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INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT

APPRAISAL OF ENDESA POWER PROJECTS

C H I L E

October 22, 1956

Department Technical Operations

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1 U.S. Dollar	=	500 pesos
1 Pesos	=	\$.002

APPRAISAL OF ENDESA POWER PROJECTS

C H I L E

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APPRAISAL OF ENDESA POWER PROJECTS

C H I L E

I. SUMMARY

1. This report covers an appraisal of a power development program proposed by the Empresa Nacional de Electricidad S. A. (Endesa) designed to meet the needs of Chile through 1965. It includes recommendations concerning three specific projects within the program which could form the basis for a Bank loan of \$15.0 million.

2. The Endesa program will add about 406,000 kw in generating capacity and will increase production by about 2.1 billion kwh/year. The total estimated cost is equivalent to \$113 million of which about \$40 million is required as foreign exchange.

3. Market forecasts show an average annual increase in demand of 8.7% for the period 1955-1965 with a corresponding increase of 9.0% in energy consumption for the Endesa interconnected system. These estimates are reasonable. The Endesa program, plus the addition of 120,000 kw by the Cia Chilena, represents a conservative basis for meeting these requirements.

4. Within the Endesa program, there are three projects on which work has advanced sufficiently to permit consideration by the Bank as a basis for a loan as follows:

Abanico Expansion	49,000 kw
Pullinque System	49,000 kw
Cipreses System Expansion and Isla Hydro Plant	<u>68,000 kw</u>
Total:	166,000 kw

These projects are sound from an engineering standpoint and fit well into the overall program.

5. The total cost of the three projects is equivalent to about \$55 million of which about \$17 million is required as foreign exchange. The cost is reasonable, considering the high proportion of transmission and distribution facilities involved and the seasonal storage which will be provided.

6. It is proposed that Corporacion de Fomento de la Produccion (Fomento) and Endesa will be co-borrowers as in the case of Loan 5 CH. The present financial position of both is good and prospects for the future are satisfactory. Neither company obtains an adequate return as yet but earnings have shown a steady improvement over the years and future prospects are good.

7. The proposed projects are suitable for a loan of \$15.0 million. Based on the useful life of the equipment and the financial prospects of Endesa, a term of 20 years is appropriate. A grace period of 4 years is indicated by the construction schedule.

II. INTRODUCTION

8. On March 25, 1948, the Bank made a loan of \$13.5 million to Corporacion de Fomento de la Produccion (Fomento) and Empresa Nacional de Electricidad, S. A. (Endesa) as co-borrowers for a program of power development to be executed by Endesa. All works included in the projects covered by the loan have been completed except for some small items of mechanical irrigation which are still under construction.

9. A Bank Mission visited Chile in April, 1956 to review the general economic situation and to examine the prospects of resuming operations in Chile. This mission concluded that the Bank could consider additional lending at this time and gave power and coal mining top priority as development categories.

10. This report covers an appraisal of the Endesa program for electric power expansion and recommends specific projects in the program for consideration by the Bank as a basis for a loan. The appraisal is based on information submitted by Endesa and field studies made in July and August.

III. POWER MARKET FORECASTS

11. Chile extends south from the Peruvian border for a distance of about 4200 km, with an average width of only about 180 km. The eastern boundary is, for the most part, the continental divide of the Andes. The western part contains the coastal range of mountains and between the two ranges lies a narrow valley in which most of the agricultural production of the country is concentrated. Hydrological and climatic conditions vary greatly from the hot, arid regions in the north to regions of heavy rainfall and permanent icecaps in the south. The present population of the country is about six million, more than four million of which are concentrated in the central regions.

12. Endesa has recently completed a detailed study of power requirements in Chile for the period 1956 through 1965 and the means by which these requirements should be met. Requirements have been estimated by regions (see map), taking into account historical development of the markets and both assured and probable developments in industry, agriculture and transportation. These estimates do not include requirements to be met by industrial and mining companies with captive plants except where such plants are interconnected with the Endesa system. The situations in the various geographical regions can be summarized as follows:

Region 1: This region, with a population of about 380,000, is largely desert and has little hydroelectric potential. It contains, however, most of the large copper and nitrate mining operations. The

mining companies have installed about 270,000 kw of which about 260,000 kw is thermal. These plants serve the mining towns so that public service installations amount to only about 12,000 kw. The total installed capacity has increased about 30% since 1945 but the total annual generation of energy has been substantially constant. No additions of importance are contemplated in this region.

Region 2: This region, with a population of about 260,000, is a developing area in which economic activity is confined largely to small mining operations, small industries and modest agricultural activity. Present installed capacity is 29,700 kw of which 21,800 kw are owned by Endesa, including the Molles hydro plant of 16,000 kw financed under Loan 5 CH.

During the five years 1951-55, demand has developed at a rate of 21% per year and consumption of energy at about 18%. Average annual increases during 1956-64 are estimated at 7.3% and 9.5% based on normal growth of existing markets and development of small mines and industries. This region has surplus generating capacity at present and it is expected that with the addition of 6,500 kw of hydro capacity by Endesa and interconnection with Region 3, estimated demand to 1965 can be met. In the early years, surplus power will be utilized in Region 3 through the interconnection to relieve the shortage in that area.

Region 3: This region has a population of about 3.3 million. It contains the cities of Santiago and Valparaiso and has the greatest concentration of industrial, commercial and agricultural activity in the country. The present installed capacity is 375,000 kw of which 141,000 kw is owned by Endesa, including the Cipreses plant financed under Loan 5 CH. Of the balance owned by private companies, Cia Chilena de Electricidad, a subsidiary of American & Foreign Power, has 164,000 kw and distributes about 75% of the total energy sold in the region.

During recent years, power has been rationed in this region with the result that the annual increase in demand during the period 1951-55 was only 2.9%. Demand and production for sale by public service companies increased at an annual rate of 4.5% during the same period. This overall increase was obtained in spite of a reduction of about 10% in residential consumption in 1954 as a result of rationing. It is conservatively estimated that if restrictions could be lifted, the peak load would be increased by about 50,000 kw or 15%. Additions are planned to permit lifting restrictions and on this basis, the demand and energy consumption are estimated to increase at an average annual rate of 7.8% during the period 1956-65. The private companies operating in the region are in substantial agreement with this estimate.

Region 4: This region, with a population of one million, contains the city of Concepcion and the surrounding industrial area. It has experienced a rapid industrial expansion in the postwar period. The present installed capacity in the region is 106,000 kw of which 86,000 kw is hydro in the Abanico plant of Endesa. The balance is thermal power in interconnected industrial plants and the central station of Cia General de Electricidad Industrial. This private company distributes about 25% of the energy sold in the area.

During the period 1951-55 demand increased at an average annual rate of 10.0% while energy consumption increased at a rate of 10.5% due to the establishment of several power intensive industries in the area. Estimates for the period 1956-64 are 11.3% and 12.6% respectively. This assumes continued industrial development in the area with a high proportion of heavy industry which seems likely.

Region 5: This is a region of limited industrial and agricultural development but is of interest as a location for hydro plants due to the presence of large mountain lakes capable of providing seasonal storage. It has a population of about 860,000. The present installed capacity is 32,700 kw, of which 24,200 kw are in the Pilmaiquen plant of Endesa which was partially financed under Loan 5 CH.

Demand in this region in the period 1951-55 has increased at an annual rate of 13.0% and energy consumption at 14%. Estimates for the period 1956-64 are 12.4% and 14.3% respectively. This seems likely in view of the present rate of development in the region and the prospects for future industrial expansion. This region will also furnish increasing quantities to the interconnected system for consumption in Regions 3 and 4.

Regions 6 and 7: These southernmost regions with a population of 180,000 are not important in the demand for electric power. Requirements for the oil fields and municipalities are furnished by small diesel plants which will be expanded as required. The present installed capacity is about 7,000 kw. No substantial additions are contemplated in these regions during the period under consideration.

¹³
13. The total installed capacity in the country increased from about 502,000 kw in 1945 to 959,000 kw in 1955, of which 445,000 kw is thermal and 514,000 kw is hydro (see Appendix 1). Generation increased from 2,610 million kwh in 1945 to 3,772 million kwh in 1955, an increase of about 45% in the ten year period. However, the increase occurred almost entirely through increased sales by the public service companies whose generation increased from 682 million kwh to 1,823 million kwh or about 167% during the same period.

¹⁴
14. On the basis of the above estimates, the demand in the four Regions 2 - 5 is estimated to increase from 441,000 kw in 1955 to 1,039,000 kw in 1965, or an average annual increase of 8.7%. The consumption of energy is

expected to increase from 2,133 million kwh in 1955 to 4,997 million in 1965, or an average annual increase of 9.0%. Appendices 3 and 4 show the projections of load and energy consumption in graphic form.

15. Estimates of consumption by categories have been made by Endesa for the year 1962 in Regions 2 - 5 which compare with actual figures for 1955 as follows:

	<u>%</u> <u>1955</u>	<u>%</u> <u>1962</u>
Residential	15	15
Commercial	6	6
Industrial	42	42
Mining	21	17
Rural	2	3
Transport	7	10
Municipal	7	7
	<u>100</u>	<u>100</u>

16. The estimated development of demand and consumption of power in Regions 2 - 5 inclusive should be achieved if economic activity in Chile maintains its present rate of growth. The estimates take into account the relative maturity of the markets in the various regions and are conservative when compared with developments in other parts of the world under somewhat comparable conditions.

17. Chile has limited reserves of coal and oil and is therefore interested in the continued development of hydroelectric power. There is no prospect for substantial hydro development in the two northern regions due to lack of rainfall. In the third and fourth regions, economic hydro sites are limited but will probably be adequate to meet requirements for the next 10 - 15 years. The fifth region offers the greatest possibilities for hydro development but the distances from the Santiago area will require heavy investments in transmission facilities. It is hoped that industry will continue to migrate to the south in order to utilize the hydro potential available there, but it is to be expected that heavy investment in high tension transmission systems cannot be entirely avoided in the future.

18. Prior to 1948, electric power for public service was generated largely by private companies. Since that time Endesa has become an increasingly important supplier of bulk power to distribution companies and has provided some distribution facilities in small towns and rural areas. In 1947, Endesa generated about 20 million kwh as compared with about 967 million kwh in 1955. (See Appendix 2). In 1955, it owned about one-third of the generating capacity in the country and produced about 25% of the energy consumed. It is expected that this trend will continue with Endesa providing all of the major hydro plants and transmission facilities but continuing to sell energy in bulk so far as possible. Thus far, there has been no substantial conflict of interests between Endesa and private companies and the latter are in agreement with the proposed position of Endesa with regard to the provision of future facilities.

IV. LOAN 5 CH

19. Loan 5 CH for an amount of \$13.5 million was made to Endesa and Fomento as co-borrowers on March 25, 1948. It covered the foreign exchange requirements of an Endesa seven-year development program as conceived at that time. Specifically, it included two new hydro plants, Cipreses and Molles, having a combined capacity of 70,000 kw, a small diesel plant of 585 kw and the addition of one unit of 10,800 kw to the existing Pilmaiquen hydro plant. Extensions to the primary and secondary transmission systems and distribution facilities were included. Some developments of pump irrigation completed the program.

20. There were a number of revisions and additions which have expanded the scope of the project, but with no increase in the amount of the Bank loan. These changes were either the result of revisions of demand forecasts or changes in design as additional technical information was developed.

21. The generating facilities were completed slightly behind schedule except for Cipreses which was delayed more than two years due to changes in design, difficulties encountered in the civil engineering works and mechanical difficulties.

22. The construction of the secondary transmission system was slow because it was necessary to organize small companies and cooperatives for their operation. Lines were not constructed until the proper organizational and financial arrangements had been made. The execution of the irrigation projects was deferred because additional studies were necessary to determine the proper types of projects to be sponsored. It was originally intended to form irrigation districts but it was eventually decided to finance isolated pumping installations, all to be paid for by the farmers. This part of the project is scheduled for completion before the end of 1956.

23. A comparison of the original and latest cost estimates is as follows:

	<u>Original</u>	<u>Latest</u>
IBRD Loan (millions of \$)	13.5	13.5
Local Currency (millions of pesos)	743	3,879

The reasons for the increase in local currency costs were the expansion of the program, which was financed largely with local currency, changes in design, and increased wages and costs of materials due to inflation in Chile.

24. Endesa's organization and functions have been considerably expanded since the signing of the loan. Performance on the projects and the efficiency of the organization has been good.

V. THE ENDESA EXPANSION PROGRAM

25. Endesa has formulated an expansion program for the period 1956-62 to provide the increased generating capacity, transmission and distribution facilities which, with those to be provided by the private companies, are estimated to meet the projected power requirements of the country through 1965. It is planned that Endesa will provide 406,000 kw of generating capacity which will be all that is required for public service with the exception of 120,000 kw of steam capacity which will be built by the Cia Chilena near Valparaiso. It will also provide all of the transmission facilities including interconnections between Regions 2 and 3 and also 4 and 5. Some distribution works in rural areas and improvements and additions to existing plants are included. The program, broken down into principal projects, and the estimated costs are summarized below:

Project	Installed Capacity kw	Total Investment Mill. pesos	Local Currency Investment Mill. pesos	Foreign Exchange Investment U.S. \$1000
Abanico System				
Expansion	49,000	8,933	6,061	5,743
Pullinque System	48,900	10,521	7,650	5,740
Cipreses System				
Expansion and Isla				
Hydro Plant	68,000	7,872	5,100	5,547
Rapel	200,000	35,478	26,430	18,096
Small Plants	29,600	5,357	3,198	4,318
Additions and Improvements	10,800	3,556	3,298	515
Total	406,300	71,717	51,737	39,959

26. This program plus the commissioning of other capacity already installed will add about 455,000 kw to the Endesa system and will increase the annual generation of energy by about 2.56 billion kwh/year. The relation of the program, including the addition of 120,000 kw of steam capacity by Cia Chilena to demand and energy forecasts is given in Appendices 3 and 4. Small deficits in firm power are indicated in 1958 and 1959 before sufficient new capacity can be brought into production. Thereafter, sufficient capacity should be available in the interconnected system to meet requirements through 1965. With respect to generation, sufficient firm energy is estimated to be available to meet requirements until 1964, although the position will be tight in 1956-58 if dry years are encountered. A shortage would exist in 1965 if this were to be a dry year.

27. The Endesa program represents an investment equivalent to about \$350 per kw and \$.07 per annual kwh. These costs are reasonable. The

foreign exchange requirements amount to about 28% of the total cost which is a relatively low proportion.

28. In estimating the capability of its installations, Endesa uses the rated capacity of the generating units with all units in operation. This is claimed to be justified by the fact that the summer peak load is about 30% less than the winter peak and normal maintenance can be done during the summer months. The program therefore represents the minimum investment required to meet the estimated demand without providing security against breakdowns during the winter months.

29. Generation is based on water flows available 95% of the time over the period of record. In this respect, generation estimates from hydro plants are conservative on the average and the meeting of peak load will normally be the controlling factor in the operation of the systems.

30. In addition to the program discussed above, Endesa will need to make normal extensions in its secondary transmission and distribution systems and provide for the financing of some new municipal companies and cooperatives. It is estimated that these will amount to about 12.6 billion pesos during the period 1956-1962. Thus the total investments to be made by Endesa during this period will amount to about 84.3 billion pesos.

31. The Papel project is the most important undertaking in the Endesa program. This project, located about 100 km from Santiago, will add 200,000 kw in Region 3 where the greatest shortage exists at present. The plant will have reservoir capacity sufficient for seasonal regulation. The estimated cost, equivalent to \$70 million (\$350/kw), is reasonable. Engineering studies and field surveys are under way at present and will probably be completed by the fall of 1957. Resettlement plans for farmers now on about 4,500 hectares in the reservoir site are being formulated. It is contemplated that the Bank will be approached for a loan on this project as soon as the preliminary work is completed.

32. The Endesa program fits well into the existing facilities in Chile and represents a conservative solution to the problem of meeting estimated demands to 1965. It has been discussed with the Cia Chilena and the Cia General, both of which are large distributors of Endesa power. The program is not in conflict with any plans of these companies and is considered by them to be necessary to meet the anticipated demand over the next ten years.

VI. PROJECTS PROPOSED FOR BANK FINANCING

33. Within the Endesa program, three projects have been selected for consideration of the Bank as a basis for a loan. The principal features of these projects are given below:

(1) Expansion of the Abanico System

(a) Description of the Project

34. An existing hydro plant having an installed capacity of 86,000 kw is located on the Rio Laja about 160 km from Concepcion. It serves an important industrial area and is interconnected with other important plants of Endesa and the private companies.

35. The Rio Laja rises in Lake Laja at an elevation of about 1,360 m in the Andes. The lake is formed by a natural lava dam and the present flow of the river is dependent on overflow of the dam and leakage. An intake structure will be constructed in the lake which will permit a draw-down of the lake level by 68 meters which is equivalent to 4.3 billion m³. Possible average seasonal storage amounts to about 2.3 billion m³. Operating levels will be determined which give minimum leakage. This intake structure will be connected to the river upstream from the existing intake for the Abanico plant by a pressure tunnel 3.2 m in diameter and about 2 km in length. The existing intake canal, about 7 km in length, will be enlarged to handle the additional water made available from the storage to be provided by the lake.

36. Two additional generating units, each having a capacity of 24,500 kw, will be installed in the present powerhouse along with the necessary auxiliaries.

37. The new units will utilize the present connection into the 154 kv transmission system. As a part of the project, however, this system will be extended 210 km to the south where it will be interconnected with plants in Region 5. Additional 66 kv lines having a total length of about 200 km will be provided to serve new markets. About 500 km of 13.2 kv lines will be provided to serve rural areas and small towns now without service. An additional synchronous condenser will be installed at Concepcion and three major substations will be enlarged.

38. With the installation of the pressure tunnel and seasonal regulation of flow from the lake, about 800 million m³/year of water will be used for irrigating about 60,000 hectares of land in the provinces of Concepcion and Nuble. For this reason, the cost of the tunnel is being shared by Endesa and the Ministry of Public Works. The irrigation works are not considered to be a part of this project and have not been included for financing.

39. Flow records for the Rio Laja are available from 1917. The river has an unusually steady flow throughout the year due to the leakage from the lake. The present installation of 86,000 kw with an annual generation of 530 million kwh is firm power. With the additional regulation to be provided by the lake, the full installation of 135,000 kw will be firm capacity at the system load factor of 55% with an annual generation of about 650 million kwh. Upon completion of the intake works and the installation of the additional generating units, the draw-down of the lake will permit the generation of an additional 1.5 billion kwh over a period of about three years. This

additional energy has been taken into account in the financial projection for the years 1959-61.

40. Work on this project is well under way. Engineering is practically complete and expansion of the powerhouse has been started. Orders for major equipment items have been placed in Germany, Switzerland and Austria after international competitive bidding. 1/

41. It is presently estimated that the project will start operation in mid-1958 and will be finally completed by the end of 1959. This is a tight schedule but can be realized.

42. The intake to be provided in the lake and the pressure tunnel are designed for exploratory as well as operational purposes. It is not known to what extent leakage from the lake can be reduced by lowering the level and this will be determined. Reduction in leakage will not influence total generation from the plant but will affect the degree of seasonal regulation. The results obtained will influence the design of a larger future installation of about 250,000 kw contemplated above the present Abanico plant which, in any case, will utilize the intake works and pressure tunnel provided in this project.

43. This project has been engineered by the staff of Endesa and will be built by its construction department. The designs which have been adopted seem to be the most economical for the conditions. Past performance of the Endesa construction department has been reasonably good and has improved with experience. The project is technically sound and arrangements for its execution are satisfactory.

(b) Estimated Cost

44. The estimated cost of the Abanico project, broken down into principal items and into local currency and foreign exchange requirements, is as follows:

1/ It is the policy of Endesa to let contracts on the basis of international bidding so far as practicable, consistent with standardization and technical requirements.

Expansion of Abanico System

Estimated Cost

<u>Item No.</u>	<u>Description</u>	<u>Total Cost in million pesos</u>	<u>Local Currency in million pesos</u>	<u>For. Exchange in \$1,000</u>
1	Pressure tunnel	1,728	1,400	654
2	Other intake works	498	401	196
3	Powerhouse and equipment	883	353	1,058
4	Step-up substation	113	36	154
5	Housing	22	22	-
6	Transmission lines	2,506	2,199	616
7	Substations	1,824	781	2,085
8	Distribution works	784	687	194
9	Construction equipment	575	182	786
	Total:	8,933 (\$17.8 million)	6,061 (\$12.1 million)	5,743

45. In the above estimate, no account is taken of the contribution of the Ministry of Public Works to the cost of the pressure tunnel, on account of the irrigation aspects of the project. This is estimated at about 650 million pesos which would reduce the total cost to Endesa to about 8.3 billion pesos. The total foreign exchange requirements will be borne by Endesa.

46. The estimates are based on recent quotations for imported equipment and materials to which 10% has been added for contingencies. Local currency costs are estimated at about 10% above the levels prevailing as of July 1, 1956. Interest during construction has been included in individual items at the rate of 4.8% per year on the total cost of the item, including local currency expenditures. All items include freight, duties and inspection costs.

47. Taking into account the contribution to the cost of the project by the Ministry of Public Works, the cost per kw installed is estimated at the equivalent of about \$340. Considering that more than 60% of the investment will be in transmission and distribution facilities, this cost is reasonable.

48. The additional energy to be generated by this project will be about 120 million kwh per year, requiring an investment of the equivalent of \$.15/annual kwh. This is reasonable considering that the entire production of 650 million kwh per year will be regulated and that a high proportion will be available during the winter months when supplementary steam generation would otherwise be required.

49. The estimated cost of construction equipment amounts to about 20% of the cost of the civil works in this project. This estimate takes into account the utilization of existing equipment available to Endesa and is reasonable for the proposed construction schedule. Upon completion of the project, the equipment and spare parts having additional life will be transferred to the Endesa equipment pool at their depreciated value.

50. Orders have been placed for the turbines, generators, transformers, penstocks and some smaller items in an amount equivalent to \$1.894 million using suppliers' credits with terms of 4 to 5 years and interest rates of 4 to 5%. Payments equivalent to \$440,000 had been made to June 30, 1956. It is proposed to exclude these credits from the proposed Bank loan, leaving a balance equivalent to about \$3.85 million to be covered by the loan.

(c) Cost of Power

51. Upon completion of the project, with the fifth and sixth units in operation, the estimated annual costs for the Abanico system are as follows:

	<u>Millions of Pesos</u>
1. <u>Direct Costs</u>	
Generation	62.1
Transmission	78.0
System overhead	19.8
General	<u>195.0</u>
	354.9
2. Depreciation	497.0
3. Taxes and contributions	<u>35.0</u>
	886.9
Total:	886.9

52. The delivered cost of power amounts to 1.48 pesos (3 mills) which provides a margin of about 1.8 pesos with respect to the present average selling price of 3.3 pesos.

53. Rates would have to be set to provide revenues of 2,707 million pesos per year if there were to be an ultimate return of 8% on the investment amounting to 1,820 million pesos. On the basis of generation of 650 million kwh and sales of about 600 million, the average rate would have to be 4.51 pesos/kwh or the equivalent of 9 mills. This rate, for bulk sales to distributors and for general industrial use, is reasonable. It represents very substantial savings to the extent that steam generation will be replaced during the winter months.

(2) Pullinque System

(a) Description of the Project

54. This project will be located on the Huanehue River near the outlet of Lake Pullinque and will utilize the regulation provided by this lake and

Lake Calafquen upstream. These lakes provide storage of about 1.5 billion m³ of which about 400 million m³ will be useful.

55. The intake works will consist of a short gravity tunnel connecting the two lakes and a low concrete barrage across the river. A canal having a length of about 5 km and designed for a capacity of 120 m³/sec will carry water to the powerhouse. The effective head on the turbines will be 47 m.

56. Three generating units each having a capacity of 16,300 kw will be installed in the powerhouse. The substation at the plant will consist of three 20,000 kva transformers stepping up to 66 kv.

57. The plant will be connected into the extension of the Endesa 154 kv transmission system at Temuco in Region 4 through 125 km of double circuit 66 kv line. A single circuit 66 kv loop about 250 km in length will serve areas to the west and south. Six substations having an aggregate capacity of about 46,200 kva will be initially installed and the necessary additions to the Temuco substation will be provided to connect into the 154 kv line. About 600 km of distribution lines will be constructed serving about 20 small towns and villages.

58. Flow records for the Huanehue River are available from 1935 and show that, with the regulation provided by the lakes, adequate water will be available to produce an average of 270 million kwh per year, giving a plant factor of about 63%. About 220 million kwh will be firm.

59. Engineering work for the project is being done by the staff of Endesa and is well advanced. The designs adopted are satisfactory. Construction work has been started. It is planned that all construction will be done by Endesa. It is estimated that the project will be completed by the end of 1960. This schedule is reasonable.

(b) Estimated Cost

60. The estimated cost of the project by principal items is as follows:

		<u>Pullinque System</u>		
		<u>Estimated Cost</u>		
<u>Item No.</u>	<u>Description</u>	<u>Total Cost</u>	<u>Local Currency</u>	<u>For. Exchange</u>
		<u>in million pesos</u>	<u>in million pesos</u>	<u>in \$1,000</u>
1	Waterways	2,447	2,324	245
2	Powerhouse and equipment	1,743	782	1,922
3	Step-up substation	377	173	407
4	Housing	350	350	-
5	Transmission lines	1,514	1,423	182
6	Substations	1,369	645	1,448
7	Distribution lines	1,626	1,511	230
8	Construction equipment	1,095	442	1,306
	Total:	10,520	7,650	5,740
		(\$21.0 million)	(\$15.3 million)	

61. The bases for the estimates are the same as those given above for the Abanico expansion project (see page 12).

62. Investment in transmission and distribution facilities amounts to about 45% of the total cost of the project. Including these items, the cost per installed kw is equivalent to about \$430 which is high but not excessive for a regulated plant. With an annual generation of 270 million kwh, the investment is equivalent to about \$.078 per annual kwh which is low for installations providing firm power with seasonal regulation.

63. The estimated cost of construction equipment for this project amounts to about 31% of the cost of the civil works. This is high but is not unreasonable for the proposed construction schedule which requires simultaneous construction of canals, tunnels and other structures. Much of the equipment will have substantial residual value for use on other projects.

64. Foreign exchange expenditures on this project prior to July 1 amounted to \$273,000. The amount to be covered by a Bank loan would be about \$5.47 million.

(c) Cost of Power

65. The estimated annual costs for the Pullinque system are as follows:

		<u>Millions of Pesos</u>
1. <u>Direct Costs</u>		
Generation	22.1	
Transmission	35.5	
System overhead	16.4	
General	<u>95.0</u>	169.0
2. Depreciation		231.5
3. Taxes and contributions		<u>25.0</u>
	Total:	425.5

66. The delivered cost of power is 1.7 pesos per kwh as compared with the current average selling price of 3.3 pesos.

67. Annual revenues would amount to 1,267 million pesos if there were to be an ultimate return of 8% amounting to 841.5 million pesos. Assuming an annual production of 270 million kwh with sales of about 250 million kwh, the average rate would be 5.05 pesos, equivalent to about 1¢/kwh. Considering the high proportion of winter power available, this cost is reasonable.

(3) Isla Hydroelectric Plant and Expansion of the Cipreses System

(a) Description of the Project

68. This project is an extension of the Cipreses system, the first stage of which was financed under Loan 5 CH. It involves the construction of a system of canals, tunnels and siphons having a total length of about 8 km,

one branch of which will take off of the Cipreses River immediately below the existing plant. The second branch will take off from the Maule River about 5 km above the proposed plant. These branches join at the forebay. The penstocks for this plant will be 900 m in length and present some technical problems. The powerhouse will be equipped with two generating units of 34,000 kw each, operating under a head of about 97 m. Each generator will be connected to a step-up transformer to increase the voltage to 154 kv.

69. A short transmission line will connect the plant into the Endesa 154 kv system at the Cipreses substation. Additions are required in two existing substations consisting largely of transformers and synchronous condensers.

70. An important item in this project is the reduction in permeability of the bed of Lake Invernada which provides storage for both the Cipreses and Isla plants. It is planned to place a blanket of clay and sand over those areas showing leakage using hydraulic placement after the reduction of the lake level which is now in progress. The equipment and method to be used have not yet been definitely established.

71. Flow records are available for the Cipreses and Maule Rivers from 1941. With the regulation which will be provided by Lake Invernada, firm generation of the Isla plant will be about 400 million kwh/year, which is equivalent to a plant factor of about 67% as compared with a load factor of about 50% on the Endesa interconnected system. It is estimated that if the leakage from Lake Invernada can be reduced by 50%, increased production of 170 million kwh/year will also be obtained from the existing Cipreses plant.

72. All engineering and construction work on the project will be done by Endesa. Engineering is well advanced but no orders have been placed and no work has been started. The designs used for this plant are satisfactory and the project is sound from an engineering standpoint, providing satisfactory methods are adopted for sealing the dam and lake bottom.

(b) Estimated Cost

73. The estimated cost of this project, broken down by principal items, is as follows:

Isla System

Estimated Cost

<u>Item No.</u>	<u>Description</u>	<u>Total Cost in million pesos</u>	<u>Local Currency in million pesos</u>	<u>For. Exchange in \$1,000</u>
1	Sealing of Lake Invernada	521	389	264
2	Waterways	3,807	3,236	1,144
3	Powerhouse and equipment	1,889	731	2,316
4	Step-up substation	82	33	98
5	Housing	49	49	-
6	Transmission lines	68	64	8
7	Substations	887	422	930
8	Construction equipment	569	176	787
Total:		7,872 (\$15.7 million)	5,100 (\$10.1 million)	5,547

74. The basis for these estimates is the same as given above for the Abanico expansion project with respect to contingencies, interest during construction and other factors (see page 12).

75. Based on the total estimated cost of the project, the investment per installed kw is equivalent to about \$230 which is very reasonable for a plant having seasonal regulation. Taking into account the generation of the Isla plant alone, the investment per annual kwh is equivalent to about \$.04 which is unusually low. Taking into account the increased production from the Cipreses plant, this figure reduces to about \$.028, which is very attractive.

76. The investment in construction equipment for this project represents about 13% of the cost of the civil works exclusive of the special equipment required for sealing the lake bed. This proportion is reasonable.

(c) Cost of Power

77. The estimated annual cost of operation of the Cipreses system after completion of all works as contemplated in this project, including the Isla plant, is as follows:

	<u>Millions of Pesos</u>
1. <u>Direct Costs</u>	
Generation	61.5
Transmission	47.4
System overhead	19.1
General	217.0
	345.0
2. Depreciation	572.0
3. Taxes and contributions	85.0
	<u>1,002.0</u>
Total:	1,002.0

78. The delivered cost of power is estimated at 1.2 pesos/kwh as compared with an average selling price of 3.3 pesos.

79. Annual revenues would amount to 3,082 million pesos if a return of 8% were to be obtained. With a production of 900 million kwh/year with sales of 850 million kwh, the average rate will be about 3.62 pesos/kwh (7.2 mills). This rate is substantially less than the prevailing rate of 5.4 pesos/kwh charged to Cia Chilena which will distribute most of the power from this system.

VII. PRODUCTION COSTS AND RATES

Costs

80. In 1955, Endesa produced 967 million kwh with net sales of about 895 million kwh. Production costs, including depreciation and property taxes, amounted to about 1,224 million pesos giving an average unit cost of 1.4 pesos/kwh (2.8 mills). The average plant factor was about 42%. About 99% of total production was hydro power. The cost equivalent to 2.8 mills/kwh is unusually low taking into account that this figure includes transmission and some distribution.

81. Except for the relatively small proportion of power which is distributed by Endesa, all sales are made in bulk to utility companies and industrial enterprises. These are all on a short-term contract basis on terms which take into account load factor, location, quantities and similar considerations. In 1955, revenues from the sale of power amounted to 1,928 million pesos corresponding to an average rate of 2.15 pesos/kwh (4.3 mills). This is a very low rate for transmitted power.

82. Present legislation in Chile limits the return on the investment of distributing companies to 10 - 15% with provisions for rate adjustments every five years. Bulk sales by Endesa are not subject to these restrictions but rates are limited by the amounts which the distribution companies can pay. A general increase of 45% in rates was allowed early in 1956 and, at present, the average rate applied by Endesa is 3.3 pesos/kwh (6.6 mills). Since the extent to which future rate increases will be allowed is not known, and in view of the present tendency to avoid price increases in Chile, it has been assumed that present rates will be maintained over the next seven years for purposes of the financial forecasts.

83. A new law covering the regulation of the electric industry is now under consideration by the legislature and the basic features have been agreed in committee. This law provides for returns of 8 to 12% on the investment of the companies, based on the replacement value of the assets. It provides for annual adjustment of the value of fixed assets and automatic adjustments for changes in labor rates, cost of fuel and cost of purchased

power. If this law becomes effective, it would result in an average rate to be charged by Endesa in 1957 of at least 5.5 pesos/kwh (11 mills) 1/ as compared with 2.15 pesos (4.3 mills) in 1955.

84. The rates which would be permitted under the new legislation both for the projects proposed for Bank financing and the average which can be obtained by Endesa for all installations compare favorably with the rates which would apply to steam and diesel power under comparable conditions. These would amount to about 7 pesos (14 mills) and 15 pesos (30 mills) respectively under comparable operating conditions with respect to load factor.

VIII. THE PROPOSED BORROWERS

(1) Corporacion de Fomento de la Produccion (Fomento)

85. The borrowers would be Fomento and Endesa. Fomento is proposed as a co-borrower as in the case of past loans in Chile since under Chilean legislation the government's guarantee can be granted for loans made to, or obtained through the intermediary of, Fomento. It is also the channel through which local currency derived from government appropriations is made available to Endesa, and it holds about 80% of the shares.

86. Appendix 5 contains a brief description of Fomento and presents the most recent information available concerning its financial position. Its past operations have been reasonably profitable for an agency of this type and its present financial position is satisfactory.

(2) Empresa Nacional de Electricidad S.A. (Endesa)

87. Endesa was formed in February 1944 by taking over most of the assets owned by Fomento in the power industry and utilizing the organization of the Fomento Fuel and Energy Department. The principal activities of Endesa are the planning of electric supply for the country and the provision of facilities for meeting power requirements which cannot be provided by other companies. Endesa may participate in other companies and may provide financing for municipal or cooperative undertakings. It is subject to all taxes and conditions applicable to a private company. Investment priorities are fixed on the basis of financial availabilities.

88. The company has eleven directors on the board which determines general policy matters. The board recommends dividend actions to the shareholders on the basis of recommendations of the management, and must approve the budgets of the company. The board meets twice each month and is unusually active in its participation in the operations of the company.

89. Management is in the hands of a director general appointed by the board. The organization is broken down into ten departments along conventional lines. The organization seems well adapted to fill the functions of the company. Top management is competent and reasonably conservative.

1/ Based on an estimated return of 8%.

90. The company has about 1,100 employees of which about 165 are engineers and 350 are classified as technicians. Due to lack of funds in recent years, planning and construction activities have been curtailed with the result that the company has lost a number of capable and experienced men. The present staff is generally young and capable but there is some question as to whether the present organization is adequate to carry out the proposed construction program on the established schedule. The Bank will obtain an undertaking that Endesa will obtain outside engineering and construction assistance to the extent that lack of personnel is shown to be preventing the maintenance of reasonable construction schedules.

91. A comparative statement of Endesa's balance sheets for the years 1951 to 1955 inclusive is attached as Appendix 6. Fixed assets are carried almost entirely on the basis of historical cost and increased from 2.6 billion pesos at the end of 1951 to 10.9 billion pesos at the end of 1955. Endesa has financed this growth to some extent from internal generation of funds, but its main source of funds has been Fomento.

92. As of December 31, 1955 Fomento held 5.1 billion pesos out of the share capital of 6.4 billion pesos and in addition had made advances of 4.8 billion pesos to Endesa. The advances consist of three items: the proceeds of the existing IBRD loan passed on by Fomento to Endesa (less amortization to date), Fomento's accumulated share of dividends declared, and advances from government appropriations.

93. Interest and amortization payments on the IBRD debt are met by Fomento. Endesa in its accounts reflects the payment of debt service by crediting Fomento's account with the peso equivalent of the interest and amortization payments. The bookkeeping produces the same result as would have been arrived at if Endesa had paid IBRD debt service with funds advanced by Fomento. The advances and accumulated dividends are technically short-term liabilities but in practice Endesa is not repaying these items to Fomento since it is the intention of Fomento and Endesa that the advances including interest and amortization payments on the IBRD loan will be converted to share capital. If this conversion be anticipated, and those amounts treated as equity, the debt/equity ratio of Endesa at December 31, 1955 was about 18/82. This ratio is good.

94. The ratio of current assets to current liabilities at the end of 1955 is estimated at about 1.6 to 1.0, which is also good.

95. A comparative statement of Endesa's profit and loss accounts for the years 1951 to 1955 inclusive is attached as Appendix 7. Revenues from the sale of electricity in 1955 were nearly 8 times the 1951 revenues but its operating costs rose to about 8.5 times those of 1951. These large increases are mainly due to a rising internal price level and only to a much lesser degree result from increases in energy generation which, in 1955, was about double that of 1951.

96. The operating expenses include provisions for depreciation which are consistent with the useful life of the various assets. The only writing-up of assets which has taken place was the addition to assets of an increase

in the peso equivalent of the liability to IBRD. Endesa has, however, been enabled by law to set up special depreciation reserves on the basis of replacement value of assets.

97. Net operating revenues increased from 116 million pesos in 1951 to 760 million pesos in 1955. These revenues, expressed as a percentage of fixed assets, were around 4% in 1951 to 1954 and 7.0% in 1955. Net profits increased from 71 million pesos in 1951 to 552 million pesos in 1955. The profits, expressed as a percentage of equity, were about 2.5% in 1951 and 7.0% in 1955. These percentages do not give a true picture, however, because the revenues and profits, particularly in 1954 and 1955, reflect present price levels whereas the assets and equity with which they are compared have not (except to a small extent in the case of the assets) been written-up to present day values. It is estimated that if assets were revalued on the basis of replacement costs the net operating revenues in 1955 would have been only about 1.5% of assets. It is evident that while Endesa has been able to charge rates sufficiently high to avoid an operating deficit and to charge depreciation on the basis of replacement values, the return it now obtains is inadequate. Pending legislation which permits a revaluation of the assets of Endesa and the distributing companies to replacement values would much improve Endesa's financial position and allow internal generation of funds to make an important contribution to the financing of expansion.

98. Endesa's budget for 1956 shows that, although an operating profit is expected on the primary systems, the estimates of revenues from the operation of distribution services are only about 448 million pesos as compared with operating costs (before depreciation and property taxes) of about 640 million pesos. Sound utility practice would require that the primary system operation should not subsidize the distribution operation, and Endesa will give an undertaking to take such action as is needed to put the distribution network on a profitable basis.

IX. FINANCIAL ASPECTS

99. The financial information supplied by Endesa, modified where necessary to reflect more recent estimates and recalculations by members of the Bank staff and officials of Endesa, has served as a basis on which to prepare the statement of Endesa's estimated financial position from January 1, 1956 to December 31, 1963 which is attached as Appendix 8.

(1) Financing During the Construction Period

100. During the construction period of the Bank program (1956 to 1960) Endesa is estimated to require for its overall program, exclusive of Rapel, an amount of about 40,887 million pesos (\$81.77 million) which it expects to obtain from the following sources:

Millions of Pesos

Internal generation and payments for work done	16,814
Funds receivable under Copper Law	5,073
Advances from Fomento	11,500
IBRD Loan	7,500
	<u>40,887</u>

101. Although the financing of the Rapel plant, for which arrangements have not been made, is not being taken into account in this report, it may be useful to consider the feasibility of tentative plans. The foreign exchange, amounting to the equivalent of about \$18 million, would probably be obtained by loans or suppliers' credits from abroad. The local currency costs amount to about 23,000 million pesos. By the end of 1963 internal generation of funds would provide about 21,000 million pesos, but owing to the amount of construction expenditure from 1957 to 1961 exceeding the funds available from that source, about 13,000 million pesos of outside funds would have to be found in those years. In 1962 and 1963 the amounts required for Rapel would be available from Endesa's own resources.

(2) Financial Prospects of Endesa

(a) Estimated Earnings

102. The revenue from sale of power is based on the assumption of the 1956 average price per kwh of 3.3 pesos obtaining in all years.

103. Operating costs ^{1/} per kwh sold would, however, fluctuate according to variations in the relation between the number of kwh sold and the total cost of operation. They are estimated to be:

	<u>1956</u>	<u>1957</u>	<u>1958</u>	<u>1959</u>	<u>1960</u>	<u>1961</u>	<u>1962</u>	<u>1963</u>
Pesos per kwh	2.4	2.3	2.4	1.9	2.1	1.8	1.7	1.6

104. Gross income would vary between 6.7% and 12.5% of assets in operation, and net profits between 5.0% and 9.3% of share capital. If, however, the assets had been revalued on the basis of replacement costs at the end of 1955 and an equivalent write-up of share capital had been made, the percentages would have been considerably lower, ranging from 2.1% to 5.7% for return on investment, and from 1.4% to 5.0% for net profit in relation to share capital. Interest on borrowed funds would be covered by earnings about six times in 1961, when interest on the proposed loan is no longer covered by withdrawals from the loan and this coverage would increase year by year.

^{1/} Operation, administration, property tax, depreciation and reserve for renewals.

(b) Depreciation

105. If the new law were in operation, Endesa would be able automatically to obtain adequate depreciation on the written-up assets. However, under the present law it can, after charging normal depreciation on historic costs, transfer to a reserve for renewals an amount which, together with the normal provision, would amount to depreciation on the assets at present day values, provided that the amount transferred to the renewals reserve does not exceed 40% of the net operating revenue. These provisions have been included in the revenue statement.

(c) Cash Position

106. According to Appendix 8, in 1956 to 1959 the margins of cash availability are expected to be small; in two years there are practically no margins. In 1960 a surplus of 700 million pesos is estimated, due to reduced capital expenditures. Thereafter the cash surpluses rise rapidly, and by 1963 Endesa is expected to have generated over 15 billion pesos since the beginning of 1956. However, it must be noted that in Appendix 8, IBRD debt service has been treated as if it were a cash outgoing, whereas, in fact, Fomento meets it. There is thus a hidden reserve, and the cash availabilities as shown are really greater by those amounts. The true cash generation from the beginning of 1956 to the end of 1963 would, in fact, be nearly 22 billion pesos. It will, however, be necessary to start the construction of additional generating capacity and other facilities by 1963 or earlier, but the cost and timing of this construction work cannot at present be estimated and for this reason no consideration has been given to this factor in the projection, which is carried only to the end of 1963. It is not realistic to make forecasts beyond that date but any new investment should be self-liquidating, and it is expected that after 1963 Endesa will continue in a sound financial position.

(d) Dividends

107. Dividends payable to Fomento and the Banco del Estado de Chile have been considered as paid by the issue of shares, and the amount of share capital outstanding adjusted accordingly. Dividends payable in cash to other shareholders are not expected to amount to more than 3 or 4 million pesos a year. The Bank will obtain an undertaking limiting cash dividends during the life of the loan.

(e) Pro Forma Balance Sheet

108. A pro forma balance sheet as at December 31, 1961, the end of the first full year of operation of the Bank-financed plants with, for comparison, the 1955 figures, is attached as Appendix 9. It shows that the ratio of debt to equity would be about 18/82.

109. If the foreign exchange portion of the Rapel investment to December 31, 1961 (US\$16.5 million, equivalent to 8,258 million pesos) had, as is likely, been obtained by means of a loan, and the remainder of the 21,131 million pesos through advances from Fomento, the debt/equity ratio would be about 24/76.

(f) Debt Service

110. As shown in Section V of Appendix 8 total debt service should be covered by net cash income over four times after the program is completed.

(g) Future Borrowings and Debt/Equity Ratio

111. Under the existing Loan Agreement, Endesa may not incur foreign debt unless, prior to taking action, it has notified the Bank and afforded the Bank a reasonable opportunity to exchange views on the proposal. In view of the fact that Endesa does not borrow locally (except short-term) since it can get funds from Fomento, and since its debt/equity ratio (considering the IBRD loans as debt) is so low, a similar provision in the proposed Loan Agreement is considered to be adequate.

(3) Security for Bank Loan

112. Under the existing Loan Agreement neither Fomento, as to foreign debt, nor Endesa, as to all debt, may create any charge on assets or revenues as security for debt unless the Bank loan is secured equally and rateably with the other debt. A similar provision for the proposed Loan is considered to be adequate.

X. CONCLUSIONS AND RECOMMENDATIONS

113. Endesa has proposed a program of power development which is well adapted to meet the estimated requirements of Chile through 1965. The program is realistic with respect to the market projections on which it is based and is conservative in respect to the capacity to be installed. It utilizes hydro sites which can be developed at relatively low cost. The total cost is estimated as equivalent to about \$143 million, of which about \$40 million will be required as foreign exchange. The need for the program has been adequately established and it is suitably coordinated with the investment plans of the private companies.

114. Endesa has performed reasonably well in the execution of the projects included in Loan 5 CH under adverse conditions and is capable of executing the proposed program although outside assistance may be required. Its present financial position is good and future financial prospects are satisfactory.

115. The projects forming the program are in various stages with respect to engineering and construction. Within the group, three projects have been

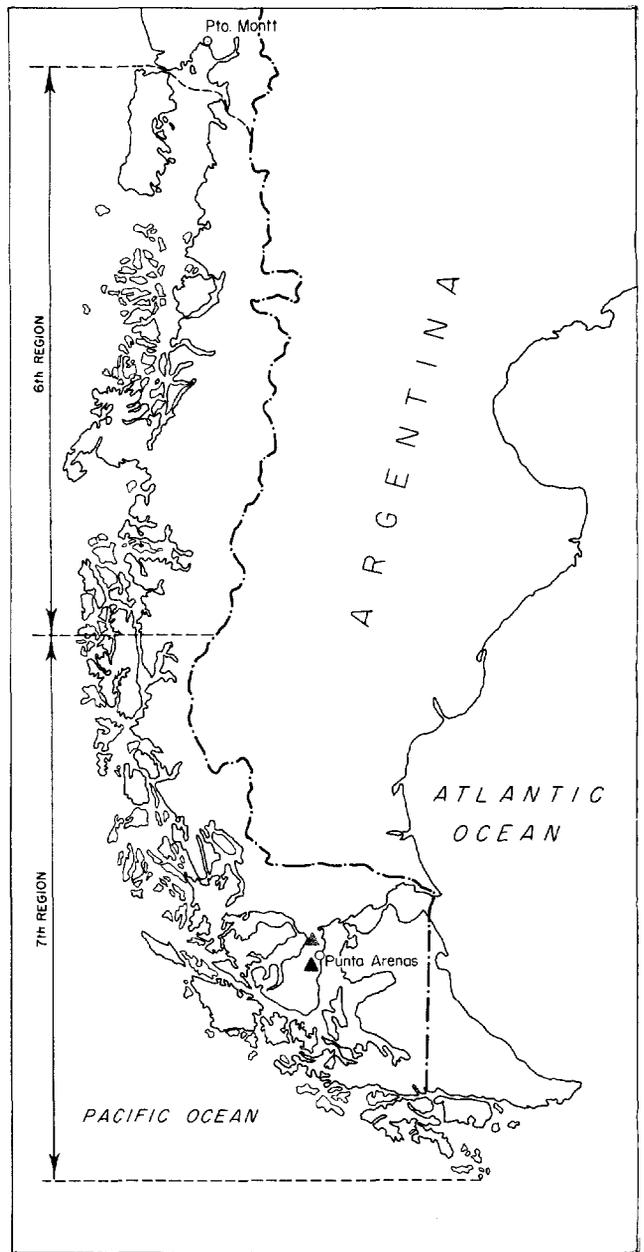
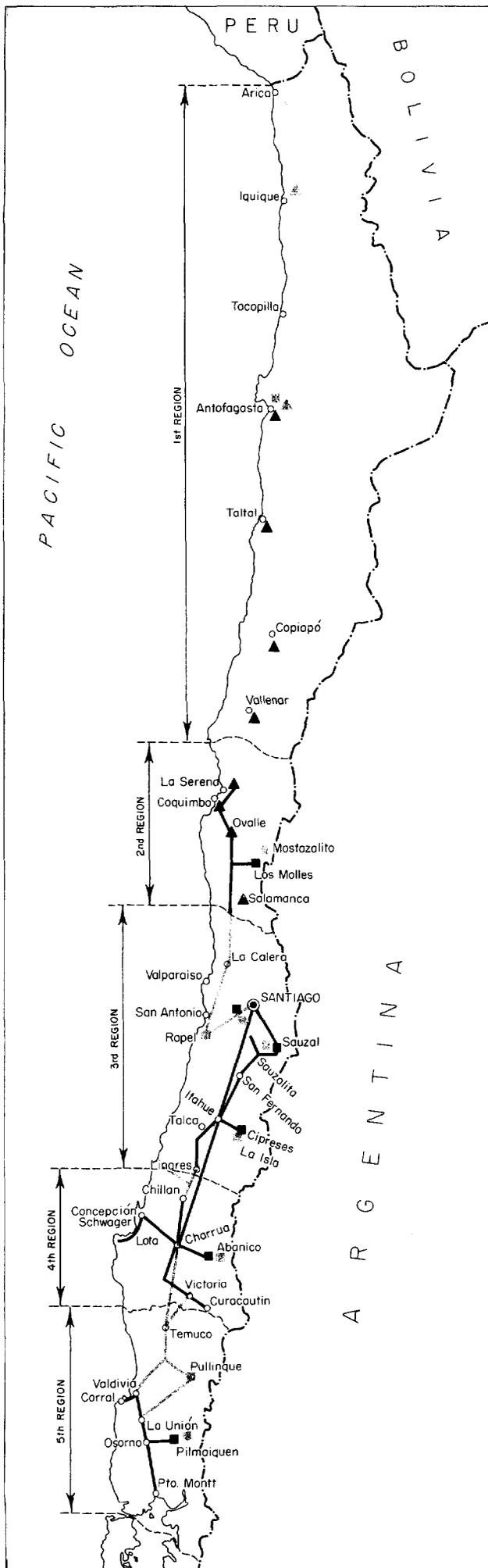
selected which are sufficiently advanced to permit their consideration as a basis for a loan at this time.

116. The Endesa program is a suitable basis for a loan of \$15 million to be allocated between three projects as follows:

Expansion of Abanico System	\$ 3.9 million
Pullinque System	5.5 million
Isla Hydro Plant	5.6 million

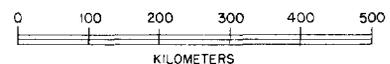
117. Based on the useful life of the installations and the financial prospects of the company, a term of 20 years is appropriate. A grace period of 4 years is indicated by the construction schedule.

118. The co-borrowers should be Fomento and Endesa as in the previous loan.



CHILE ENDESA POWER INSTALLATIONS

- IN OPERATION**
- Thermal plants
 - Hydro plants
 - Transmission lines
- IN PROGRAM**
- Thermal plants
 - Hydro plants
 - Transmission lines
- INTERNATIONAL BOUNDARIES**



INSTALLED CAPACITY AND PRODUCTION OF ELECTRIC ENERGY IN CHILE

APPENDIX 1

1945 - 1955

YEAR	LARGE MINING ENTERPRISES(1) (copper, iron and nitrate)		Industry, Coal Mines and small mining enterprises (1)		PRIVATE ENTERPRISES		PUBLIC SERVICE Government Service		TOTAL		GRAND TOTAL
	Thermo	Hidro	Thermo	Hidro	Thermo	Hidro	Thermo	Hidro	Thermo	Hidro	
	<u>INSTALLED CAPACITY MW</u>										
1945	184.5	57.2	27.4	44.3	74.2	97.0	3.5	13.4	289.6	211.9	501.5
1946	184.5	59.8	28.1	44.3	74.5	97.0	3.7	13.4	290.8	214.5	505.3
1947	192.8	59.8	29.4	44.3	75.9	97.0	3.9	13.4	302.0	214.5	516.5
1948	197.8	66.5	39.9	44.3	75.5	97.0	4.1	108.6	317.3	316.4	633.7
1949	197.8	66.5	40.7	44.3	107.7	97.8	4.9	133.2	351.1	341.8	692.9
1950	198.1	66.5	43.6	44.3	113.0	97.8	5.2	176.2	359.9	384.8	744.7
1951	198.1	66.5	44.3	44.3	118.5	97.8	8.5	188.3	369.4	396.9	766.3
1952	231.1	66.5	53.5	44.3	115.9	97.6	10.3	210.5	410.8	418.9	829.7
1953	245.6	66.5	55.6	44.3	111.6	97.6	10.6	210.5	423.4	418.9	842.3
1954	261.5	66.5	58.3	44.3	110.1	97.6	12.9	210.5	442.8	418.9	861.7
1955	261.5	66.5	59.7	44.3	110.5	97.6	12.9	305.7	444.6	514.1	958.7
	<u>ENERGY GENERATION - MILLIONS of kWh</u>										
1945	1,221	353	81	273	124	537	7	14	1,433	1,177	2,610
1946	1,145	265	92	272	175	522	7	24	1,419	1,083	2,502
1947	1,205	329	95	306	216	533	8	32	1,524	1,200	2,724
1948	1,217	371	97	321	181	570	8	117	1,503	1,379	2,882
1949	1,125	342	74	319	115	568	9	314	1,323	1,543	2,866
1950	1,011	361	88	322	180	552	11	400	1,290	1,635	2,925
1951	1,142	395	100	297	192	608	17	498	1,451	1,798	3,249
1952	1,075	398	118	325	265	600	14	582	1,472	1,905	3,377
1953	988	372	121	332	257	615	6	676	1,372	1,995	3,367
1954	1,158	309	125	350	274	643	6	772	1,563	2,074	3,637
1955	1,160(2)	330(2)	129(2)	330(2)	241	615	7	960	1,537	2,235	3,772

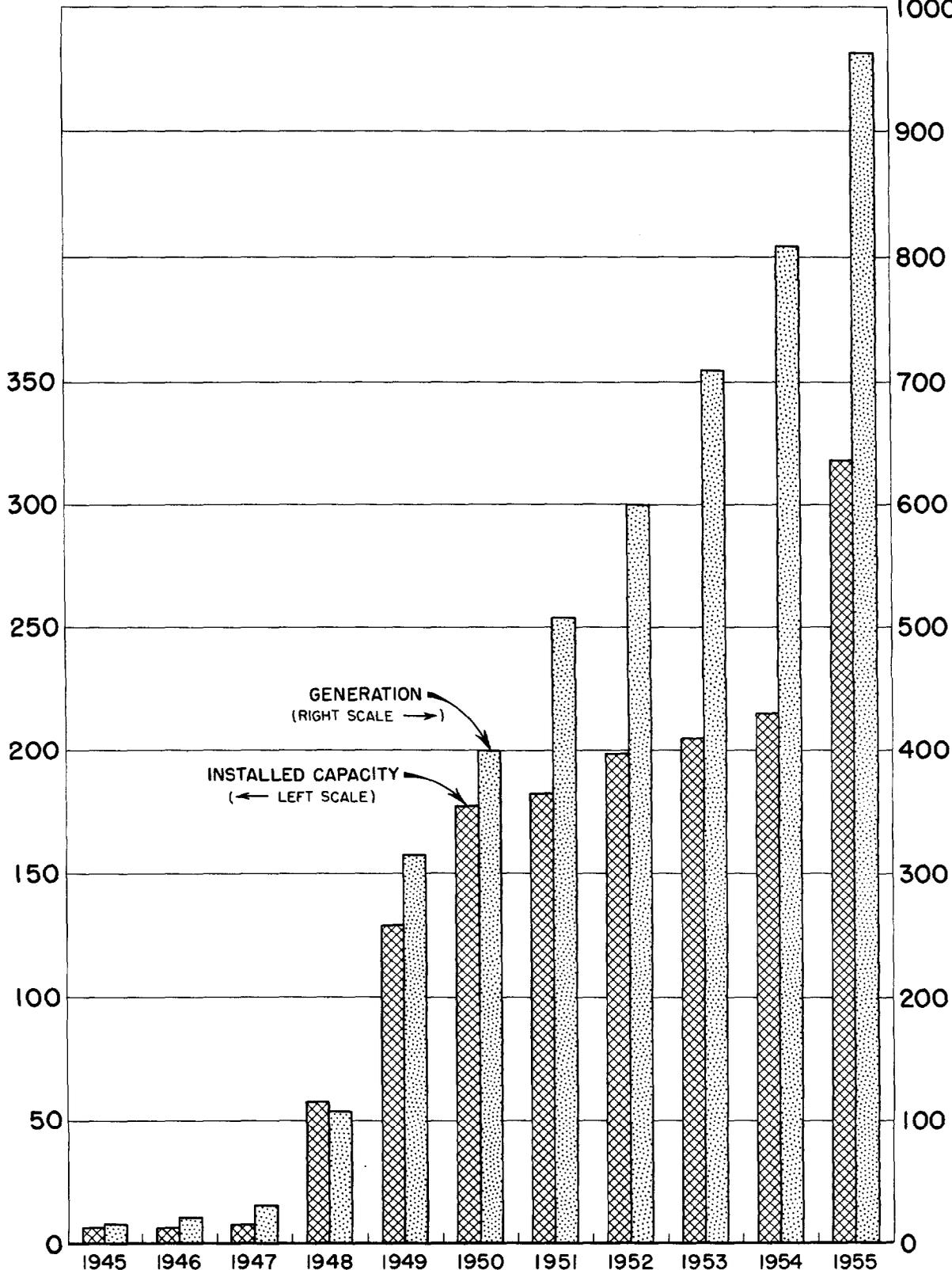
(1) Several of these companies supply part of their energy for public services.

(2) Estimated.

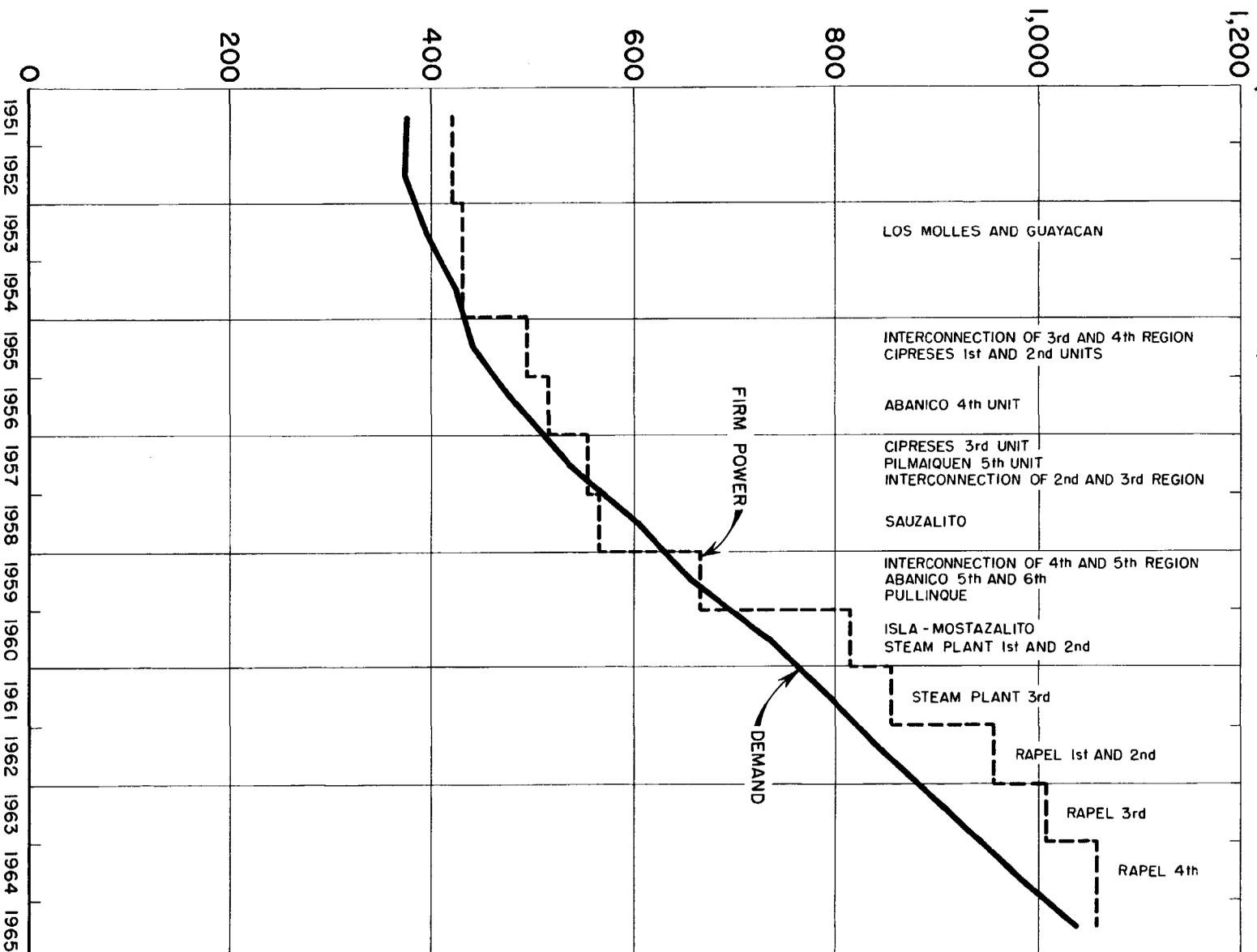
DEVELOPMENT OF INSTALLED CAPACITY AND GENERATION - ENDESA SYSTEM

THOUSANDS OF KW

MILLIONS OF KWH
1000

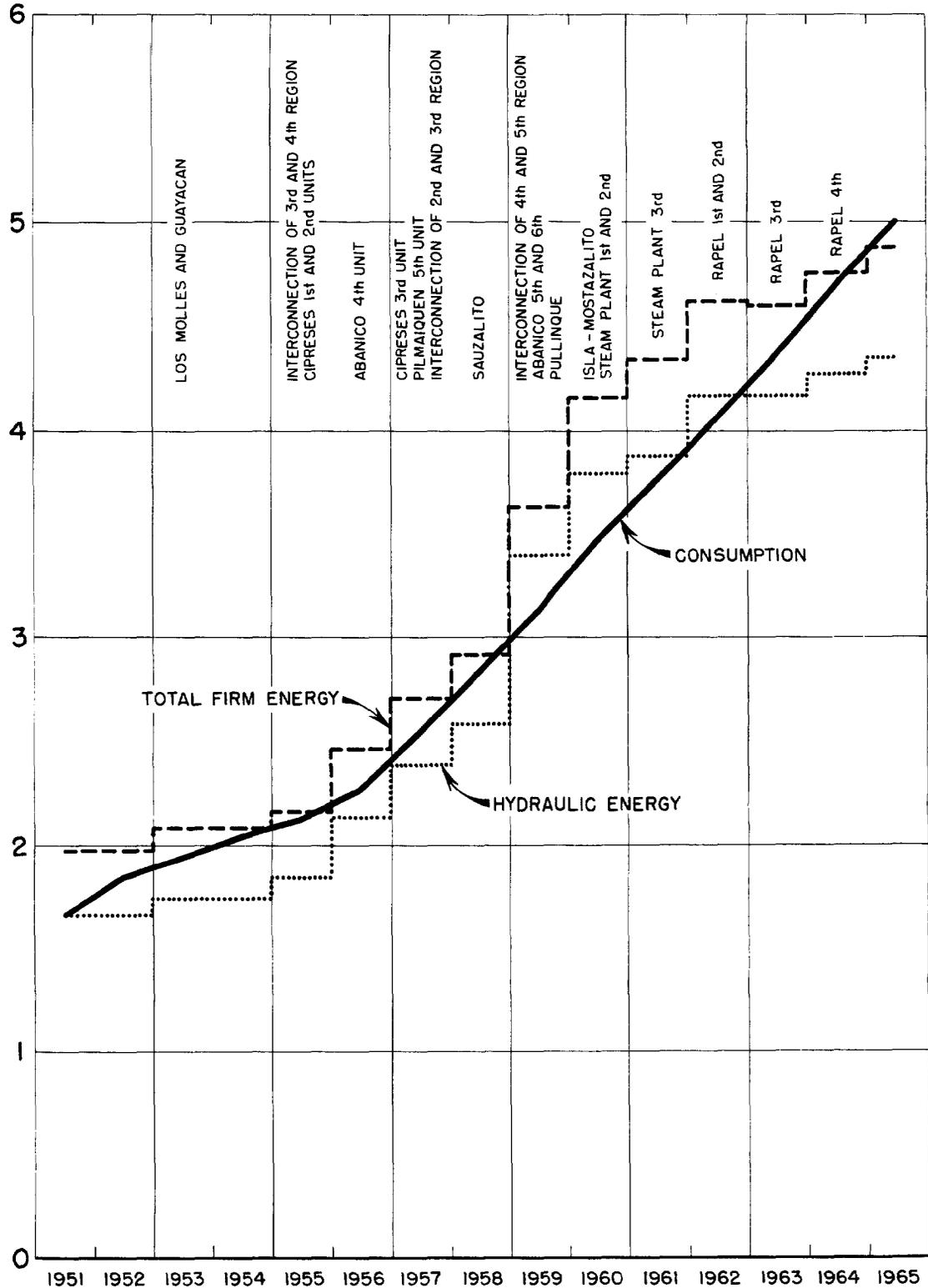


FORECAST OF MAXIMUM DEMAND AND FIRM POWER - ENDESA SYSTEM (REGIONS 2-5) (THOUSANDS OF KW)



FORECAST OF CONSUMPTION AND AVAILABLE FIRM ENERGY - ENDESA SYSTEM (REGIONS 2-5)

(BILLIONS OF KWH)



Corporacion de Fomento de la Produccion (Fomento)

Fomento is a government agency which is a legal person and which has a considerable degree of autonomy. It was established in 1939 by legislation to be largely responsible for carrying out the government's development policies. The law which established Fomento required it to establish a general plan for the development of national production, in order to raise the standard of living, by means of the exploitation of natural resources, the reduction of production costs and the improvement of the international balance of payments. In carrying out its task Fomento is to pay due attention to the balanced development of mining, agriculture, industry and commerce.

Fomento is to collaborate with public and private entities in making plans and studies for development and cause them to be put into execution by such means and with such assistance as it deems most suitable, and is to assist in the manufacture in the country, or in the importation, of machinery and other factors of production.

Fomento may foster development either by undertaking production itself, by lending to individual enterprises or to development banks, or by purchasing stock in either existing or specially created companies.

Sources of Funds

Funds are derived from government appropriations, income on investment, the repayment of advances made, the sale of shareholdings and borrowing. Fomento submits its budget annually to Congress in order to obtain the government appropriations usually necessary to make up the difference between total cash requirements and funds available from non-government sources.

Organization and Management

The corporation is managed and directed by a Board of Directors of which the chairman president is the Minister of Economy. Membership on the board is given to representatives of the executive and legislative branches of the government, labor, agriculture, industry, commerce and banking.

The day-by-day operations are controlled by an executive vice-president; under him is a general manager.

There are in effect two managers, since there is an administration manager who is in charge of accounting, personnel, internal control, statistics and, in addition, of two departments whose function is to assist in the development of the provinces of Tarapaca and Antofagasta.

Although the administration manager is technically subordinate to the general manager, in practice the general manager concentrates his activities on the supervision of the major operating departments: agriculture, industry, mining, planning and studies, civil works and financial studies.

The organization includes also a fiscal and legal department, an office of the Secretary-General, and a New York office. This latter office performs the important functions of maintaining business relations with financial organizations outside Chile, of negotiating foreign credits, of placing foreign orders and of supervising the construction and testing of equipment to be imported into Chile.

The efficiency of the management may be judged from the large number of successful expansions of existing, and creations of new enterprises, among which may be mentioned Endesa, the steel plant at Huachipato, petroleum development, a variety of agricultural projects, and diversified industrial undertakings, which have taken place.

Financial

In keeping with the above the Balance Sheets of Fomento have reflected the continuing expansion of its activities. A comparative statement of the Balance Sheets for the years 1951 to 1955 inclusive is attached as Annex A.

It will be seen that the funds received by Fomento rose from 5,441 million pesos at the end of 1951 to 20,903 million pesos at the end of 1955, an increase in 4 years of 15,462 million pesos. In the same period investments rose by 18,209 million pesos.

The activities of Fomento have been financed not only by government contributions, but also by internal cash generation and borrowings abroad. At December 1955 the foreign debt amounted to the equivalent of over 11,000 million pesos of which roughly one-third had been provided from each of the following sources:

Export-Import Bank
IERD
Foreign suppliers' credits

At the end of 1955 the debt equity ratio was about 30/70 and in the last 3 years current liabilities were less than cash balances alone (without considering other current assets).

A comparative statement of the profit and loss accounts for the years 1951 to 1955 inclusive is attached as Annex B. Fomento has earned net profits as follows:

1951	134.5 million pesos
1952	78.7 million pesos
1953	261.6 million pesos
1954	288.6 million pesos
1955	513.0 million pesos

The financial position of Fomento is considered to be satisfactory.

ANNEX A

CORPORACION DE FOMENTO DE LA PRODUCCIONC H I L EEXPRESSED IN MILLIONS OF PESOSCONDENSED AND ROUNDED BALANCE SHEETS

<u>Years ended December 31:</u>	<u>1951</u>	<u>1952</u>	<u>1953</u>	<u>1954</u>	<u>1955</u>
<u>Assets and Debit Balances</u>					
Land, buildings and other property	166.07	206.97	242.95	309.29	403.90
Investments: Advances to be converted to equity	392.42	1,338.34	2,967.78	3,317.18	6,115.16
Advances and loans	795.71	916.82	1,018.16	1,558.73	2,773.14
Participations in equity	4,378.92	5,394.26	7,274.92	10,079.06	12,295.00
Other	1/ 1,904.60	1,888.82	1,997.10	1,846.10	4,498.26
Cash in hand and at Bank	303.63	319.13	1,082.90	2,675.28	3,895.81
Other Current Assets	701.43	833.87	1,970.86	2,841.31	7,552.45 2/
Other Debit Balances	51.61	8.03	1,601.49	2,019.41	3,006.98 3/
	<u>8,694.39</u>	<u>10,906.24</u>	<u>18,156.16</u>	<u>24,646.36</u>	<u>40,540.70</u>
<u>Liabilities and Credit Balances</u>					
Capital	5,440.90	7,134.38	9,954.81	14,853.75	20,902.98
Surplus	134.50	78.71	261.65	1,472.13 4/	1,985.09
Reserves	989.70	1,090.30	980.67	71.86 4/	3,219.97
Foreign Liabilities	5/ 1,391.10	1,585.35	5,861.22	6,216.23	11,077.20
Domestic Liabilities	6/ 738.19	1,017.50	1,034.14	1,942.02	2,934.88
Other Credit Balances			63.67	90.37	420.58
	<u>8,694.39</u>	<u>10,906.24</u>	<u>18,156.16</u>	<u>24,646.36</u>	<u>40,540.70</u>

- 1/ Mainly blocked counterpart funds of balance of payments credit from Export-Import Bank.
2/ Affected by volume of imports, particularly agricultural machinery.
3/ Affected by differences in exchange rates, and in 1955 by Copper Fund balances not yet distributed.
4/ Transfer from reserves.
5/ Medium and long-term.
6/ In general, all short-term.

ANNEX B

CORPORATION DE FOMENTO DE LA PRODUCCION
CHILEExpressed in Millions of Pesos.COMPARATIVE PROFIT AND LOSS ACCOUNTS FOR THE YEARS
1951 TO 1955

Years ended December 31:	<u>1951</u>	<u>1952</u>	<u>1953</u>	<u>1954</u>	<u>1955</u>	
<u>Income</u> Profit on sales of investments, importation of merchandise, machinery and other goods, interest, commissions, operation of funds, dividends, recoveries of expenses etc.	<u>219</u>	<u>201.81</u>	<u>425.41</u>	<u>631.18</u>	<u>1,097.83</u>	
<u>Expenditures</u>						
New York Office						
Sundry expenses (salaries, general expenses, rent, etc)	14.12	15.67	15.20	53.29	81.19	
Less Sundry receipts (commissions, recoveries of expense etc.)	<u>-11.32</u>	2.80 <u>-13.79</u>	1.88 <u>-10.89</u>	4.31 <u>-31.89</u>	21.40 <u>-63.15</u>	18.04
Administration Expenses						
Salaries, travelling expenses, director's fees, transport and freight, rents, family allowances, social laws, wages, general expenses, direct charges, etc.	43.17	59.99	96.31	162.06	311.28	
Interest on foreign and other credits	<u>29.29</u>	72.46 <u>29.89</u>	89.88 <u>30.06</u>	126.37 <u>92.89</u>	254.95 <u>116.44</u>	427.72
Studies, tests and surveys	9.24	31.34	33.08	66.26	87.13	
Department of civil works, costs of studies and sundry	-	-	-	-	<u>51.98</u>	
Total expenditures	<u>84.50</u>	<u>123.10</u>	<u>163.76</u>	<u>342.61</u>	<u>584.87</u>	
<u>Net Profit for the year</u>	<u>134.50</u>	<u>78.71</u>	<u>261.65</u>	<u>288.57</u>	<u>512.96</u>	

EMPRESA NACIONAL DE ELECTRICIDAD S.A.
Condensed and Rounded Balance Sheets
(Expressed in Millions of Pesos)

Appendix No. 6

<u>Years ended December 31:</u>	<u>1951</u>	<u>1952</u>	<u>1953</u>	<u>1954</u>	<u>1955</u>
<u>Assets and Debit Balances</u>					
<u>Fixed Assets:</u>					
Electric installations in operation (gross)	1,773.36	1,834.34	2,803.48	3,251.84	9,388.35
Work in progress	796.84	1,804.54	2,050.96	4,231.60	1,449.12
Other (at written-down value)	32.35	65.02	72.04	118.44	96.80
	<u>2,602.55</u>	<u>3,703.90</u>	<u>4,926.48</u>	<u>7,601.88</u>	<u>10,934.27</u>
Investments in and advances to subsidiary and affiliated companies	59.80	60.27	66.00	110.51	185.00
Other investments and long-term advances	12.85	15.21	13.83	26.97	44.27
Inventories - construction	1/				1,750.02
- operation	1/	854.57	1,097.02	1,488.16	481.71
Notes and accounts receivable, short-term advances and deposits	90.79	128.84	186.56	360.00	742.71
Cash in hand and at bank	20.11	7.11	44.43	54.88	314.70
Other assets	63.70	56.10	68.50	121.39	266.34
	<u>3,402.16</u>	<u>4,826.00</u>	<u>6,402.82</u>	<u>9,757.79</u>	<u>14,719.02</u>
<u>Liabilities and Credit Balances</u>					
Capital	2/	2,700.00	2,706.50	3,510.47	4,810.25
Capital reserve		51.16	71.58	108.25	157.93
Other reserve		79.95	120.69	198.71	337.03
Surplus		1.96	1.96	1.96	7.76
Profit for year		71.24	123.72	172.56	274.26
		<u>2,904.31</u>	<u>3,024.45</u>	<u>3,991.95</u>	<u>5,587.23</u>
Funds received under Copper Law				57.57	282.98
Reserve for depreciation		131.91	186.93	267.74	432.50
Fomento - advances	3/	(- 60.09)	790.16	1,290.97	1,582.46
- advances re IBRD loan	3/	155.05	276.34	332.56	1,158.33
- dividends payable to Fomento	3/	46.76	92.87	162.06	279.13
Other long-term debt		17.26	18.22	26.22	38.82
Notes and accounts payable, short-term debt and other liabilities		180.30	437.03	331.32	621.75
		<u>3,402.16</u>	<u>4,826.00</u>	<u>6,402.82</u>	<u>9,757.79</u>
		<u>14,719.02</u>	<u>14,719.02</u>	<u>14,719.02</u>	<u>14,719.02</u>

(continued)

Empresa Nacional de Electricidad S.A. - Condensed and Rounded Balance Sheets

- 1/ The division of 1955 inventories between construction and operation is estimated from a partial breakdown. Insufficient information is available for prior years to enable a division to be made.
- 2/ At December 31, 1955, Fomento's holding amounted to 5.1 billion pesos.
- 3/ The advances re: IBRD loan reflect the passing on by Fomento to Endesa of the proceeds of the Bank loan. Each time that Fomento makes a repayment of capital to the Bank an equivalent peso amount is transferred from "advances re: IBRD loan" to "advances." It is contemplated that the latter account will be converted to share capital.

Supplement to Appendix No. 6

Remarks on Endesa's Accounting and Balance Sheet

The Bank's appraisal of the organization and accounting methods of Endesa led to the conclusion that the methods adopted are unduly complicated. In great part this is the result of all administration and accounting being centralized at the Santiago Head Office. Decentralization would go far to improve accounting efficiency, but in addition a review and reorganization of stores and financial accounting methods would be needed.

In Appendix 6, Endesa's balance sheet has been rearranged so far as possible to conform with public utility practice but the original balance sheet presentation could undoubtedly be improved. For instance, under a heading of "Realizable Assets" are found both current assets and long-term advances, and the large item of inventories does not show separately construction inventories for major projects which are in effect work in progress, and operational inventories which form part of current assets.

The liabilities are similarly placed in one section which is divided into long and short-term items, but the short-term items include the advances of Fomento, and also funds to be invested under the copper law, which are to be transferred to capital.

The balance sheet also carries suspense assets and liabilities of which the nature and degree of nearness of realization or payment are not always apparent. Fortunately, the amounts involved are relatively small.

It is understood that Endesa contemplates a reorganization of its accounting system at an early date to the extent possible under Chilean law. It will not be possible to simplify the system to the extent possible in most other countries, due to legal restrictions, but it is expected that substantial improvements can be made.

EMPRESA NACIONAL DE ELECTRICIDAD S.A.

Appendix No. 7

Comparative Profit and Loss Accounts for the Years 1951 to 1955
(Expressed in Millions of Pesos)

<u>Years ended December 31:</u>	<u>1951</u>	<u>1952</u>	<u>1953</u>	<u>1954</u>	<u>1955</u>
Electrical operating revenues	247.05	315.96	486.79	858.95	1,928.21
Rents and dividends received	3.55	4.28	1.14	1.42	4.45
Profit on sale of materials and equipment	8.88	10.34	6.94	20.65	51.25
Writing back of unnecessary provisions			17.00		
Sundry receipts.	.29	.79	4.11	3.49	
	<u>252.77</u>	<u>331.37</u>	<u>515.98</u>	<u>884.51</u>	<u>1,983.91</u>
Electrical operations costs	74.29	112.95	198.82	345.58	760.21
Taxes	13.26	14.19	25.53	35.93	70.76
Amortization and charges:					
Depreciation of fixed assets:					
Normal for year	44.05	46.05	75.83	85.97	173.15
Adjustment of prior years ^{1/}					26.05
					199.20
Special reserve ^{2/}	44.05	6.10	52.15	11.71	87.54
Provision for bad debts	12.20	13.15			
	<u>143.80</u>	<u>192.44</u>	<u>311.89</u>	<u>537.34</u>	<u>1,223.67</u>
Net operating revenues	<u>115.97</u>	<u>138.93</u>	<u>204.09</u>	<u>347.17</u>	<u>760.24</u>
Non-operating revenues or expenses (net)	(- .97)	(- 1.45)	.79	9.85	12.75
Losses in subsidiary and associated companies				3.28	2.05
Fees paid to directors & committees	.14	.14	.12	.13	.19
Bonuses to employees and workers	12.73				
Interests paid	21.12	1.77	5.30	10.82	62.65
Amortization of expenses of and taxes on increase in capital	5.18	3.05	4.22		13.22
Provision for participations	.71	1.24	1.73	2.74	28.76
Provision for income tax	5.50	10.00	17.50	45.00	85.00
Adjustment of prior years (net)	.32	.47	1.87	1.09	3.36
	<u>44.73</u>	<u>15.22</u>	<u>31.53</u>	<u>72.91</u>	<u>207.98</u>
Net profit	<u>71.24</u>	<u>123.71</u>	<u>172.56</u>	<u>274.26</u>	<u>552.26</u>
Net profit as percentage of equity	2.5%	4.1%	4.3%	4.9%	7.0%

Comparative Profit and Loss Accounts for the Years 1951 to 1955

- 1/ The Corporacion de Fomento charged Endesa with the difference between the rates of exchange of pesos 110.20 and Pesos 203 per US\$ applied to the amount of the IBRD loan received by Endesa up to January 1, 1955 - Endesa's fixed assets were increased accordingly and additional depreciation was charged to profit and loss for this year as well as for prior years, the latter amount being shown separately on this table.
- 2/ Under this item are shown:
- in 1952 and 1953 the amounts charged to profits for the constitution, according to government law No. 10,343, of a fund for the renovation of the machinery;
 - in 1954 and 1955, the amounts provided, in accordance with extraordinary depreciation law No. 11,575, for a fixed assets replacement reserve. These amounts are calculated so as to take into account the present day replacement values of fixed assets as calculated by the company.

EMPRESA NACIONAL DE ELECTRICIDAD S. A.

STATEMENT OF ESTIMATED REVENUE, SOURCE AND APPLICATION OF FUNDS, AVAILABLE FUNDS AND REVENUE COVER FOR DEBT SERVICE
(expressed in millions of Pesos except where otherwise stated)

Years Ending December 31	1956	1957	1958	1959	1960	1961	1962	1963
I. Revenue Account								
Millions of kwh Sold	1,127	1,390	1,555	1,985	2,000	2,560	2,880	3,050
Average Price per kwh in Pesos	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
Revenue from Sale of Power	3,680	4,587	5,131	6,550	6,600	8,514	9,504	10,065
Operating and Administrative Expenses	1,649	1,799	2,140	2,142	2,142	2,267	2,267	2,350
Property Tax	120	201	216	225	225	312	416	492
Normal Depreciation	281	367	497	541	927	1,213	1,231	1,234
NET OPERATING REVENUE	1,630	2,200	2,278	3,642	3,306	4,722	5,590	5,989
Reserve for Renewals	652	848	848	849	849	647	849	649
ADJUSTED NET OPERATING REVENUE	978	1,352	1,430	2,793	2,457	3,875	4,741	5,140
Non-Operating Income (net)	97	272	297	300	378	266	264	269
GROSS INCOME	1,075	1,624	1,727	3,093	2,835	4,141	5,005	5,409
Income Deductions:								
Income Tax	147	243	262	497	456	618	770	842
Participations in Profits	43	71	77	146	133	180	225	246
Interest - Existing IBRD Loan	196	314	339	643	589	798	995	1,000
- Proposed IBRD Loan	196	183	170	156	141	126	111	95
- Local Loans	20	22	24	26	26	30	32	34
TOTAL INCOME DEDUCTIONS	406	519	533	825	758	1,325	1,492	1,522
NET PROFIT	669	1,108	1,194	2,268	2,077	2,816	3,512	3,850
Gross Income as Percentage of Investment	3/ 8.4%	9.2%	7.7%	12.5%	6.7%	7.5%	8.9%	9.0%
Net Profit as Percentage of Share Capital	4/ 2.1%	2.3%	2.6%	4.9%	3.3%	4.4%	5.3%	5.7%
	5/ 5.0%	5.2%	5.1%	8.2%	6.9%	8.2%	9.3%	9.2%
	6/ 1.4%	2.0%	2.0%	3.6%	3.2%	4.1%	4.8%	5.0%
II. Source of Funds								
Net Profit	669	1,108	1,194	2,268	2,077	2,816	3,512	3,850
Add Back Depreciation Etc.	7/ 933	1,235	1,345	1,390	2,005	2,060	2,080	2,083
	1,602	2,343	2,539	3,658	4,082	4,876	5,592	5,933
Proposed IBRD Loan; 20 years, 4 years grace, 5%	500	2,500	3,650	500	350			
Funds Receivable Under Copper Law	1,013	1,015	1,015	1,015	1,015	1,015	1,015	1,015
Advances from Fomento	8/ 3,500	3,500	3,000	1,500				
Payment for Work Done for Others, Etc.	993	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Repeal Requirements	118	1,753	3,738	4,846	8,820	9,374	2,798	1,100
	7,726	12,111	14,942	12,519	15,267	16,265	10,402	9,044
III. Application of Funds								
Construction, etc.:								
Special Projects:								
Bank Financed	2,059	6,440	8,599	5,010	2,772			
Repeal	118	1,753	3,738	4,846	8,820	9,374	2,798	1,100
Other	3,315	1,854	462	586	868	193	15	
Transmission, Distribution and Work Done for Others	1,288	1,301	1,317	1,279	1,197	1,205	1,220	1,220
Imports for Operating Departments, Etc.	515	740	515	490	460	505	560	600
	7,295	12,088	14,431	12,211	14,137	11,277	4,593	2,820
Repayments of borrowed money:								
IBRD - Existing Loan	372	365	398	412	427	442	457	473
- Proposed Loan	372	365	398	412	427	315	331	346
	7,667	12,473	14,829	12,623	14,564	12,034	5,381	3,641
IV. Available Funds								
Surplus or Deficit for Year	59	- 362	113	- 104	703	4,231	5,024	5,407
Available at Beginning of Year	315	374	12	125	21	724	4,955	9,979
Available at End of Year	374	12	125	21	724	4,955	9,979	15,386
V. Revenue Cover for Debt Service								
Net Cash Income (before depreciation)	1,818	2,548	2,733	3,840	4,022	5,403	6,090	6,400
Total Debt Service	588	590	592	594	596	1,284	1,286	1,288
Number of Times Debt Service Covered	3.1	4.3	4.6	6.5	6.7	4.2	4.7	5.0

1/ 1956 average rate

2/ in 1956 the maximum 40% of net operating revenue; in subsequent years the amount required to bring total provision to 2.2% of revalued assets

3/ investment at historic cost up to end 1955, plus write-up of IBRD debt to new exchange rate, plus year by year additions.

4/ investment made up of all 1955 assets revalued, plus year by year additions.

5/ no write-up of share capital

6/ share capital written-up as result of revaluation of assets

7/ including provision for renewals

8/ interest free; to be converted to capital

Considerations Affecting the Preparation of Appendix No. 8

Existing legislation has exempted from payment of customs duties imports required for the construction of certain comparatively small projects, and therefore in the cost estimates for those projects no provision for duties has been made. Pending legislation would, among other things, exempt from duties all imports for the rest of the program, but in the expenditures shown customs duties have been included. On the assumption that the local costs of Rapel which are not met from internal sources would be met out of advances from Fomento, the total advances Fomento would have to make for the overall Endesa program would be about 24 billion pesos if customs duties were payable, and only about 18 billion pesos if the imports were exempt.

No arrangements have yet been made for the financing of the Rapel plant, but as the demands of the system require the added capacity to be available by the end of 1963, it has been considered to be an essential part of Endesa's program. A contra item has been included in the source of funds section to neutralize the expenditures on Rapel; thus the surpluses or deficits, and available funds, of each year reflect the operations of the present system plus new capacity other than Rapel.

The proposed Bank loan has, for purposes of calculation only, been assumed to have a term of 20 years with a period of grace of 4 years, an interest rate of 5% per annum, and to carry a commitment charge of 3/4% per annum. A full year's amortization has been assumed in 1961, and the last amortization payment would accordingly be in 1976. The amount of the loan has been calculated so as to include commitment charges and interest during the construction period.

Interest during construction is included in construction expenditures to the extent that it is actually paid; thus interest on the Bank loan, which is theoretically paid in cash (but by means of withdrawals from the Bank loan) and interest on suppliers' credits are included. Interest during construction on the part of the investment financed from Endesa's internal generation and from interest-free advances from Fomento, which is included in the total costs shown earlier in this report, is not included in Appendix No. 8 since it is not a cash outgoing.

Legislation is pending whereby Endesa would be enabled to write up its fixed assets to present day values. This would greatly increase the rate base on which the permitted return is to be calculated, and thus lead to considerable increases in revenues. In the revenue account, however, the figures are based on a continuance of the existing law and the maintenance throughout of the 1956 tariff rates.

Endesa in its accounts reflects the payment of debt service by crediting Fomento's account with the peso equivalent of the interest and amortization payments. The bookkeeping produces the same result as would have been arrived at if Endesa had paid IBRD debt service with funds advanced by Fomento. In order to demonstrate the financial ability of Endesa to meet debt

(ii) Supplement to Appendix No. 8

service on IBRD loans incurred for its benefit, were it required to do so, IBRD debt service has been shown as though it were a cash payment by Endesa, and the ratios of revenue cover have been included in the Appendix.

Endesa's imports, other than Bank financed, are in most cases financed by means of suppliers' credits (which are guaranteed by Fomento) but some direct purchases are made also. Endesa in both cases makes actual payment, remitting the necessary foreign exchange to Fomento which acts as paying agent for Endesa. These payments which, in the case of suppliers' credits, normally extend over 4 or 5 years, and include interest at about 4-1/2%, are included in the construction expenditures in Section III of the Appendix.

No provision for increases in working capital, nor for temporary cash shortages arising from variations between the rate of construction expenditures and the rate of cash inflow from operations, has been made in the cash flow sections of Appendix No. 8, but an increase in short-term borrowings from banks has been assumed, and appropriate charges for interest have been included in the revenue account.

Empresa Nacional de Electricidad S.A.
Condensed and Rounded Balance Sheet
as at December 31, 1955 and Pro Forma
Balance Sheet as at December 31, 1961
(Expressed in Millions of Pesos)

	<u>1955</u>	<u>1961</u>
<u>Assets and Debit Balances</u>		
Fixed Assets:		
Installations in operation	9,485.2	54,979.0
Work in progress	1,449.1	30,405.0
	10,934.3	85,384.0
Investments	229.3	229.3
Construction inventories ^{1/}	1,750.0 ^{2/}	-
Net current assets	784.3	2,000.0
	13,697.9	87,613.3
<u>Liabilities and Credit Balances</u>		
Capital ^{3/}	8,871.7	34,165.7
Capital reserve	309.1	4,188.1
Other reserves and surplus	1,112.3	1,544.3
Funds received under Copper Law	283.0	6,371.0
	10,576.1	46,269.1
Reserve for Depreciation	815.2	9,783.2
IBRD first loan	2,306.6	3,245.3
IBRD second loan	-	7,185.0
Rapel	- ^{4/}	21,130.7
	13,697.9	87,613.3
Debt/Equity Ratio	18/82	18/82
Debt/Equity Ratio including foreign currency cost of Rapel to date	-	24/76

^{1/} Estimated.

^{2/} In 1961 construction inventories are included in work in progress.

^{3/} Assuming Fomento advances other than re: IBRD to be capitalized.

^{4/} The balance of financing for Rapel which, after maximum utilization of internally generated funds, would have to be obtained from outside sources, probably a foreign loan and advances from Fomento.