
Supervision V	05/82	1	1 PE	1	3	F
Supervision VI	07/82	0.5	1 T	0.5		
Supervision VII	11/82	1	1 PE	1		F
Supervision VIII	10/83	1	1 PE	1	2	F, T
Supervision IX	05/84	1	1 PE	1	2	F
Supervision X	03/85	1	1 PE	1		F
Supervision XI	10/85	1	1 PE, 2 FA	3	2	F
Supervision XII	09/86	1	1 PE, 1 FA	2	2	F
Supervision XIII	11/87	1	1 PE, 1 FA	2	2	F
Total				26.5		

1/ 1 = Problem-free or minor problems; 2 = Moderate problems; and 3 = Major problems.

2/ F = Financial; T = Technical.

3/ PE = Power Engineer; FA = Financial Analyst; E = Economist; T = Training Specialist

COLOMBIA

INTERCONEXION ELÉCTRICA S.A. (ISA)

PROJECT COMPLETION REPORT (LOANS 1582/1723-CO)

Comparison of Forecast and Actual Income Statements (1978-1988)
(million of current Col \$)

	1978		1980		1981		1982		1983		1984		1985		1986	1987	1988	1988
	SAR	Actual	SAR	Actual	SAR	Actual	SAR	Actual	SAR	Actual	SAR	Actual	SAR	Actual	Actual	Actual	Actual	Actual
Energy Sales (GWh)	3314	3636	4556	4667	5294	4183	6349	5646	8827	5770	9595	8279	10502	9977	10317	11436	12555	13825
Average Tariff per kWh In Colombian pesos	0.614	0.607	0.658	0.746	0.872	1.079	0.998	1.354	1.063	1.882	1.373	2.364	1.430	2.784	3.135	3.857	5.286	6.480
Operating Revenues																		
Sales revenues	2036	2208	2999	3630	4814	4513	6336	7917	9559	10658	13173	19572	15018	27772	32344	41817	66363	89687
Contributions 1/	413	461	461	565	500	792	-	840	-	487	-	115	-	-	-	-	-	-
Total operating revenues	2449	2667	3460	4195	5114	5305	6336	8757	9559	11355	13173	19687	15018	27772	32344	41817	66363	89687
Operating Costs																		
Generation	104	139	119	188	294	430	335	1156	456	1490	813	2338	691	1856	1822	2892	4444	7475
Transmission	74	120	84	183	88	219	97	208	107	189	120	323	133	317	510	671	1213	1553
Interconnection	0	0	0	0	57	0	78	0	81	0	91	48	100	68	112	133	102	97
Depreciation	571	571	651	727	1188	972	1514	1323	2279	2084	3253	3517	3644	4945	6745	8938	12920	17174
Amortization of deferred assets	65		106		155		197		178		203		198					
Energy purchased from shareholder	84	328	378	657	481	1001	579	2024	0	2982	0	4349	0	6028	2562	4136	8284	10032
General administration															1202	1955	2113	2510
Other						37								571	884	1089	1395	1948
Total operating costs	879	1158	1340	2085	2242	2859	2798	4711	3102	6735	4280	10573	4768	13785	13637	19798	31471	40788
Operating Income	1570	1509	2120	2130	2872	2646	3540	4046	6456	4620	8893	9114	10252	13987	18507	22021	34892	48798
Other Income																		
Non-operating income	0	122	0	514	0	1371	0	1894	0	198	0	429	0	-2477	-911	180	-8707	-17208
Total other income	0	122	0	514	0	1371	0	1894	0	198	0	429	0	-2477	-911	180	-8707	-17208
Net Income before Interest	1570	1631	2120	2644	2872	4017	3540	5940	6456	4818	8993	9543	10252	11610	17596	22201	26185	31589
Total Interest	1298	1222	1761	1708	2287	2918	3005	4052	3941	5139	5158	8595	6912	11505	17274	19094	22840	32391
Less: interest during construction	640	517	1147	1034	1227	2111	1992	2557	2149	3537	2560	4948	4524	5028	7442	5908	2185	3680
Interest charged to income	422	705	417	674	903	607	827	1495	1714	1802	2598	3649	2368	6477	9832	13486	20655	26701
Interest on the FDL 2/	238		197		156		117		78		0		0					
Net Income	912	926	1507	1970	1612	3210	2497	4446	4895	3214	6295	5694	7864	5033	7764	8713	7530	2888

1/ Shareholders' contributions for the use of the interconnection system. This contribution was eliminated with the commissioning of San Carlos.

2/ Interest on the Fondo de Desarrollo Loans, which would be reimbursed by the shareholders.

COLOMBIA

INTERCONEXION ELECTRICA S.A. (ISA)

PROJECT COMPLETION REPORT (LOANS 1582/1725-CO)

Comparison of Forecast and Actual Sources and Application of Funds (1979-1989)
(million of current Col \$)

SOURCES	1979		1980		1981		1982		1983		1984		1985		1986	1987	1988	1989
	SAR	Actual	SAR	Actual	SAR	Actual	SAR	Actual	SAR	Actual	SAR	Actual	SAR	Actual	Actual	Actual	Actual	Actual
SOURCES																		
<u>Internal Cash Generation</u>																		
Net income before interest	1570	1831	2120	2844	2872	4017	3540	5840	6458	4818	6883	8543	10252	11510	17588	22201	28185	31588
Depreciation and amortization	637	571	759	727	1342	972	1711	1323	2458	2094	3457	3517	3842	4945	6745	8638	12820	17174
Other non-cash expenses	0	38	0	54	0	71	0	81	0	188	0	87	0	4873	1915	3853	3338	4047
Gross internal cash generation	2207	2236	2880	3425	4214	5088	5251	7344	8915	7108	12348	13147	14094	21328	28258	34792	44444	52810
<u>Debt Service</u>																		
Amortization	404	535	789	751	1208	1128	1781	2188	2454	4814	4373	6822	6845	18408	12870	28989	35881	117734
Interest charged to income	422	705	417	874	803	807	827	1485	1714	1602	2588	3849	2388	8477	9532	13488	20855	28701
Total	826	1240	1206	1425	2110	1935	2708	3681	4188	6418	6970	10471	9233	24883	22802	40087	56838	146435
Net internal cash generation	1381	998	1673	2000	2105	3125	2543	3663	4747	893	5379	2678	4762	-3555	3454	-5295	-12082	-93825
Bonds & capital contributions	1788	1585	2457	2487	3287	4410	5738	3172	7424	4284	8425	4218	13761	4011	1888	3148	58887	117084
Total sector internal sources	3179	2583	4131	4487	5402	7535	8282	6855	12171	4977	14804	8892	18522	458	5323	-2149	44005	23438
Borrowings	5380	3183	5283	4184	7848	7858	11884	8850	14820	14882	21284	22242	28787	28829	18347	8884	27825	80887
<u>Equity</u>																		
Gov. contributions (interconnect.)	2088	751	2123	1853	548	1715	543	1280	3181	1384	3882	1483	808	233	287	0	0	0
Gov. contributions (other)	885	815	1528	1188	2388	2823	3872	2080	5034	2888	6431	3284	8507	2374	3482	3158	543	0
Total equity	3034	1888	3648	3148	2844	4838	4515	3340	8185	4388	10123	4747	10413	2807	3748	3158	543	0
Other sources	0	882	0	734	0	0	0	5513	0	748	0	583	0	808	120	1084	4144	28088
TOTAL SOURCES	11584	8114	13042	12544	18182	20028	24481	28858	35288	28088	48220	34444	57732	32800	28538	11884	78817	142425
APPLICATIONS																		
<u>Generation</u>																		
Interconnection	2088	841	2123	2048	548	1828	543	1348	3181	1488	3882	1851	808	1487	802	3455	13384	15885
Studies and general plant	685	171	818	388	588	770	508	881	780	385	1085	457	1247	417	370	353	1032	1875
Total construction program	10301	8744	11181	10188	14382	15301	21841	18025	31880	17182	43188	17085	82872	13080	10770	7803	14788	20344
Interest during construction	651	517	1142	1034	1212	2111	1892	2557	2141	3537	2582	4848	4528	5028	7442	5808	2185	3880
Total investment	10982	7281	12302	11220	15584	17412	23773	21582	34131	20719	45750	22011	57388	18108	18212	13589	18971	24034
<u>FDE Loan: Amortization</u>																		
Interest	188		188		188		177		485		0		0					
Sub-total	435	0	388	0	388	0	284	0	583	0	0	0	0	0	0	0	0	0
Increase in working capital	208	47	344	734	272	321	424	-1882	882	1134	471	8128	334	123	2880	-18858	-12037	18888
<u>Other applications</u>																		
Other investment	0	7	0	0	0	25	0	3348	0	510	0	1420	0	5587	2714	2008	50080	48881
Dividends	0	850	0	1174	0	1821	0	2177	0	2588	0	3878	0	4583	5485	8010	8317	1287
Other	0	148	0	582	0	450	0	142	0	117	0	1007	0	4212	-372	7283	15278	53157
Total other applications	0	808	0	582	0	2288	0	5888	0	3218	0	8303	0	14372	7807	16301	71883	101405
TOTAL APPLICATIONS	11584	8114	13042	12548	18182	20028	24481	28888	35288	28088	48220	34442	57732	32803	28538	11884	78817	142425

COLOMBIA

INTERCONEXION ELÉCTRICA S.A. (ISA)

PROJECT COMPLETION REPORT (LOANS 1582/1725-CO)

Comparison of Forecast and Actual Balance Sheets (1978-1988)
(million of current Col \$)

	1978		1980		1981		1982		1983		1984		1985		1986	1987	1988	1989
	SAR	Actual	SAR	Actual	SAR	Actual	SAR	Actual	SAR	Actual	SAR	Actual	SAR	Actual	Actual	Actual	Actual	Actual
ASSETS																		
Gross fixed assets	21449	23236	34276	29367	45367	40505	71832	59639	111226	91896	124751	153478	177640	235857	290054	422813	622427	801820
Accumulated depreciation	1641	2078	2734	3430	4234	5366	6236	7832	9245	11421	13562	17318	18634	26463	39315	56611	86562	131634
Net fixed assets in service	19808	21158	31541	25937	41133	35139	65596	52007	101980	80477	111189	136160	159006	209394	250739	366202	535865	669986
Work in progress	19992	14507	24996	30379	37412	52566	45569	74861	59029	86677	109994	80802	145459	70367	86778	78315	34878	51560
Total fixed assets	39801	35665	56537	56316	78545	87705	111263	126866	161010	167154	221183	216964	304265	276181	346517	444117	584743	721566
Investments	0	14	0	14	0	39	0	336	0	366	0	5431	0	11073	13778	15620	85999	136485
Current Assets																		
Cash	348	720	536	1280	713	673	971	846	1456	463	2077	2296	2263	3967	3584	1844	6862	5940
Accounts Receivable (energy sales)	409	1108	578	2029	854	2562	1056	2960	1596	6245	2200	13300	2518	14618	22250	36178	45630	81845
Acc. Receivable (contributions)	483	1055	739	1867	934	5108	1433	5794	1681	6073	2370	12560	3551	12231	16135	25680	45361	70613
Inventories	320	115	410	175	472	339	774	523	1189	703	1363	778	1389	1091	1419	1819	2236	2821
Other	247	781	281	1282	315	1139	353	2653	395	2968	442	2501	496	4765	10733	1713	4897	5457
Total current assets	1767	3779	2544	6593	3268	10041	4566	12766	6296	16452	8452	31465	10246	36892	54121	67334	105006	186676
Other assets	1381	690	1647	796	1644	1406	1825	3031	2229	2272	2886	2827	3666	7482	7821	11897	27966	52921
TOTAL ASSETS	41750	40116	60629	63746	63406	69186	117797	146103	166536	189776	232503	256467	318397	335026	425037	535166	786653	1077846
EQUITY AND LIABILITIES																		
Equity																		
Capital and reserves	8026	8721	10213	13506	15462	22236	22657	29010	33061	35470	44917	46000	60693	62046	80360	84811	120054	256196
Securities	3101		4408		6662		11475		18375		26669		43448					
Government contributions	2402	926	4525	2911	5073	4626	5816	5866	6777	7270	12469	8753	13375	12957	13706	16982	17405	17405
Revaluation surplus	13669	14683	18329	23007	25678	36177	34661	55003	47667	67757	85457	85432	91279	78319	71103	84945	154742	224871
Total equity	25469	24332	36472	36423	53074	63039	74906	69699	107920	110497	151532	140185	208992	143322	145169	166618	292201	496475
Long-term debt (gross)	15021	12929	20506	18126	26209	27206	36696	36551	54500	59325	75169	68036	102145	165334	237270	296124	347741	407563
Less: current maturities	789		1206		1781		2454		4373		6945		9722					
Net long-term debt	14232	12929	19300	18126	26428	27206	37434	36551	50127	59325	68225	68036	92422	165334	237270	296124	347741	407563
Pension	0	37	0	60	0	98	0	148	0	345	0	432		563	743	1108	1454	1636
Current liabilities																		
Current maturities	789	0	1206	0	1781	0	2454	0	4373	0	6945	0	9722	0	0	0	0	0
Account payable to contractors	654	804	1129	1531	1428	2541	2103	3679	3069	3179	4173	2937	5131	2562	2075	2846	2612	4013
Accounts payable (energy)	11	124	63	283	77	437	98	1101	0	1301	0	3548	0	3999	590	1917	2121	6772
Dividends & interest in arrears	0	537	0	1121	0	1784	0	1894	0	2072	0	3602		3326	5481	3632	4574	3755
Interest payable	166	464	247	682	379	1168	532	1367	748	2044	1290	3371	1751	6001	11569	16902	24549	18131
Other current liabilities	169	86	215	489	241	1283	270	3719	303	5488	339	9509	360	4752	15574	40041	80663	124261
Total current liabilities	2026	2066	2858	4086	3604	7213	5455	11560	8490	14082	12745	22967	16963	20360	35269	65338	115049	156932
Other liabilities	0	616	0	2053	0	1632	0	4945	0	5526	0	4867		5447	6584	5961	10207	10519
TOTAL EQUITY AND LIABILITIES	41750	40116	60629	63746	63406	69186	117797	146103	166536	189776	232502	256467	318397	335026	425035	535167	786652	1077847

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COLOMBIA
INTERCONEXION ELECTRICA S.A. (ISA)
PROJECT COMPLETION REPORT (LOANS 1582/1725-CO)

Comparison of Forecast and Actual Key Performance Indicators (1978-1989)

	1979		1980		1981		1982		1983		1984		1985		1986	1987	1988	1989
	SAR	Actual	SAR	Actual	SAR	Actual	SAR	Actual	SAR	Actual	SAR	Actual	SAR	Actual	Actual	Actual	Actual	Actual
Energy sales	3314	3636	4556	4887	5294	4183	6349	5646	6627	5770	9595	6279	10502	9977	10317	11436	12555	13625
Receivables to op.income(%) 1/	16.7	41.5	16.7	46.4	16.7	46.7	16.7	34.0	16.7	55.0	16.7	67.6	16.6	52.8	68.8	66.5	66.8	61.4
Debt service coverage (times) 2/	2.67	1.80	2.39	2.40	2.00	2.61	1.94	2.01	2.14	1.11	1.77	1.26	1.51	0.88	1.15	0.87	0.79	0.36
Debt/debt+equity ratio 3/	0.37	0.35	0.35	0.31	0.35	0.30	0.35	0.31	0.34	0.35	0.33	0.36	0.33	0.54	0.62	0.64	0.54	0.45
Self-financing ratio 3/	27.4	32.0	31.7	35.8	33.4	37.6	33.6	26.7	34.5	19.9	32.0	20.0	32.1	1.4	16.7	-16.0	67.4	16.5
Rate of return (%) 4/	6.0	6.1	9.0	9.2	11.0	8.7	9.0	9.3	9.0	7.0	9.0	8.4	7.8	8.1	8.0	7.2	7.8	8.1

1/ Ratio of Accounts Receivable on energy sales to Total Billings.

2/ Ratio of Gross Internal Cash Generation to Total Debt Service (excluding all IDCs). This definition differs from the one used in the SAR that only excluded IDC financed by loans.

3/ It was not possible to determine the method used to calculate this ratio in the SAR. Here it has been estimated with this formula and only the numerator is shown.

3/ Ratio of Net Internal Cash Generation plus shareholders' contributions (other than those finance by the Government) to Total Applications.

4/ Ratio of Operating Income to Average Revolved Net Fixed Assets in Service.

COLOMBIA

INTERCONEXION ELECTRICA S.A. (ISA)

PROJECT COMPLETION REPORT

SAN CARLOS I AND II HYDRO PROJECTS (LOANS 1582-CO AND 1725-CO)

Balance of Accounts Receivable at year-end
(million of Col\$)

	-----19 84-----		-----19 87-----		-----19 89-----	
	Total Billing 1/	Cumulative Arrears	Total Billing 1/	Cumulative Arrears	Total Billing 1/	Cumulative Arrears
<u>For Energy Sales to:</u>						
EEB	2389	424	16619	13763	34882	25728
EPM	534	24	1755	2	4123	28
CVC	3608	3082	6007	4429	9940	6327
ICEL	5696	4072	9133	5562	23961	17013
CORELCA	1091	613	2662	1031	8843	6147
CHB		0		0	96	0
CHEC		0		0		0
Sub-Total	<u>13300</u>	<u>8215</u>	<u>36176</u>	<u>24807</u>	<u>81845</u>	<u>55243</u>
<u>For Capital Contributions and other from:</u>						
EEB	3048	2760	4357	3262	12593	9087
EPM	0	0	62	17	6947	6910
CVC	2899	2565	2296	0	16471	15396
ICEL	6333	5888	9066	6414	18209	16372
CORELCA	296	272	627	530	16592	15721
CHB		0		0		
CHEC		0		0		
Sub-Total	<u>12576</u>	<u>11485</u>	<u>16408</u>	<u>12223</u>	<u>70812</u>	<u>63486</u>
<u>TOTAL</u>						
EEB	5417	3184	20976	17025	47475	34815
EPM	534	24	1817	19	11070	6938
CVC	6507	5647	8303	4429	26411	21723
ICEL	12031	9960	18199	13996	42170	33365
CORELCA	1387	885	3289	1561	25435	21868
CHB	0	0	0	0	96	0
CHEC	0	0	0	0	0	0
TOTAL	<u>25876</u>	<u>19700</u>	<u>52584</u>	<u>37030</u>	<u>152657</u>	<u>118729</u>
Total (In US\$ million)	227	173	199	140	352	274
Exchange Rate (year-end)	113.89		263.7		433.92	

1/: Total billing for energy sales, and capital contributions committed, for that year respectively.

COLOMBIA

PROJECT COMPLETION REPORT

SAN CARLOS I AND II HYDRO POWER PROJECT (LOANS 1582-CO AND 1725-CO)

ISA'S SHAREHOLDERS

Annual Level of Performance

	1979		1980		1981		1982		1983		1984		1985		1986	1987	1988	1989
	SAR	Actual	SAR	Actual	SAR	Actual	SAR	Actual	SAR	Actual	SAR	Actual	SAR	Actual	Actual	Actual	Actual	Actual
EES																		
Energy Sales (TWh) 1/	3.91	3.71	4.29	3.98	4.75	3.83	5.27	4.18	5.84	4.18	6.49	4.28	7.21	4.55	4.88	5.14	5.44	5.88
Self-financing ratio (%) 2/	48.80	58.00	38.80	47.00	52.60	24.00	112.80	30.00	128.20	25.00	121.80	28.00	231.40	32.00	45.00	64.00		
Debt service coverage (times) 3/	3.50	2.00	2.90	2.90	3.10	2.50	3.80	2.00	3.50	1.80	3.60	1.90	3.90	2.20	1.88	1.41	1.10	0.98
Debt service coverage including investment in ISA (times) 4/	1.80	1.30	1.70	1.50	1.80	1.30	1.80	1.50	1.70	1.50	1.50	1.60	1.50	2.00	1.82	1.40		
Rate of return (%)	8.70	8.50	15.10	8.40	20.80	10.40	20.20	16.30	18.50	14.80	17.90	13.20	20.20	19.80	14.80	14.90	12.10	13.60
Losses (%) 7/		18.50		19.00		18.80		19.50		22.20		25.00		24.40	24.70	28.10	24.80	22.30
EPM																		
Energy Sales (TWh) 1/	3.38	3.10	3.87	3.81	3.87	3.70	4.33	3.69	4.70	4.14	5.08	4.32	5.48	4.49	4.83	5.28	6.48	7.54
Self-financing ratio (%) 2/	61.80	58.00	67.00	68.00	80.10	61.00	75.00	43.00	74.80	38.00	420.80	15.00	610.80	28.00	10.00	18.00		
Debt service coverage (times) 3/	2.00	2.10	2.40	2.10	2.60	2.60	2.80	1.80	1.70	1.80	3.10	1.80	4.10	2.00	1.30	1.50	1.13	0.82
Debt service coverage including investment in ISA (times) 4/	1.40	2.10	1.80	1.80	1.70	1.80	1.80	1.60	1.10	1.80	2.00	1.30	2.10	1.70	1.20	1.50		
Rate of return (%)	9.20	7.30	11.10	7.00	13.80	8.80	11.80	7.80	11.90	10.80	15.20	8.80	18.70	11.30	11.14	13.82	9.30	7.20
Losses (%) 7/		20.30		20.10		20.00		21.30		20.50		21.80		22.40	21.80	19.10	20.30	19.70
CYC																		
Energy Sales (TWh) 1/	2.68	2.55	2.81	2.81	3.08	2.87	3.31	2.88	3.80	2.90	3.90	3.40	4.25	3.40	4.20	4.30	4.38	4.88
Self-financing ratio (%) 2/	25.20	188.80	41.40	68.80	85.30	77.80	108.00	70.30	282.80	7.00	140.00	8.00	161.50	-0.82	-0.20	-1.10		
Debt service coverage (times) 3/	1.50	1.50	1.80	1.70	2.10	2.22	2.40	2.70	2.70	1.10	3.10	1.10	4.00	0.70	0.90	0.70	0.48	0.48
Debt service coverage including investment in ISA (times) 4/	1.00	1.20	1.20	1.20	1.30	0.88	1.30	1.40	1.40	0.80	1.70	0.80	1.80	0.80	0.80	0.80		
Rate of return (%)	8.50	7.80	12.00	7.40	13.50	8.40	13.20	10.80	12.50	8.50	9.60	8.80	11.20	12.10	12.50	12.50	5.51	8.42
Losses (%) 7/		14.20		14.30		14.10		14.40		18.10		18.50		18.10	17.80	19.40	20.80	21.00
CORELCA																		
Energy Sales (TWh) 1/	1.80	1.58	2.14	1.84	2.84	2.03	3.48	2.82	3.81	3.30	4.40	3.64	5.14	3.82	3.88	4.44	4.49	4.58
Self-financing ratio (%) 2/	-17.00	-4.30	-14.00	-28.50	-20.50	-17.50	-0.50	-33.20	21.70	-1.70	38.80	-22.70	80.00	-21.40	-29.10	-25.80		
Debt service coverage (times) 5/	0.50	0.70	0.70	0.40	0.70	0.80	1.00	0.80	1.10	0.80	1.20	0.80	1.80	0.60	0.60	0.60	0.61	0.80
Debt service coverage including investment in ISA (times) 6/	1.20	1.70	1.80	1.10	1.30	1.30	1.30	1.30	1.10	2.20	1.10	0.70	1.20	0.80	0.70	0.80		
Rate of return (%)	5.00	4.30	5.00	2.80	6.00	2.20	7.00	5.20	8.00	8.70	9.00	7.20	9.00	8.00	8.60	9.10	5.88	6.31
Losses (%) 7/		20.80		22.70		22.20		23.80		23.20		22.50		23.00	22.70	23.70	23.80	22.30
SECTOR																		
Losses (%) 7/		19.80		20.10		19.30		21.30		22.80		23.30		23.40	23.80	24.10	24.30	23.00

1/ Sales in its own system.

2/ Net internal cash generation (excluding income from ISA) divided by applications (excluding investments in ISA).

3/ Gross internal cash generation (operating income plus depreciation and increase in reserves) divided by debt service (net of interest during construction financed by loans).

4/ Gross internal cash generation divided by: debt service (net of interest during construction financed by loans) plus investments in ISA.

5/ Gross internal cash generation (op

6/ Gross internal cash generation plus Government Contributions divided by:

7/ Transmission and distribution losses divided by net supply (gross generation plus purchases to the interconnected system); except EEEB which net supply excludes station use.

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Annex 3

COLOMBIA

INTERCONEXION ELÉCTRICA S.A. (ISA)

PROJECT COMPLETION REPORT

SAN CARLOS PROJECT (LOANS 1582-CO AND 1725-CO)

Sector Installed Capacity (MW)

As of December 31, 1977	Year of Commis- sioning	Hydro	Thermal	Total
EEEB		583	138	719
EPM		729	0	729
CVC-CHIDRAL		540	58	598
ICEL - CHEC		363	203	566
CORELCA		0	440	440
ISA		500	0	500
Total as of December 31, 1977		2715	837	3552
Plant Additions				
EEEB				
-Mesitas	1986	200		200
-Mesitas	1987	400		400
EPM				
-Guatapé II	1979	280		280
-Ayura	1983	16		16
-Guadalupe IV	1985	213		213
-Playas	1987	200		200
CVC - CHIDRAL				
-Salvajina	1985	270		270
ICEL - CHEC				
-Barranca III	1978		55	55
-Iraula	1979	18		18
-Palpa III	1982		75	75
-Palenque V	1982		22	22
-Barranca IV	1983		32	32
-Tasajero	1985		150	150
CORELCA				
-Ballenas	1978		31	31
-Termo-Barranquilla	1980		142	142
-Termo-Cartajena III	1980		71	71
-Termo-Guajira I	1983		160	160
-Ballenas	1984		31	31
-Termo-Guajira II	1987		170	170
ISA				
-Termozipa IV	1981		66	66
-Turbogas-Chinu	1982		133	133
-Chivor II	1982	500		500
-San Carlos I	1984	620		620
-Termozipa V	1985		66	66
-San Carlos II	1987	620		620
-Jaguas	1987	170		170
-Calderas	1987	18		18
ICEL-ISA				
-Betania	1987	500		500
Total Plants Additions 1978-88		4025	1204	5229
Total Installed Capacity		6740	2041	8781