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UNITED STATES INTERNATIONAL DEVELOPMENT COOPERATION AGENCY
AGENCY FOR INTERNATIONAL DEVELOPMENT
Washington, D. C. 20523

BOLIVIA

PROJECT PAPER

CHAPRARE REGIONAL DEVELOPMENT
(Amendment)

AID/LAC/P-276 &
AID/LAC/P-149

Loan Number: 511-T-067
Project Number: 511-0543

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AGENCY FOR INTERNATIONAL DEVELOPMENT PROJECT DATA SHEET			1. TRANSACTION CODE <input type="checkbox"/> A = Add <input type="checkbox"/> C = Change <input type="checkbox"/> D = Delete		Amendment Number <u>1</u>		DOCUMENT CODE <u>3</u>	
2. COUNTRY/ENTITY <u>BOLIVIA</u>			3. PROJECT NUMBER <u>511-0543</u>					
4. BUREAU/OFFICE <u>LAC</u> <u>05</u>			5. PROJECT TITLE (maximum 40 characters) <u>CHAPARE REGIONAL DEVELOPMENT</u>					
6. PROJECT ASSISTANCE COMPLETION DATE (PACD) MM DD YY <u>08</u> <u>31</u> <u>88</u>			7. ESTIMATED DATE OF OBLIGATION (Under 'B' below, enter 1, 2, 3, or 4) A. Initial FY <u>85</u> B. Quarter <u>2</u> C. Final FY <u>88</u>					

8. COSTS (\$000 OR EQUIVALENT \$1 =)						
A. FUNDING SOURCE	FIRST FY			LIFE OF PROJECT		
	B. FX	C. L/C	D. Total	E. FX	F. L/C	G. Total
AID Appropriated Total						
(Grant)	(1.143)	()	(1.143)	(4.400)	()	(4.400)
(Loan)	(6.459)	(2.153)	(8.612)	(7.624)	(4.876)	(12.500)
Other U.S.						
1.						
2.						
Host Country	1.019	12.130	13.149	1.019	23.763	24.782
Other Donor(s)						
TOTALS	8.621	14.283	22.904	13.043	28.639	41.682

9. SCHEDULE OF AID FUNDING (\$000)									
A. APPRO. PRIATION	B. PRIMARY PURPOSE CODE	C. PRIMARY TECH. CODE		D. OBLIGATIONS TO DATE		E. AMOUNT APPROVED THIS ACTION		F. LIFE OF PROJECT	
		1. Grant	2. Loan	1. Grant	2. Loan	1. Grant	2. Loan	1. Grant	2. Loan
(1) FN	253B	210	210	641	10,000	-	2,500	4,400	12,500
(2)									
(3)									
(4)									
TOTALS				641	10,000	-	2,500	4,400	12,500

10. SECONDARY TECHNICAL CODES (maximum 6 codes of 3 positions each) <u>140</u> <u>150</u> <u>070</u> <u>240</u> <u>210</u>						11. SECONDARY PURPOSE CODE			
12. SPECIAL CONCERNS CODES (maximum 7 codes of 4 positions each)									
A. Code		BS		BR					
B. Amount									

13. PROJECT PURPOSE (maximum 480 characters)

The purpose of the Chapare Project is to modify and improve the agriculture and forestry systems of farmers in the Chapare to respond better to diverse, profitable marketing opportunities provided under medium level production models which are environmentally compatible.

14. SCHEDULED EVALUATIONS					15. SOURCE/ORIGIN OF GOODS AND SERVICES						
Interim	MM	YY	MM	YY	Final	MM	YY	<input checked="" type="checkbox"/> 000	<input checked="" type="checkbox"/> 94I	<input checked="" type="checkbox"/> Local	<input type="checkbox"/> Other (Specify)
	<u>08</u>	<u>86</u>				<u>07</u>	<u>88</u>				

16. AMENDMENTS/NATURE OF CHANGE PROPOSED (This is page 1 of a 1 page PP Amendment.)
 This amendment will complement the overall objectives of the Chapare Regional Development Project by providing critical electrification infrastructure. The provision of a reliable, economic source of electrical energy will enable agroindustries to operate more efficiently and will contribute to an improved standard of living.

I have reviewed and concur in the proposed implementation and financing procedures for this project.

Joe O. Hill, Jr. Controller *[Signature]*

17. APPROVED BY	Signature	18. DATE DOCUMENT RECEIVED IN AID/W, OR FOR AID/W DOCUMENTS, DATE OF DISTRIBUTION
	Title	
	David A. Cohen Mission Director	
	Date Signed	
	MM DD YY <u>06</u> <u>05</u> <u>85</u>	MM DD YY <u>06</u> <u>05</u> <u>85</u>

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La Paz, Bolivia

USAID - BOLIVIA
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PROJECT AUTHORIZATION

AMENDMENT No. 1

Name of Country:	Bolivia
Name of Project:	Chapare Regional Development Project
Number of Project:	511-0543
Number of Loan:	511-T-067

1. Pursuant to Section 103 of the Foreign Assistance Act of 1961, as amended, the Chapare Regional Development Project for Bolivia was authorized on July 29, 1983. That authorization is hereby amended by deleting the first sentence of paragraph 1 and substituting in lieu thereof the following sentence:

Pursuant to Section 103 of the Foreign Assistance Act of 1961, as amended, I hereby authorize the Chapare Regional Development Project for Bolivia, involving planned obligations of not to exceed twelve million five hundred thousand United States dollars (US\$12,500,000) in loan funds ("Loan") and four million four hundred thousand United States dollars (US\$4,400,000) in grant funds ("Grant") over a three year period from date of authorization, subject to the availability of funds in accordance with the A.I.D. OYB allotment process, to help in financing foreign exchange and local currency costs for the Project.

2. The effective date of this authorization amendment is July 22, 1985.
3. The authorization cited above remains in force except as hereby amended.



Director, USAID/Bolivia

1/10/86

Date

PD&I:RJAsselin:mtn
CLEARANCES:
GC/LAC:Marian Reedy (substance)
CONT:SLiapis
DD:Gwachtenheim

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I. SUMMARY AND RECOMMENDATION

A. The Project

The Chapare Regional Development (CRDP) Project Agreement was signed on August 12, 1983, with A.I.D. resources of \$14.4 million and GOB and Bolivian private sector counterpart contributions of more than \$21 million. The purpose of the CRDP is to carry out a multi-faceted development program within the Chapare region. The project includes an integrated package of financing and technical assistance to support small farmer and agroindustrial production activities, programs for the identification and promotion of new agribusiness and marketing opportunities and support for institutional development in the Chapare region. The developmental strategy was conceived and initiated in conjunction with an International Narcotics Matters (INM)-supported program designed to reduce and control, through specific enforcement measures, the production of coca from the Chapare destined for illicit international markets. Successful accomplishment of the Chapare project objectives is based on a combined effort to diminish and control the illegal production and trade of coca and, at the same time, offer Chapare farm and non-farm residents viable options for achieving sustained growth in personal income and an overall improved standard of living. In addition to the CRDP, the total development effort within the Chapare includes \$11.5 million in USAID financing for infrastructural investments in rural roads, rural sanitation projects and community development activities.

The Chapare region is similar to many rural areas of Bolivia in that it is characterized by small towns, dispersed populations and rugged terrain which tends to further isolate inhabitants from the advantages of life in urban and peri-urban population centers. The absence of an electrical power system in the Chapare has retarded the growth of normal developmental processes in that area. As a consequence, agroindustrial opportunities have gone untapped. Chapare residents and agroindustrial experts emphasize the urgent need for electricity, not only to improve the quality of life in the region, but also to encourage alternative agricultural investments in a region conducive to the introduction of new crops and agricultural technologies.

The design of the CRDP was based on the provision of basic infrastructure for the Chapare, with priority given to the construction and repair of the rural roads system and a consistent, cost-effective supply of electrical energy, to provide fundamental incentives for existing and new business initiatives in the region. In addition to providing an economical and reliable source of power to enhance the impact of development activities fostered under the CRDP, electrification is expected to strengthen the effect of coca control enforcement measures and better the Chapare inhabitant's quality of life.

In 1980, the Inter-American Development Bank (IDB) proposed a long-term electrification project to assist the Bolivian National Electric Company (ENDE) in expanding its generation, transmission and transformer facilities. The project was designed to enable ENDE to meet the expected load growth from existing customers and to supply electrical power to new customers serviced along subtransmission lines to be built under the program. Key elements of the project included a high voltage transmission line interconnecting Santa Cruz with the rest of the central and eastern parts of Bolivia, and the provision of increased transformer capacity for two existing and two new substations, allowing for distribution of electrical service within certain areas of the Department of Cochabamba. The total cost of the four year project was estimated at \$122 million, with 70 percent of the cost to be financed by IDB, 10 percent by the Andean Development Corporation (CAF) and the remaining 20 percent to be covered by GOB contributions and a grant by the Swedish Government.

As a result of discussions with USAID and other international organizations, the IDB project included a connection from Cochabamba to a new switching station to be constructed at San Jose in the Chapare, with linkage to the primary ENDE system at the Santa Isabel hydro station. Thus, the system would have provided a significant amount of electric power transmission and distribution to a portion of the Chapare.

USAID completed the design of the CRDP under the assumption that IDB would provide, in a timely way, the necessary Chapare electrification infrastructure. However, in early 1983, IDB decided to postpone the project temporarily for technical and financial reasons. Since an electrification system is essential to the overall achievement of Chapare project objectives, completion of the proposed, large-scale IDB electrification program was a critical assumption in the design of the Chapare development project and a key aspect of successful implementation of the project's coca control measures. The IDB delay has, therefore, necessitated direct AID action (i.e. an amendment to the CRDP) to provide the required electrification infrastructure to the Chapare. In addition, the Mission will continue discussions to ensure eventual linkage of the Chapare with the overall IDB electrification program to provide increased electrical distribution capacity in the region.

The proposed electrification project amendment will have an important impact on the achievement of a major objective of the Chapare project - - that being the enhancement and creation of a variety of profitable marketing opportunities needed to encourage farmers to improve and diversify agricultural and forestry systems, and therefore diminish their reliance on coca as a major source of income. Through the electrification of the Chapare, a significant number of families and commercial entities will have access to a permanent source of energy. The successful completion of this project will contribute to the increased profitability and efficiency of both existing and new, small

and medium size agroindustrial businesses located in the region. This will be accomplished through reductions in operational costs and increased productive capacities of commercial enterprises having access to electrical power. In addition, the Chapare electrification project will enhance marketing opportunities by making information regarding product pricing, demand and distribution more accessible through increased usage of radio and television. The project will also contribute to an improved standard of living for those residents of the Chapare who experience the advantages and comforts of electrical power service.

The project contemplates the construction of an electrical power system throughout approximately 15 percent of the geographical area of the Chapare. A system of electrical transmission and distribution totalling 151 kms. and providing service to approximately 3,000 residential users (or close to 10 percent of the Chapare population) and 350 institutional and commercial establishments, is projected at the end of the three year project.

The primary components of this \$5.42 million subproject are the construction and installation of both primary transmission lines and a secondary distribution system. The system will include: 1) a 9 km. 115 KV transmission line between the points of Santa Isabel and San José, 2) the partial construction of a substation at San José to accommodate termination of the 115 KV line and interconnection with the outgoing 34.5 KV line, and 3) the construction of a 34.5 KV distribution system providing 79.2 kms. of service line between San José and Chimoré, two northern trunk distribution lines at 34.5 KV capacity spanning a distance of 57.9 kms., and one 6 km. spur off of the main distribution line.

Financing of all project activities will be accomplished through the provision of \$2.5 million in AID loan funds and \$2.919 million in GOB counterpart contributions. AID resources will finance the cost of the transmission line and substation construction and upgrading work, distribution line materials and equipment, and the provision of 24 months of technical assistance. The GOB has already procured \$1.019 million in transmission line materials and equipment that will be directly employed in the construction of the system's high voltage transmission line between Santa Isabel and San José. In addition, the GOB will finance \$1.9 million in additional costs, including the use of \$1 million in Title III funds, for the local purchase of materials, equipment and other construction inputs.

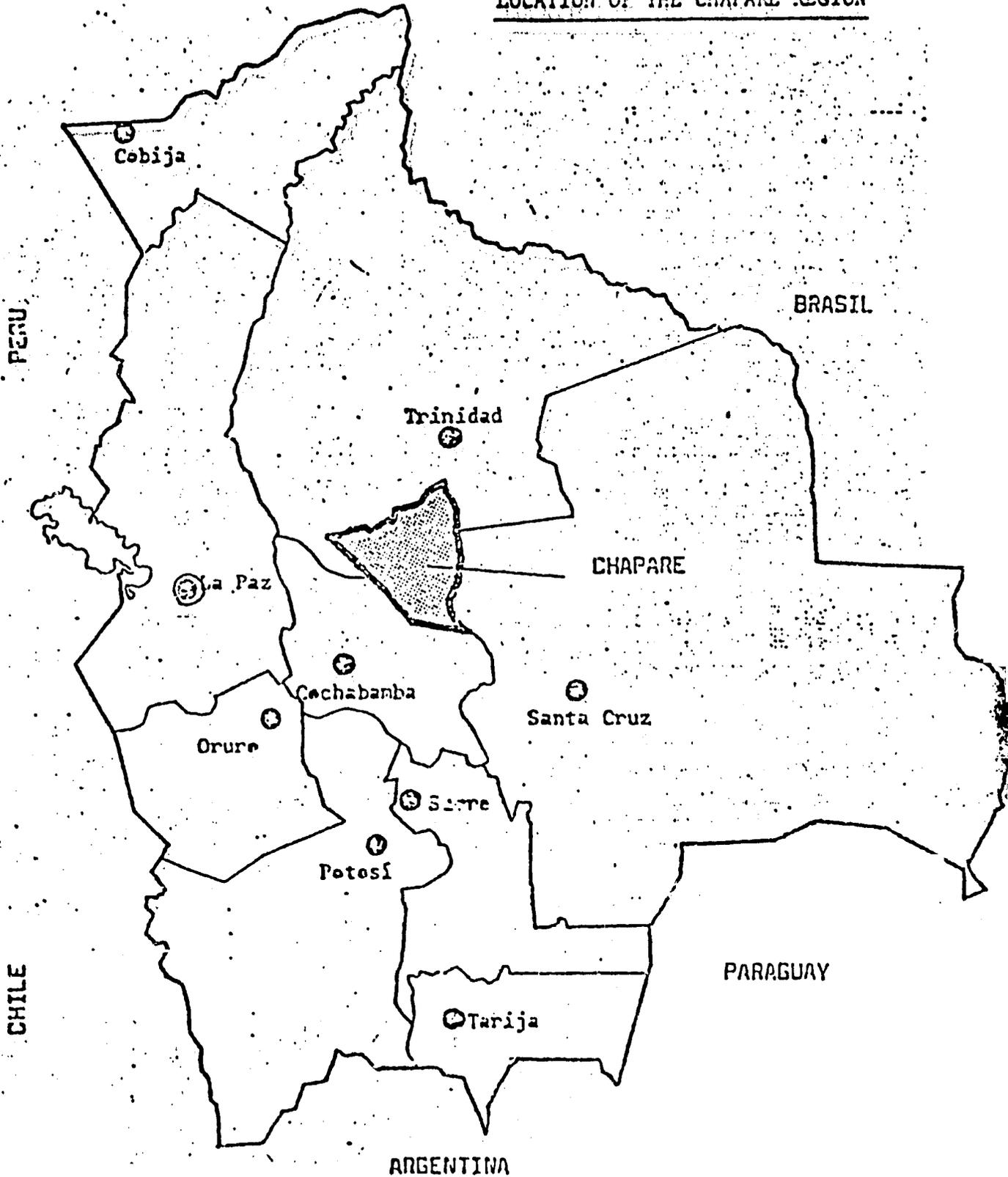
The project executing agencies will be the national power company, Empresa Nacional de Electricidad S.A. (ENDE), and the electric distribution company in Cochabamba, Luz y Fuerza Eléctrica Cochabamba, S.A.M. (ELFEC). These institutions will be responsible for the planning, design and implementation of the project, as well as operation and maintenance of the completed system.

B. Summary Project Budget
(In \$000)

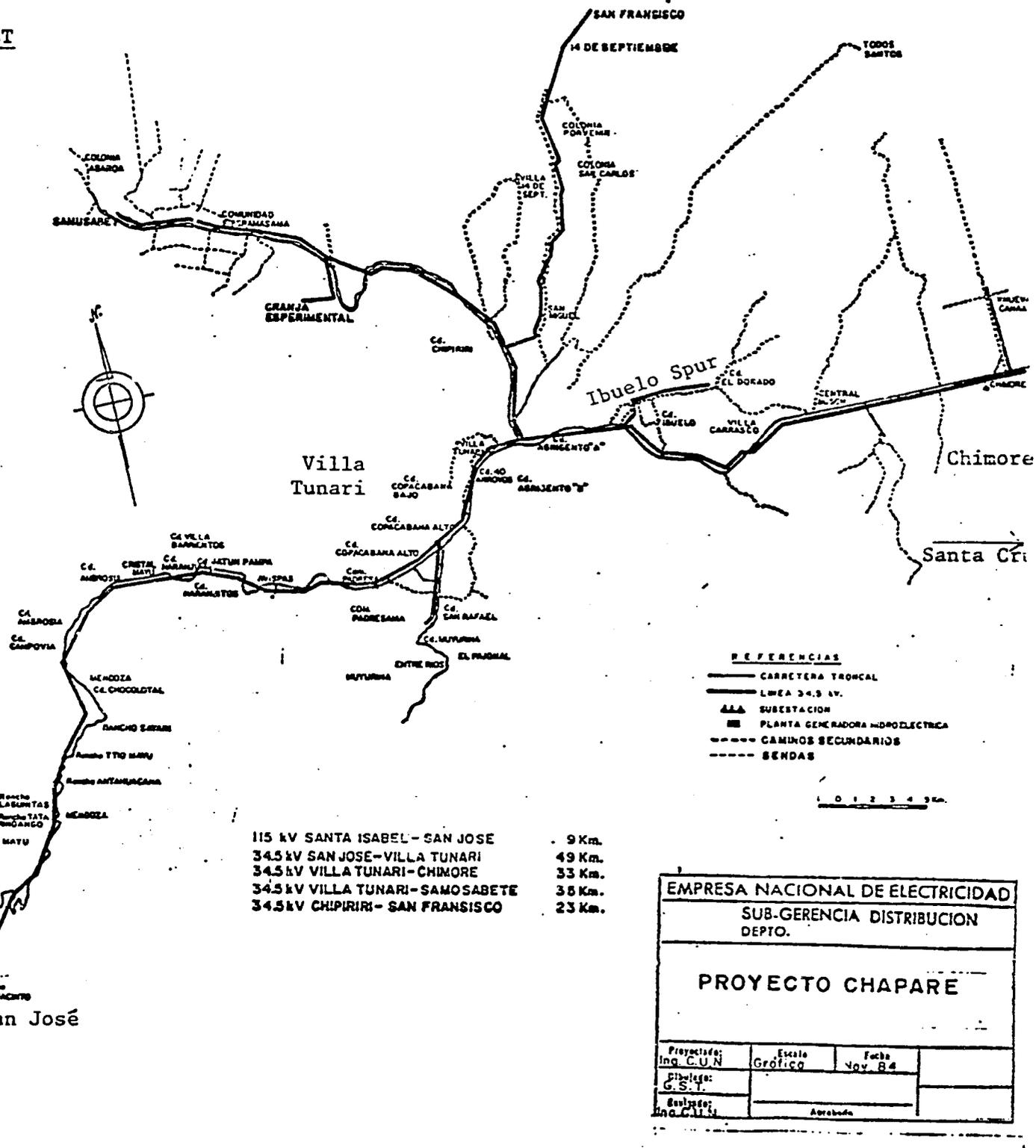
	H O S T C O U N T R Y			Grand TOTAL
	AID Loan	GOB Treasury	P.L.480 TITLE III	
Technical Assitance	300			300
Materials and Equipment				
1. Transmission Line and Substations	414	1,019		1,433
2. Distribution Line	1,313		248	1,561
3. Venicles & Equip.	148			148
Construction				
1. Transmission Line	186	355	115	656
2. Distribution Line		436	559	995
Subtotal	2,361	1,810	922	5,093
Inflation/Contingency	139	109	78	326
T O T A L	\$2,500	\$1,919	\$1,000	\$5,419
	=====	=====	=====	=====

BOLIVIA

LOCATION OF THE CHAPARE REGION



HAPARE ELECTRIFICATION PROJECT



- REFERENCIAS**
- CARRETERA TRONCAL
 - LINEA 34.5 kV.
 - ▲▲▲ SUBESTACION
 - PLANTA GENERADORA HIDROELECTRICA
 - - - - CAMINOS SECUNDARIOS
 - SENDAS



- 115 kV SANTA ISABEL - SAN JOSE . . . 9 Km.
- 34.5 kV SAN JOSE - VILLA TUNARI . . . 49 Km.
- 34.5 kV VILLA TUNARI - CHIMORE . . . 33 Km.
- 34.5 kV VILLA TUNARI - SAMOSABETE . . . 38 Km.
- 34.5 kV CHIPIRIRI - SAN FRANCISCO . . . 23 Km.

EMPRESA NACIONAL DE ELECTRICIDAD		
SUB-GERENCIA DISTRIBUCION DEPTO.		
PROYECTO CHAPARE		
Proyectado: Ing. C. U. N.	Escala: Gráfica	Fecha: Nov. 84
Diseñado: G. S. T.		
Revisado: Ing. C. U. N.		Aprobado:

Santa Isabel

San José

- 6 -

C. Recommendation

The USAID/Bolivia project committee has determined that the proposed electrification project is technically, administratively and financially feasible within the three-year life-of-project period. The specific analyses carried out during the project design stage did not identify any serious obstacles to project implementation and indicated that the project can achieve its purpose. Special attention was paid to the environmental and institutional issues identified during the project intensive review. Both the USAID Project Development Team and the Reviewing and Approval Committee recommend that the project be approved and that an A.I.D. loan for \$2.5 million be authorized.

D. Project Development Team

The Project Development Team was composed of the following USAID/Bolivia staff Members:

Michael H. Loistrom	Assistant Project Development Officer
John A. Fasullo	Rural Development Officer (Cnapare Project Coordinator)
Gonzalo Fernandez	Project Engineer
Walter Fiorilo	Project Engineer
Oscar Antezana	Program Economist
Raúl Pinto	Financial Analyst
Luis Ampuero	Private Sector Office

The following consultants and ENDE and SDBT personnel assisted in the technical analysis of the project:

Wilson Houqin	Electrical Engineer (Retired AID)
Gustavo Vega	Financial Analyst
Conrado Camacho	Civil Engineer SDBT
Federico Lucero B.	ENDE
Carlos Ulloa N.	ENDE
Rodolfo Asbún	ENDE
Ramiro Rico	ENDE

The project was reviewed by the following USAID/BOLIVIA Officers:

Joe O. Hill, Jr.	Controller
Roberto León de Vivero	Program Officer
Robert V. Thurston	Rural Development Officer
Robert J. Asselin, Jr.	Project Development Officer
M. Peter Leifert	Deputy Project Development Officer
Henry H. Bassford	Mission Director

The project was approved by:

David A. Conen	Acting Mission Director
----------------	-------------------------

II. PROJECT RATIONALE AND DESCRIPTION

A. Background

The Chapare project is designed to improve the agricultural and forestry systems of farmers in the Chapare region of Bolivia, so as to allow them to respond to diversified marketing opportunities in primary agroindustrial areas. The project strategy focuses on enhancing market demand for agricultural and forestry commodities. This strategy is being accomplished through improved marketing methods to strengthen the demand pull effect* in, and outside of, the Chapare, thereby stimulating production and, in turn, increasing personal incomes of inhabitants of the region.

The three primary components of the Chapare project consist of: 1) agricultural/forestry production, 2) agrobusiness development and marketing, and 3) project administration/institutional development. Essential to the first component of agricultural/forestry production is the application of tropical agricultural research and extension and the provision of agricultural production credit.

The primary thrust of the agroindustrial development/marketing component is to reduce the constraints to marketing Chapare agricultural products. A major constraint to improved marketing incentives is the inaccessibility to established market channels for Chapare commodities and the lack of adequate information provided to farmers regarding pricing policies, product demand and potential markets. The proposed electrification project amendment will have a direct impact on alleviating marketing constraints to further development in the Chapare.

To address the marketing problems in the region, the Chapare project is financing the production and investment costs of three large-scale agroindustrial initiatives. All three interventions have been subject to rigorous feasibility studies and have demonstrated their financial soundness, as well as strong linkages with small farmer producers and existing and new channels of distribution. In addition, the agro-industrial/marketing component involves a minimum of 10 small to medium scale processing activities. The majority of these subprojects have been developed in the Chapare and, once implemented, will promote local entrepreneurship, including management and ownership.

* Demand Pull Effect: A USAID/Bolivia strategy through which enhanced marketing and processing of agricultural commodities will increase production and, by extension, improve the income-generating capacity and standard of living of the rural poor.

For example, the Chapare project has promoted the development of several small scale enterprise activities related to improving the Chapare agricultural and forestry systems, such as the production of tea, honey, citrus products, furniture, handicraft and artisanry goods. The development of these products will serve to stimulate demand within the immediate geographical area as well as encourage marketing and distribution of these products in other areas of Cochabamba and in other Departments of Bolivia. These centers of demand will increase the outreach of existing markets and help create other demand centers, thereby increasing productivity and improving market efficiency.

The last project element, involving administration and institutional development, is designed to establish cross-sectoral coordination in project planning, participation of the beneficiaries and linkage to coca control efforts. The Secretariat for the Development of the Bolivian Tropics (SDBT) is the primary implementing institution which has been assigned the key responsibility of overseeing and coordinating the activities financed by: 1) the Chapare project, 2) related A.I.D. loans for infrastructure, and 3) other donors.

Other AID supported projects designed to have a developmental impact on the region include the Rural Roads II (061) and Rural Sanitation (058) projects. Under the Rural Roads II project, a temporary Bailey bridge is being constructed to allow passage through the Cesarzama area during the Chapare rainy season. Once the rains have subsided, construction of a permanent bridge facility will take place. Also supported under this loan project is the upgrading and repair of 230 kilometers of secondary roads which provide access from the Chapare to the eastern portion of the Departments of Cochabamba and Santa Cruz. In addition, new potable water systems have been constructed within the Chapare. Three complete systems have been installed already, with an estimated 21 systems to be completed during the next two years. Community participation in the project's training programs is considered good. In the future, the Division of Environmental Sanitation within the Ministry of Health plans to open a Chapare field office with the permanent technical staff required to service the sanitary systems.

At the completion of the CRDP, there will be in place a combination of public and private sector applied research and extension activities in the Chapare directly supporting improved agricultural and forestry production and diversified farming. Moreover, the project will have established a self-sustaining credit system based on realistic interest rates and a program for mobilizing savings in the region. In the context of agribusiness development, the CRDP will help develop systems for processing and marketing regional commodities and will install an information clearing house for local and regional marketing of Chapare products. At the end of the five year period, an institutional structure will exist with a human resource base adequate to manage the delivery of project inputs and to coordinate with the coca control program.

Ongoing Chapare development activities have recently gained momentum, showing progress consistent with project objectives. To date, all project conditions precedent have been met -- including the formation and regular meeting of the Inter-Ministerial Commission for the Development of the Bolivian Tropics, organization and staffing of the SDBT and IBTA/Chapare, and the submission and approval of a plan to determine farmer eligibility for credit assistance under the Project or from Title III funding. Systems research and agricultural extension projects are underway with supervision and technical assistance being supplied by Experience Inc., the project's long term technical contractor. Representative demonstration farms have been identified within strategic areas of the Chapare, and IBTA will shortly be providing training and research programs at these sites. In addition, the Federación Nacional de Cooperativas de Ahorro y Crédito (FENACRE) has established procedures for a Chapare credit review system and is in the process of approving small loans for Chapare farmers.

With regard to larger agroindustrial interventions supported under the CRDP, financial packages for hog fattening, particle board production and citrus processing have been developed and presented to Intermediate Credit Institutions (ICIs) for credit authorization.

To facilitate the attainment of the Chapare project's objectives, the proposed Chapare electrification project amendment will provide economical, reliable electric power which will serve a significant portion of Chapare inhabitants and commercial enterprises.

IBTA efforts in promoting applied tropical agricultural research extension methodologies, on a broader and more comprehensive scale, will be greatly facilitated through the provision of electrical service. With electrification, IBTA will be able to carry out laboratory testing at its research stations, seed processing experiments, and storage of agricultural inputs in addition to expanding its audio visual programs.

Electrification will serve as a key inducement to agroindustrial activities developed and sponsored under the project. Interventions already in advanced stages of production which stand to reduce operational costs considerably through utilization of electric power include: tea processing, honey and beeswax production, fisheries development, poultry operations and the promotion of box and wood product factories. Agroindustries already operating in the Chapare which require reliable, economical sources of power include sawmills, carpentry firms, farm equipment repair shops, a rice mill and the expansion of a pork processing facility. Social service projects providing assistance to areas of the Chapare, such as potable water and irrigation systems, health and sanitation posts, and school and training institutes, all depend on available and affordable sources of energy. Without electrical energy, the quality of these services and the achievement of project social and economic objectives will be seriously jeopardized.

Funds for an electrification system were not included in the original Chapare project design because of IDB plans for a national electrification project, which included a major transmission interconnect system between Santa Cruz and Cochabamba with multiple substation installations. The Chapare project design was premised on the provision of an IDB-financed electrification system in the Chapare, servicing the basic energy needs of the region and allowing agribusiness related activities to operate more efficiently through increased productive capacities and reduced operational costs. However, the IDB has temporarily postponed its proposed electrification program, although it is still committed to financing the project within the next few years, and any further delay at this time in meeting the initial electrification requirements of the Chapare would seriously jeopardize the success of ongoing and planned development activities. Therefore, AID will provide for a basic electrification subproject within the CRDP to meet the urgent energy needs of the Chapare. The proposed amendment will proceed on the assumption that the larger IDB program will be implemented. Accordingly, all activities of the AID electrification component will be coordinated with the IDB.

B. Relationship to Mission Assistance Strategy

The Mission's primary program emphasis is on the expansion of private agriculture development in the Bolivian economy, with particular concentration on the La Paz-Cochabamba-Santa Cruz Corridor. The Chapare region lies at the geographic center of the corridor and serves as a natural focal point for implementation of the USAID demand-pull development strategy. The strategy assumes that improved marketing and the development of agroindustrial production capacity for agricultural commodities and non-farm products will stimulate increases in agricultural production. Likewise, increased farm productivity will raise the level of personal income and provide for a better standard of living for the rural poor.

To meet the expected increase in demand, rural development activities will reinforce farmer initiatives to improve and increase production output. It is anticipated that increased agricultural market transactions will create additional "demand-pulls" (i.e. economic multipliers) within the corridor region. For example, increased farm production will heighten the demand for agricultural inputs (e.g. chemical fertilizers, improved seed varieties and more efficient farm machinery), encourage additional private investment in agroindustrial expansion, as well as enhance the demand for production credit and skilled technical assistance. The synergism of these factors will result in increased incomes serving to boost demand for consumer goods and basic social services, thus, contributing to overall development.

The proposed Chapare electrification subproject is an essential element in the Mission's strategy to assist the private sector to assume a more prominent role in the economy and will simultaneously encourage the GOB to control and provide incentives to decrease illegal production of coca and narcotics trafficking in the Chapare. In confronting the coca production and trafficking control issue, the proposed rural electrification project will strengthen USAID's program to assist the GOB in implementing an effective anti-narcotics control effort and to reduce coca production to the legal demand level. The strategy of the CRDP was based on the fact that success in reducing coca cultivation depends to a great extent on farmer's awareness of, and receptivity to, new economic alternatives, such as those developed and supported under the CRDP. Therefore, an effective control program of coca cultivation cannot be accomplished without the concurrent undertaking of regional development activities, advanced through the provision of a dependable and affordable system of electrical energy.

USAID/Bolivia is directing substantial project effort toward increasing the productivity and income of small farmers. Enactment of the demand-pull strategy entails a close, mutually-supportive relationship between agroindustries and growers. Private sector commerce and agroindustrial investment represent key elements in the creation of new markets, while a consistent supply of farm produce is essential to the stability and growth of enterprises. Existing and planned USAID/Bolivia projects will continue to support both sides of this mutual relationship.

The CRDP contains a farm production component and will also work directly with private enterprises to create and strengthen markets for Chapare commodities. In addition, the ongoing Agricultural Sector II project is furnishing assistance to the Chapare region through applied research, credit and institutional formation (integral cooperatives), all of which will assist growers to increase and improve crop yields. These efforts are being supported by production related activities financed under the P.L. 480 Title III Program. A source of local currency and foreign exchange credit is provided under the Agroindustry and Artisanry (A&A) project, designed to expand existing enterprises and to help establish new ones. As a result of project promotional and technical assistance activities, several commercial banks have expressed an interest in establishing fully-staffed branch offices within the Chapare. Lastly, the Productive Credit Guarantee Program (PCGP), operating under Central Bank management for the past six years, is being reprogrammed and will be wholly administered by the private commercial banking sector. The new private sector PCGP is expected to more effectively satisfy loan requirements of Chapare borrowers who presently lack the necessary collateral backing required by most financial institutions for credit authorization.

Current USAID/Bolivia support for agroindustry will be complemented by new initiatives for the immediate future and near-term. The FY 1985 Management Training project will provide a key support role, serving as a source of entrepreneurial training required to enhance the efficiency of industries developed through other USAID/Bolivia financed projects. It is envisioned that agroindustries establishing operations in the Chapare will benefit from this training initiative. A private second storey bank, to be financed under the planned Agroindustrial Development project, will provide an additional source of needed investment capital for private sector expansion nationwide, including the Chapare. Moreover, the planned Producer Organizations project will strengthen existing and develop new farmer producer organizations, providing storage, sorting and marketing services for their members as well as serving as bargaining agents.

The Mission believes that ongoing and planned projects represent a sound core for developing an efficient, profitable agroindustrial sector. Other complementary activities are also being planned as a means to help fully achieve program objectives. New initiatives to promote marketing and agribusiness development, extend private enterprise development, and accelerate technology transfer and export promotion will be underway in FY 1986. The proposed Chapare Marketing and Agribusiness project will strengthen existing and develop new marketing facilities needed to promote agribusiness development and establish new outlets for Chapare agricultural produce. This new project will also provide continued support for the elimination of illicit coca production in the Chapare region. A second key FY 1986 project, Market Town Capital Formation, will provide financing to promote and extend private enterprise development to secondary and tertiary cities in La Paz, Cochabamba (including the Chapare) and Santa Cruz Departments.

C. Project Goal and Purpose

As stated in the original Project Paper, the goal of the CRDP continues to be the encouragement of reduction in the cultivation and illicit trafficking of coca through the achievement of balanced economic development and an enhanced standard of living in the Chapare Region, which will result from a mixture of public and private sector productive activity, a diversified economic base and more equitable income distribution. The Chapare Electrification amendment will facilitate the achievement of the above objectives and will improve the economic and social conditions of the inhabitants of the region by providing electrical services on a self-supporting basis.

The purpose of the CRDP is to modify and improve the agriculture and forestry systems of farmers in the Chapare to respond better to diverse, profitable marketing opportunities provided under sustained, environmentally compatible, medium technology production models.

The purpose of the subproject amendment is to construct, install and assist in the distribution of electrical power services to a significant portion of the population located in the Chapare region. This amendment will complement the overall project objectives by providing critical electrification infrastructure. A reliable, economic source of electrical energy will enable agricultural-related micro and medium size enterprises to carry out more efficiently all production activities, and will contribute to an improved standard of living.

D. Subproject Strategy

Five options for the provision of electrical power to the Chapare were considered by the Mission. In reviewing various project alternatives for the provision of electrical power to the Chapare, the Mission Project Committee first considered the possibility of waiting for the larger IDB electrification project to be approved. The IDB proposal to establish a major eastern transmission interconnect system and to upgrade ENDE's generation and transmission capacity, has been temporarily postponed. In view of the urgent developmental and narcotics control priorities of the Chapare region the Mission project committee determined that any further delay in designing and implementing a Chapare electrification project was unacceptable. Therefore, other strategies were assessed which contemplated using AID funding for the provision of electrical power to the region.

The second alternative considered the purchase of small diesel-fueled generator sets (25-100 KW) to be installed in priority population centers of the Chapare, as well as the purchase of a 2MW diesel plant to be located near Villa Tunari. This option was contemplated in lieu of the construction and installation of a permanent subtransmission line through a portion of the Chapare. Compared to the total investment cost of a subtransmission line to Villa Tunari, the diesel plant and generators are slightly less costly in nominal terms, although when analyzed on the basis of the cost per unit of electric energy delivered to Villa Tunari, the diesel proposal is substantially more costly than the permanent subtransmission line (see Annex D).

In addition to the higher unit cost of electricity required for diesel generators in the Chapare, the usage of heavy duty diesel power plants has little merit given the large amount of nearby hydro-electric power supplied by ENDE. The existence of hydro plants effectively eliminates most other forms of power as practical solutions for meeting the electric energy needs of the Chapare. Small diesel plants would only be useful as interim sources of power. Moreover, the relatively short economic life of such equipment (ten years), as well as its limited power capacity and high maintenance requirements, make this alternative incompatible with meeting the longer term objectives of the project.

The third option considered was the construction of a temporary 9 km., 34.5 KV line between Santa Isabel and San José. This transmission line would serve as a temporary system link until such time as a 115 KV system could be built and thus allow for eventual interconnection with the eastern region and greater distribution capacity within the Chapare. The proposal also included the construction and installation of a 34.5 KV distribution line between San José and Chimoré, totalling 79 kms. Total cost of this alternative was estimated to be approximately \$2.85 million, and would provide electricity to approximately 995 families and 125 industrial and institutional users.

A major disadvantage associated with this option is the temporary nature of the 9 km. transmission line, which would have to be dismantled at some time in the future and replaced with a 115 KV line to enable interconnection with the eastern system. In addition, the salvage value of the temporary transmission line is estimated at less than 50 percent of the investment. Thus, a loss of 50 percent on the initial investment in the transmission line, combined with additional costs associated with the installation of a new 115 KV line in an area considered to be environmentally sensitive to physiological change, makes this option less attractive in terms of fulfilling the project objectives.

The fourth option is the installation of a permanent 115 KV transmission line between Santa Isabel and San José, the construction of a substation at San José and the placement of a 34.5 KV distribution line connecting San José with Chimoré. Total cost of this proposal is estimated at \$3.8 million, with electrical service projected to reach 995 families, (i.e. the same household coverage estimated under option three) along with an equal amount of industrial and commercial usage.

The major advantage to choosing the fourth option to accomplish the objectives of the project is that ENDE currently has in storage all equipment and materials for installation of the 115 KV, 9 km. transmission line between Santa Isabel and San José. (Total cost of these materials and equipment is estimated at \$1.019 million, all of which is a counterpart contribution of the GOB.) These commodities were purchased by ENDE one year ago in anticipation of proceeding with the IDB electrification project. Therefore, substantial economies would be gained by opting for alternative four. In addition, even though electrification coverage is the same as option three, option four would provide a permanent link with a future interconnect system as well as additional transmission power between Santa Isabel and San José, should this be necessary in the near future.

Regarding a fifth option, the Mission sought to maximize usage of US\$ dollar loan funds under the project amendment. All project foreign exchange was earmarked for the purpose of importing materials and equipment needed to construct an electrification system and maximize service to an optimum number of inhabitants of the Chapare, given the financial limitations of the project. Building on option four, option five would incorporate the installation of two additional northern trunk

lines originating at Villa Tunari and include the construction of a short spur off of the main transmission line. An additional 63 kms. of distribution line would be linked to the system under option five, and, since a majority of the Chapare population is located close to the proposed northern trunk lines, industrial and household electrification services provided under this option would be substantially greater. It is estimated that an additional 1,000 families, plus numerous commercial enterprises, would receive service, with the total cost of the project amounting to \$4.2 million (exclusive of the equipment and materials already purchased by ENDE), or approximately \$500,000 more than the cost of option four. The overall benefits derived from utilizing the present ENDE transmission system and employment of existing materials and equipment necessary to construct a permanent 115KV transmission line between Santa Isabel and San José, plus the additional distribution capacity extending along northern branches of the Chapare (which is an extremely cost effective investment), makes the fifth option the most desirable project strategy.

E. Subproject Implementation

The primary project components consist of the construction and installation of a 9 Km., 115 KV transmission line, approximately 143 Kms. of 34.5 KV distribution line and the partial construction of a substation at the San José site to accommodate termination of the new transmission line and interconnection with the outgoing distribution line. The project implementation plan contemplates the following three separate phases of implementation.

1) Contracting and Procurement: ENDE, as the primary executing agency, will be responsible for contracting the construction firm and procuring all local and imported materials and equipment required for the transmission and distribution systems. It is expected that all engineering and design work, advertising and bid processing, delivery of materials and final contracting of the construction firm will be completed by the end of the first year. Contracting of the long-term technical adviser will be done by USAID through a personal services contract.

2) Construction and Installation: Primary to the second phase is the construction of the 115 KV transmission line between Santa Isabel and San José, amplification and installation of two substations at the same sites, and construction and installation of secondary line distribution at 34.5 KV. The total distribution system will encompass San José and Chimoré, two northern branches extending from Villa Tunari to the points of San Francisco and Chipiriri and the short Ibuelo spur distribution line. These activities comprise the largest component of the project. Once delivery of all equipment and materials and contracting of a construction firm have taken place, construction and installation will commence on a system-wide basis, with aspects of the transmission and distribution systems occurring according to a time-phased implementation schedule. All of the system construction and installation work will be completed before the end of year two.

3) **Supervision, Testing and Technical Assistance:** In its role as project executor, ENDE will supervise all operations beginning with system construction to installation, testing and energizing of the power system. Technical assistance will be in place at the appropriate time in order to provide maximum support during the construction and installation phases.

III. FINANCIAL PLAN AND COST ESTIMATE

The total cost of activities to be financed under this project amendment is \$5,419,000. The A.I.D. loan contribution will be \$2,500,000 (46%), and the GOB will provide \$2,919,000 or 54% (composed of ENDE cash and in-kind contribution totalling \$1,919,000, and P.L. 480, Title III funds totalling \$1,000,000). The loan will be used to finance: (a) one long-term international technical consultant; (b) the purchase of distribution line materials, and (c) part of the costs of the construction and installation of the transmission and distribution lines.

Table A shows the LOP estimated cost of the Electrification Subproject. Table B shows the subproject's disbursement schedule. Table C shows implementation and financing procedures.

TABLE A

III. FINANCIAL PLAN AND COST ESTIMATE

LOP ESTIMATED COST AND FINANCIAL PLAN

(in US\$000)

	H O S T C O U N T R Y					Grand TOTAL
	A.I.D. Loan		G O B		PL 480 Title III	
	FX	LC	FX	LC	TOTAL LC	
A. Technical Assistance						
1. Long-term (2 yrs.)	300					300
Sub-total	300					300
B. Materials and Equipment						
1. Transmission Line and Substations						
1.1 115 KV Line between Santa Isabel and San José:						
Steel Structures			283		283	283
Conductors			79		79	79
Insulators			17		17	17
Hardware and accessories			25		25	25
1.2 Enlargement Santa Isabel Sub- station:						
Equipment and Materials			288		288	288
1.3 Partial con- struction San José Substation:						
Equipment and materials			327		327	327
1.4 Transformers	414					

	A.I.D.		H O S T C O U N T R Y		PL 480 Title III LC	TOTAL	Grand TOTAL
	Loan FX	LC	FX	G O B LC			
2. Distribution Line							
2.1 Primaries:							
Poles	206						206
Crossarms					63	63	63
Conductor	397						397
Insulators and hardware	324						324
2.2 Secondaries:							
Poles	40						40
Conductor	40						40
Insulators and hardware	16						16
2.3 Transformers:	131						131
2.4 Services:							
Service Connections				104	104	104	
Meters	48						48
2.5 Interior wiring:							
Conductor					81	81	81
Fittings	14						14
2.6 Steel lights:	49						49
2.7 Sect. Equipment:	48						48
2.8 Special Vehicles for Supervision	148						148
Sub-total	1875		1019		248	1267	2580
. Construction and Labor							
1. Transmission Line							
1.1 Construction	139			193	115	308	861
1.2 Engineering Admin. and other	47			162		162	209

	A.I.D. Loan		H O S T C O U N T R Y P L 480		TOTAL	Grand TOTAL
			G O B			
	FX	LC	FX	LC		
2. Distribution Line						
2.1 Construction				140	699	699
2.2 O & M Equipment				10	10	128
2.3 Engineering and Admin.				286	286	316
Sub-total	2175	186		791	1465	2213
T O T A L	2175	186	1019	791	2732	5093
Inflation/Contingency	100	39		109	187	326
GRAND TOTAL	\$2275	\$225	\$1019	\$900	\$1000	\$5419
	=====	=====	=====	=====	=====	=====

* An additional \$300,000 is available under the Chapare Regional Development Project to provide auxiliary funding for foreign exchange conversion into local currency, should this be necessary.

TABLE B
DISBURSEMENT SCHEDULE
(U.S. Dollars)

	Y E A R 1		Y E A R 2		Y E A R 3		TOTAL
	FX	LC	FX	LC	FX	LC	
A.I.D. Loan							
A. Technical Assistance							
1. Long-term (2 yrs)	90,000		115,000		95,000		300,000
B. Materials and Equipment							
1. Transmission Line							
1.1 Transformers	414,000						
2. Distribution Line							
2.1 Primaries:							
- Poles	206,000						206,000
- Conductors	397,000						397,000
- Insulators and hardware	324,000						324,000
2.2 Secondaries:							
- Poles	40,000						40,000
- Conductors	40,000						40,000
- Insulators and hardware	16,000						16,000
2.3 Transformers	131,000						131,000
2.4 Services							
- Meters	48,000						48,000
2.5 Interior wiring:							
- Fittings	14,000						14,000
2.6 Steel Lights	49,000						49,000
2.7 Sect. Equipment	48,000						48,000
2.8 Special Vehicles for supervision	148,000						148,000

	Y E A R 1		Y E A R 2		Y E A R 3		TOTAL
	FX	LC	FX	LC	FX	LC	
C. Construction							
1. Transmission line							
1.1 Construction		40,000		99,000			139,000
1.2 Engineering Admin. and other		15,000		10,000		10,000	47,000
2. Distribution Line							
2.2 O & M Equipment							
Sub-Total	1,965,000	55,000	115,000	115,000	95,000	10,000	2,361,000
Inflation/Contingency	100,000		20,000		19,000		139,000
Total A.I.D. Loan	<u>2,065,000</u>	<u>55,000</u>	<u>135,000</u>	<u>115,000</u>	<u>114,000</u>	<u>10,000</u>	<u>2,500,000</u>

G O B

B. Materials and Equipment
 1. Transmission Line and
 Substations

 1.1 115KV between
 Sta. Isabel & San
 José:

- Steel Structures	283,000						283,000
- Conductors	79,000						79,000
- Insulators	17,000						17,000
- Hardware and Accesories	25,000						25,000

 1.2 Enlargement Santa
 Isabel:

- Substation Equipment and Materials	288,000						288,000
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	<u>Y E A R 1</u>		<u>Y E A R 2</u>		<u>Y E A R 3</u>		<u>TOTAL</u>
	<u>FX</u>	<u>LC</u>	<u>FX</u>	<u>LC</u>	<u>FX</u>	<u>LC</u>	
1.3 Partial Construction San José Substation: - Equipment and Materials		327,000					327,000
C. Construction							
1. Transmission Line							
1.1 Construction		14,000		110,000		69,000	193,000
1.2 Engineering Admin. and other		52,000		55,000		55,000	162,000
2. Distribution Line							
2.1 Construction		19,000		76,000		45,000	140,000
2.2 O & M Equipment		2,000		4,000		4,000	10,000
2.3 Engineering and Admin.		95,000		101,000		90,000	286,000
Inflation/Contingency	1,019,000*	182,000		346,000		263,000	1,810,000
		25,000		48,000		36,000	109,000
<u>Total G.O.B.</u>	<u>1,019,000</u>	<u>207,000</u>		<u>394,000</u>		<u>299,000</u>	<u>1,919,000</u>
	=====	=====		=====		=====	=====
P.L.480 Title III							
B. Materials and Equipment							
2. Distribution Line							
2.1 Primaries:							
- Cross arms		63,000					63,000
2.4 Services:							
- Service Connections				62,000		42,000	104,000
2.5 Interior Wiring:							
- Conductor		81,000					81,000

	<u>Y E A R 1</u>		<u>Y E A R 2</u>		<u>Y E A R 3</u>		<u>TOTAL</u>
	<u>FX</u>	<u>LC</u>	<u>FX</u>	<u>LC</u>	<u>FX</u>	<u>LC</u>	
C. <u>Construction</u>							
1. <u>Transmission Line</u>							
1.1 <u>Construction</u>		10,000		70,000		35,000	115,000
2. <u>Distribution Line</u>							
2.1 <u>Construction</u>		<u>40,000</u>		<u>320,000</u>		<u>199,000</u>	<u>559,000</u>
		194,000		452,000		276,000	922,000
<u>Inflation/Contingency</u>		<u>17,000</u>		<u>38,000</u>		<u>23,000</u>	<u>78,000</u>
 <u>Total P.L.480, Title III</u>		<u>211,000</u>		<u>490,000</u>		<u>299,000</u>	<u>1,000,000</u>
 TOTAL PROJECT COST	<u>2,735,000</u>	<u>418,000</u>	<u>491,000</u>	<u>884,000</u>	<u>293,000</u>	<u>\$598,000</u>	<u>\$5,419,000</u>
	=====	=====	=====	=====	=====	=====	=====

A. Disbursement Schedule

The disbursement schedule for the project for the combined A.I.D., GOB, and P.L. 480 Title III funds is estimated at \$3,153,000 for the first year, \$1,375,000 for the second year, and \$891,000 for the last year of the LOP.

B. Implementation and Financing Procedures

A.I.D. financing for this project will be channeled as indicated in Table C.

The USAID/Bolivia disbursement system includes measures to ensure the systematic and timely flow of project funds. The system will provide for advances of host country local currency funds to be deposited into a special project account to be maintained by an agency of the GOB. This GOB Agency will be responsible for disbursing funds from the special account in accordance with quarterly project financing approval by USAID. USAID/Bolivia dollar payments for technical assistance and commodity procurements and construction will be made following procedures indicated in Table A above. In order to implement the disbursement system, USAID and Bolivian counterpart representatives will agree on a detailed budget for local currency contributions.

TABLE C

Method of Implementation and Financing for A.I.D. Resources

	Major Element	Method of Implementation	Method of Financing	Approximate Amount
(1)	Technical Assistance	Personal Service Contract	Direct Payment	\$ 300,000
(2)	Commodities	Host Country Procurement	Direct L/Comm.	1,875,000
(3)	Construction	Host Country Contract	Direct Pmt.	186,000
	Subtotal			2,361,000
	Inflation/ Contingency			139,000
	T O T A L			\$2,500,000 =====

IV. IMPLEMENTATION PLAN

A. Implementing Agencies

The transmission and distribution of electric power for the Department and city of Cochabamba and the Chapare are the responsibility of two organizations, Empresa Nacional de Electricidad (ENDE) and Empresa de Luz y Fuerza Eléctrica Cochabamba (ELFEC).

ENDE is a public corporation with responsibility to develop, manage and operate primary generation and transmission systems in Bolivia, with the exception of the Department of La Paz and some sections of the Department of Oruro. Its principal generation plants are the 45 MVA Corani Hydroelectric plant and the 67.5 MVA Santa Isabel hydroelectric plant. Both of these plants are near the western boarder of the Chapare area at a distance of approximately 65 Kms., on a straight line from Villa Tunari.

ELFEC is also a public corporation of which ENDE is majority shareholder. ENDE supplies all of ELFEC's electric energy, and ELFEC in turn has the responsibility to distribute electric power in the city and Department of Cochabamba, including the Chapare area.

ENDE will be responsible for the construction, installation and management of the 115 kv transmission line, the substation addition at Santa Isabel and the new substation at San José. All personnel required for the supervision of this project component will be selected from ENDE's existing staff. The actual construction of the transmission line, requiring civil works to be performed at each substation and the erection of tower structures, will be contracted locally by ENDE.

One contractor will carry out all tasks associated with the construction and installation of the transmission line, including right of way clearance, tower foundation construction, line erection, site preparation at the San José substation, steel structure construction at both Santa Isabel and San José, and the construction of a control house also to be located at the San José site. ENDE will manage and supervise the installation of the San José substation with its own work force and will hire additional laborers should they be required.

The electrical distribution lines between San José and Chimoré and northern trunk lines originating at Villa Tunari will be installed jointly by ENDE and ELFEC on a force account basis. ENDE, in addition to being responsible for overall project management, will also supply administrative personnel as needed, including an accountant, administrative assistant, design and drafting services as

well as the provision of other forms of administrative backstopping. ELFEC's contribution to full-time project personnel will consist of a four-man staking crew, a resident engineer, two construction inspectors, an accountant and various warehouse personnel selected from ELFEC's existing staff. In addition, two vehicles and an SSB radio communication system will be supplied by ELFEC for project specific tasks.

B. Procurement Plan

All materials and equipment required for the project will be imported by ENDE under host country procurement arrangements. Suppliers from all countries in AID Geographic Code 941 will be eligible to bid on the supply of imported items required for the project. It is envisioned that wooden electrical poles, anchor logs and crossarms will all be procured internationally since local production of these commodities does not meet project specifications for size and durability. These commodities will be excluded from import duties because ENDE, as a nationalized utility, has a blanket exoneration granted by the GOB for all necessary imports.

All project materials will be warehoused by ELFEC in Cochabamba, and those items currently being stored in Santa Cruz will be transferred to Cochabamba as required by construction and installation schedules. The construction firms to be contracted by ENDE will be responsible for transporting materials from Cochabamba to project sites and providing temporary storage when necessary.

C. Technical Assistance and Subproject Monitoring

ENDE and ELFEC are competent to carry out this project with minimal assistance. The assistance suggested is partly technical and partly administrative. On prior rural electrification projects, an expatriate engineering firm and an AID U.S. direct hire electrical engineering advisor were available to provide engineering design and construction supervision, preparation and technical review of procurement and construction documents, report preparation and other administrative duties to coordinate activities in compliance with AID requirements. However, The Mission no longer has USDH engineers. Therefore, it is planned that one long-term technical consultant will be hired to perform these tasks. The engineering design criteria and technical specifications previously developed by ENDE and its consultants have been adopted by ENDE and ELFEC for the proposed Chapare rural electrification project. This will enable one contract engineer to handle the task of assisting ENDE and ELFEC to implement the project and USAID to monitor it.

The recommended amount of technical assistance is 24 months of long-term TA during the construction and installation phases of the

project. The estimated cost of these services is \$300,000, assuming an institutional contract rather than a PSC. The electrical engineer will undertake the following tasks:

- Review design revisions, if any, and assist with updating designs as required.
- Field check preliminary staking and recommend revisions where appropriate.
- Review procurement documents for imported and local materials to be financed by AID and assist with revisions, if necessary, for AID approval.
- Advise on bid procedures, bid evaluations and procurement actions and assist with documentation for AID approval.
- Assist with preparation of construction contract bid documents, contractor qualification evaluations, and documentation where AID approvals are needed.
- Field check contractor work and engineering supervision during construction and advise ENDE of any recommended corrective actions.
- Assist ENDE with factory inspections of materials if required.
- Assist with preparation of periodic progress reports.
- Assist in developing standards and guidelines for future distribution programs.
- Assist with construction contract close-out documentation.

D. Subproject Implementation Schedule

The subproject implementation schedule is presented below.

Month 1

- Project Agreement signed, staking of the line traverse is performed,
- transportation of materials and equipment from ENDE warehouses in Santa Cruz and Cochabamba to the project site completed for the 115KV Transmission line, and
- all conditions precedent met.

Month 2

- Volume of quantities determined for civil work items,
- final review of the project construction plans,
- preparation of procurement documentation for the distribution lines,
- local advertisements for construction works of the 115 KV line and civil works for transmission substation published,
- local and international advertisements for transformer equipment published,
- local and international advertisements for procurement of line materials and equipment for the distribution lines published, and
- advertisements for a technical advisor are published.

Month 3

- All the materials and equipment already in stock for the construction of the 115 KV transmission line and substations are on site (San José), and
- technical advisor is selected.

Month 4

- Technical advisor arrives and starts working with ENDE.

Month 5

- Evaluation and awarding of bids for transformer equipment,
- evaluation and awarding of bids for posts and wood products for distribution lines are made, and
- evaluation and selection of construction firms for the transmission line and civil works of substations are made.

Month 6

- Procurement contracts for line materials and equipment for 34.5 KV lines are signed which starts the period for fabrication and transportation,
- contractors selected for the transmission line and substations and
- moving equipment and personnel to the project site commences.

Month 7

- Procurement contracts for posts and wood products for 34.5 KV lines are signed, starting the period for fabrication and transportation, and
- installation of the 115 KV line, substations on site and completed.

Month 8

- Preparation of the tender documentation for construction of the 34.5 KV line,
- construction and erection of the line between Santa Isabel-San José (115 KV), and
- civil works for substations begin.

Month 9

- Construction of the 115 KV line in process.

Month 10

- Local advertisements for construction works of the distribution lines are published,
- construction of the 115 KV line continues,
- construction of civil works for substations continue, and
- equipment for substations is transported to the site.

Month 11

- Re-staking of the distribution line traverse begins,
- construction of the 115 KV line continues, and
- installation of equipment in substations by ENDE personnel starts.

Month 12

- Civil works in substations are completed,
- evaluation and award of bids for construction works on all distribution lines are made,
- construction and erection of the 115 KV line continues, and
- delivery of posts and wood products is finalized.

Month 13

- Construction work for the 115 KV line is completed, and
- installation of substations completed.

Month 14

- Arrival of posts and wood products concluded,
- receipt by ENDE of posts and wood products finalized, and
- tests and energization of the line between Santa Isabel - San José carried out.

Month 15

- Receipt by ENDE of line materials and equipment for the 34.5 KV lines finalized, and
- construction firms conclude with the installation of transformer and transportation of equipment and personnel.

Month 16

- Construction and erection of the distribution lines between San José - Villa Tunari, Villa Tunari - Chimore and other secondary lines start at the same time.

Month 17

- Construction works on the distribution lines underway.

Month 18

- Construction and erection of the 34.5 lines underway, and
- first project evaluation initiated and completed to assess the progress of construction and installation activities.

Month 19

- Construction works in the distribution lines continue, and
- re-staking of the line transverse finalized.

Month 20

- Construction works in the distribution lines continue.

Month 21

- Construction works in the distribution lines continue.

Month 22

- Construction works continue.

Month 23

- Construction and erection works for the line between San José - Villa Tunari completed, and
- construction and erection works continue on other distribution lines.

Month 24

- Tests and energization of completed portions of lines begin.

Month 25

- Construction and erection works for the 34.5 KV lines continue.

Month 26

- Construction and erection works continue.

Month 27

- Technical advisor completes evaluation report.

Month 28

- Construction and erection works for the distribution lines near finalization.

Month 29

- Construction and erection of the distribution lines are in last stage.

Month 30

- Construction and erection works for the Villa Tunari - Chimoré line and other secondary lines are completed.

Month 31

- Tests and energization of all distribution lines are completed and
- final report and evaluation of the project starts.

Month 32

- Final evaluation of the project continues.

Month 33-36

- Final evaluation, final report of the project and final disbursements completed.

E. Evaluation Plan

It is anticipated that two types of evaluations will be undertaken. The first evaluation will take place approximately 18 months after the initiation of the project. This evaluation will assess the progress of construction and installation activities underway at that time. The second evaluation will occur at the end of the project, at which time accomplishment of the project objectives will be evaluated.

V. PROJECT ANALYSES

A. Technical Analysis

During the intensive review period, USAID contracted the technical services of an electrical engineer, recently retired from AID, to review and analyze the various project alternatives put forth by ENDE. The consultant helped develop, and was in full agreement with the selected project implementation strategy and the project's engineering design. The following assessment of the technical soundness and feasibility of the project was provided in the consultant's report.

Design criteria for the primary and secondary lines are based on sound utility standards for a safe and reliable system. The criteria follow those used by the U.S. Rural Electrification Administration and were used in previously completed rural electrification projects in Bolivia. The technical specifications for materials and equipment prepared for previous projects are generally applicable, with a few modifications, and are considered acceptable for the Chapare Project.

The main design features of the project are:

1. Power Generation

The power will be supplied from the ENDE interconnected system which has an installed capacity of 164.7 MW. Annual peak demand, which occurs in June and July, was 119.2 MW in 1983 and has been at about the same level since the interconnection of the south and central systems in 1981. Service to the Chapare will originate at the Santa Isabel hydro plant and will combine capacity with the Corani plant due to scarcity of resources for new generation and transmission facilities. System load growth has increased less than expected and no shortage of capacity or energy now exists. At the end of 1983, the interconnected system had a reserve capacity of 27.3 percent, and, consequently, the small incremental demand of 2-3 MW imposed by the Chapare project places no strain on the current generating capability of ENDE.

2. 115 KV Transmission line between Sta. Isabel and San José, and the expansion of the Santa Isabel substation and partial construction of the San José substation.

The 9 kms. of 115KV transmission line single circuit, 397.5 MCM ACSR conductor on self-supporting steel towers and the enlargement of the substation in Santa Isabel are part of the proposed interconnection with the Santa Cruz system and are technically justified. The project is designed to transfer up to 60 MW of power between the central and eastern systems. The proposed major interconnection of the 220 KV line from San José to Santa Cruz requires more space than is presently available at Santa Isabel. Therefore, the selection of San José for the 220 KV termination and the connection of the 115 KV link to Santa Isabel is the best alternative until the future interconnection is made with the eastern region.

The San José substation is planned as a transmission interconnection point, linking the existing Santa Isabel and Corani plants and the proposed San José plant with the 220 KV transmission interconnector to the Santa Cruz system. The Chapare project will include only minimum facilities at San José to accommodate termination of the 115 KV transmission line. These facilities will include the 34.5 KV transformer with 3.75 MVA capacity, and switching and related equipment required for the 34.5 KV distribution level.

Since 1980, a number of studies on technical aspects of the transmission interconnector have been performed by ENDE and its consultants. These have related primarily to the 220 KV line, although the short 115 KV line to San José was included in the studies and established design criteria of the project. Technical studies performed by ENDE consultants verified such features as insulation coordination, system protection, conductor selection, line and substation designs and operating procedures. Furthermore, in 1981, other consultants performed topographic surveys, line routing and tower locations, and soil studies to determine the foundation requirements of the project region.

The USAID electrical engineer hired to review the project concluded that the design of the 115 KV line described above and the corresponding substations were both technically sound.

3. 157 kms. of 34.5/19.9 KV, 3 phase and 19.9 KV single phase primary distribution lines constructed on wooden poles, including 34 kms. of secondary line support and 22 kms. of 380/220 volt, and 3 phase and 220 volt single phase secondary lines constructed on wooden poles carrying secondary line distribution only.

The primary distribution lines will extend from San José to Chimoré with principal branch lines north from Villa Tunari, including shorter extensions from other points in the region. Main lines will be installed at 34.5/19.9 KV, using three phase wires, with a grounded neutral wire, and an ACSR conductor supported on pressure treated wood poles. Single phase 19.9 KV lines will extend into light load areas where three phase service is not required. Transformers will be single phase 19.9 KV to 220 volt, pole mounted, ranging in size from 5 to 75 KVA. Secondary lines and services will use quadruplex and duplex insulated cables, AA conductor and ACSR support features. The proposed mechanical line design is based on the US National Electric Safety Code (NESC) for light loading districts.

The 34.5/19.9 KV primary voltage introduces a new voltage level to the ENDE and ELFEC systems, while the standard voltage

previously used for rural areas has been 24.9/14.4 KV. For purposes of standardization, it is preferable to limit the number of different voltages as much as possible. After considering the advantages and disadvantages of the two voltages, ENDE and ELFEC chose 34.5/19.9 KV. This voltage initially permits the project area to be served directly from the San José substation, and defers the cost of subtransmission and substations to the future interconnect system. At the higher voltage, primary lines can be extended further and still maintain adequate voltage regulation, which is important to ENDE and ELFEC in terms of planned future expansion into the Chapare beyond the limits of the proposed project. Expected load density is very low in the area and the higher voltage will permit reliable service and voltage regulation, while deferring some investment costs associated with a lower voltage system.

4. Higher cost of using the 34.5/19.9 KV primary transmission line.

The disadvantage of using the 34.5/19.9 KV primary is the higher cost of equipment, including transformers, sectionalizing devices and lightning arresters. Budget quotations obtained by ENDE indicate that a cost differential between 24.9 KV and 34.5 KV equipment is approximately 10 percent. Items such as poles, conductors and the entire secondary system are the same for either voltage. Thus the total cost differential for the 34.5 KV primary line is much less than 10 percent for the entire system. Therefore, economies of scale gained in the future will justify the higher cost of the proposed voltage system.

5. 1,937 household inlets, meters and interior wiring for household consumers and 420 street lighting fixtures.

It has been decided that all consumers will be individually metered. ELFEC will also provide interior housewiring to residential consumers on a cost reimbursable basis.

B. Institutional Analysis

The Empresa Nacional de Electricidad S.A. (ENDE) is the largest electric company in Bolivia. Approximately 100 percent of ENDE's shares are owned by three public entities, the Corporación Boliviana de Fomento (CBF), Yacimientos Petrolíferos Fiscales Bolivianos (YPFB), and the Corporación Minera de Bolivia (COMIBOL). ENDE's management is responsible to a six-member Board of Directors, with the Minister of Energy and Hydrocarbons as the designated Chairman of the Board. Of the other five members who are elected by the shareholders, three directors represent CBF, and one director each represents COMIBOL and YPFB. All Board members serve four years and are eligible for reelection. According to ENDE's statutes, the chief executive of the company is a General Manager appointed by the Board. This position is currently occupied by an experienced engineer who is a competent executive.

Organizationally, ENDE consists of a general management division, four technical divisions and an administrative division. The corporate offices are headquartered in Cochabamba, with approximately 50 percent of the employees assigned to this central office. The staff of ENDE numbers 550, of whom 80 are professional engineers. Presently, 66 engineers are in Cochabamba, one each is in Corani and Santa Isabel, 4 are in Santa Cruz, 3 are in Sucre and 5 are in La Paz.

The main consumption centers served by ENDE are the cities and outlying areas of La Paz, Cochabamba, Oruro, Sucre, Potosí, Santa Cruz, Tarija and Trinidad, the private and state mining sector, and private industry in the central and southern parts of the country. Electricity distribution service is the responsibility of local companies such as the Empresa de Luz y Fuerza (ELFEC) in Cochabamba, and the Cooperativa Rural de Electrificación (CRE) in Santa Cruz.

Before the Siles Government came to power in October 1982, the GOB had residential, commercial and industrial private sector tariffs which allowed the electric company to cover all of its operational and maintenance costs related to the transmission and distribution of electric power. Even though ENDE had to import a substantial amount of construction materials and equipment (such as equipment related to transformer stations and pole and line distribution), due to the over-valued peso, income derived from tariffs charged to businesses, residential and municipal customers allowed ENDE to self-finance its rural electrification projects.

However, once the current Government's economic policies were implemented, allowing the peso to float and thus reflect a realistic rate of inflation within the Bolivian economy, it became apparent that ENDE's existing tariff structure was no longer adequate to cover the costs of system operation and maintenance. ENDE's operational deficit was directly attributable to the highly subsidized tariffs afforded to publically held corporations. Over the past two years, ENDE's financial situation has worsened to the point where it is now heavily dependent on GOB assistance to continue to apply tariff subsidies to such publicly controlled entities as COMIBOL and Yacimientos. Moreover, last year, ENDE was unable to break even on operations with private sector residential and commercial users because tariffs were not allowed to rise.

Although residential, commercial and municipal tariffs have recently increased somewhat and are now, by themselves, adequate for ENDE to cover all costs associated with private sector users, total revenues generated from these operations do not permit ENDE to subsidize tariffs to public consumers. The proposed Project Amendment does not contribute to ENDE's problem of having to subsidize tariffs charged to publicly held corporations. On the contrary, the Chapare Electrification project will incorporate a tariff structure that will allow all costs and all future cost increases to be covered by project revenues. In order to guarantee

the project's financial viability, the project agreement amendment will contain a covenant requiring ENDE to gradually raise tariffs charged to both residential and industrial users and publically controlled corporations, so that this project, as well as ENDE's overall electrical transmission operations, will become self-supportive in the near term. In addition to the project covenant, USAID, together with the IDB, will continue discussions with GOB officials to bring about the elimination of subsidies to public entities. These measures are essential to ensure that tariff policies are established which will allow ENDE to realize income generations equivalent to its investment in plant and equipment, and total cost of operations.

ENDE currently has in operation 3 hydroelectric plants with a total generating capacity of 126 MW, and 7 thermoelectric plants with total generating capacity of 168 MW, for a total generating capacity of 294 MW.

The generating plants of ENDE are as follows:

PLANT TYPE	LOCATION	CAPACITY	OPERATION
		MW	STARTED
Hydroelectric	Corani (Cbba.)	54	1967
Hydroelectric	Sta. Isabel (Cbba.)	72	1973
Hydroelectric	El Angosto (Tarija)	0.3	1964
Termoelectric	Huarachi (Sta. Cruz)	118	1975
Termoelectric	Aranjuez (Sucre)	22	1974
Termoelectric	Sucre, Tarija, Trinidad,		1959
(5 small plants)	Villamontes and Karachipampa	28	1982

C. Financial Analysis

1. Project Demand

The project's demographic area contains approximately 2,335 families living within 30 small towns and informal communities. An estimated 65 percent of these families, or 1,940 residences, will utilize electric power services provided under the project by 1987. By 1989, total family residences are expected to increase to 5,025, of which approximately 75 percent, or 3,770 families, will utilize project-supplied electrical power.

The demand for residential electric power will come primarily from lighting for homes; electrical appliances, such as fans, irons, radios, refrigerators and cooking equipment; and power needed to operate pumps to supply water to households and for sanitary facilities. Based on electricity utilization rates for rural residences in other areas of Bolivia, the total megawatt hours (MWh) per month for Chapare residents are expected to be 95 during the first year of operation. Total residential demand is expected to increase to 234 MWh per month, given the growth in population in the Chapare and increased usage of electricity over the life of the project.

Commercial and industrial demand for electricity in the Chapare will fall under two general categories; 1) on-farm production needs and 2) final product processing of crops and other agricultural related raw materials. Within the first category, the greatest demand and most important use of electric power will most likely be for farm machinery and electrical equipment repair shops. The round the clock provision of light and the use of power tools in machine repair workshops will have a very positive impact on increasing the productive capacity of farms in the Chapare. In addition, in the areas of hog, poultry and dairy production, there will be substantial demand for energy to power refrigerated storage systems, pump water for feeding, washing and cooling animals, heating of piglet and poultry shelters and energy needed for fencing and milking machines. All of these uses relate to production activities that will be greatly enhanced through the availability of central-grid power.

The production of rice, corn, bananas, citrus, papaya and yucca in the Chapare will also be increased by improved crop yields derived from the usage of electrically-powered irrigation systems and laboratory testing facilities, receiving energy from the project's electrification system.

Demand for electrical energy for intermediate processing of agricultural products will largely come from medium size rice and corn farming operations in the Chapare, requiring power for drying, hulling and husking, and fruit and citrus production which utilizes refrigerated storage and electrically powered plant facilities. These two major

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fields of agricultural processing will contribute greatly to the demand for power. Moreover, the overall benefit/cost relationships of using electrical power supplied by the project for agricultural processing is much greater versus energy supplied from other sources such as diesel-fueled generators (See Annex D).

Total system capacity required to meet the power needs of approximately 250 commercial, industrial and municipal users during the first year of Chapare electrification is expected to be 516 MWh per month. This figure is derived from similar non-residential utilization rates from electrification systems operating in rural areas of Santa Cruz. With an expected 7 percent annual growth rate of non-residential users in the project area, the system will require a capacity of 722 MWh per month in order to meet the expected demand. By adding the total residential energy requirements to the total demand for commercial and industrial electricity, a system capacity of at least 956 MWh per month is needed in order to accommodate project demand throughout the duration of the project. As presented in the institutional and technical analyses of the project (see Sections V. A. and B.), the proposed system will allow for per month usage of at least 9,100 MWh, more than sufficient to meet all estimated demand during the estimated life of the system as well as provide a reserve capacity for the remainder of the Chapare area and outlying vicinities.

2. Financial Assessment

The following financial analysis is based on a 15 year cash flow projection for all revenues and costs associated with the project. The analysis demonstrates that net cash flows derived from revenues generated by the supply of electricity to Chapare residential, municipal and commercial/industrial users are sufficient to amortize the project's initial incremental investment in a reasonable period of time. The project's internal rate of return (IRR) is calculated utilizing a discount factor of 10 percent, which reflects an average cost of capital. In other words, the discount factor is equal to the average annual rate of return on investment which ENDE must receive in order to cover the project's operational costs and investment in physical plant.

The project's IRR is 12.3 percent. This rate is higher than the project's average cost of capital, or break even point, of 10 percent, which verifies the project's financial viability given an initial incremental investment of \$4.5 million. The incremental investment is defined as the project's initial cash outlay applied to all costs associated with the generation of project revenues.

At the end of 13 years (yr. 1999), the project's incremental investment will be fully amortized. An estimate of the total investment salvage value at that time, is \$700,000. Thus, based on an estimated IRR of 12.3 percent, and payback period of 13 years, the project is considered to be financially sound. (See Table 1).

a. Incremental Investment

The initial incremental investment of the project is determined by the total cost of the project (\$5,419,000) less the additional sunk cost of materials and equipment already procured for the 115 KV transmission line between San José and Santa Isabel (\$ 500,000), and the cost of upgrading the transformer at the San José substation (\$ 419,000) which is part of the overall substation construction work. These costs have been excluded from the project's incremental investment because they will only generate sufficient revenues needed to amortize their costs once the IDB eastern region interconnect system is in place.

The project's incremental investment of \$4.5 million is, therefore, based on the total cost of construction and installation of project transmission and distribution lines (\$2,213 million), including engineering and administrative expenses, the cost of materials and equipment associated with transmission and distribution lines and project related substations (\$1,661 million), and the cost of project technical assistance (\$300,000) and inflation and contingency expenses (\$326,000). (See Project Strategy Section).

b. Project Revenues

A technical study was carried out to determine the demand for electrical service within the project area for the following distinct categories of users: 1) residential, 2) municipalities and other public entities, and 3) private commercial and industrial consumers. The study was based on a five year projection and showed that, on a megawatt hour per month basis (MWh), industrial and commercial usage was more than four times the expected consumption by both residential and municipal customers.

At the end of five years, the projected demand for consumption of electricity by households and municipalities will increase at an average rate of 5 percent per year, and is expected to level off at that time given the physical limitations of the project. Therefore, these two categories of users have a zero growth rate from year six through the end of the 15 year cash flow period. On the contrary, electricity requirements for commercial and industrial users are estimated to increase substantially once agroindustry development and other forms of commercial enterprise become established in the Chapare. Given the expected increase in electrical requirements of these customers, the project cash flow estimates a 7 percent annual increase in industrial and commercial usage at the start of year six through the 15th year of the project (See Table 1). Based on this rate of growth, commercial and industrial users will require a maximum MWh capacity per month of 722 at the end of the cash flow period in year 2001.

The current tariff charged to private industrial users and households allows the power company to recover its costs and provide for minimum maintenance so that service to these customers results in a

self-supportive operation. Project revenue estimates were based on an initial tariff of US 8.5 cents/KWh, which approximates the current tariff charged to private industrial and commercial users. As shown in the cash flow projections, the tariff for electrical service is expected to increase on the average of \$.01/KWh over the first three years of the project, then, for the next two years, it will increase by \$.005/KWh. In year six, the tariff will rise to a rate of \$.12/KWh where it will remain throughout the final years of the project due to a slight economy of scale, realized from increased demand for electricity in the later years. Additional project revenues will also be generated from one-time installation charges collected from each user.

c. Project Costs

Both ELFEC's and ENDE's actual costs related to the project were estimated over the first five years based on data gathered from existing operations. Total operational costs are expected to increase approximately 5 percent per year after year five of the project, given increased industrial usage and the slightly higher cost of administering and maintaining the system. The primary operational cost of the project is the purchase of energy by ELFEC from ENDE hydro plants. These costs to ELFEC must be increased at a 5 percent annual rate in order to provide ENDE with an adequate cash flow to service its project related financial obligations.

d. IRR Sensitivity Analysis

The financial internal rate of return for the project was calculated using a base case projection of project revenues and costs. The basic assumptions for this sensitivity analysis are the same as those used for the base case IRR with the only adjustment occurring in the tariffs charged by ENDE, which vary according to an optimistic (e.g. the GOB takes strong measures to eliminate subsidies to public corporations and provides a better return on investment to ENDE) and a pessimistic scenario. In the pessimistic projection, tariffs are expected to increase at the conservative rate of \$.005 per year until 1992, and then remain constant for the rest of the cash flow period. Under this projection, it is likely that revenues generated from the project will not be sufficient to offset any of the deficits incurred by ENDE's public, subsidized operations. Nonetheless, the project will still yield a positive rate of return of 10.2 percent, slightly higher than the average cost of capital, and will allow for amortization of the project investment in 15 years. The optimistic projection of the project and ENDE's rate structure assumes that tariffs will increase rapidly on the order of \$.01 per year until 1992, when tariffs will level off at \$.135 per year for the remaining ten years of the project, through 2001. The project IRR calculated on this optimistic tariff structure will enable ENDE to secure an annual return of 14.4 percent and fully amortize the project's incremental investment within 11 years (See Tables 2 and 3).

TABLE 1

PROJECT CASH FLOW (\$us.)

YEAR	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	
Revenue (\$us.)												
A. Medium Tariff(\$us/kuh)		0.085	0.095	0.105	0.110	0.115	0.120	0.120	0.120	0.120	0.120	
B. (Produced Energy(mwh))		7,336.000	7,959.000	8,745.000	9,577.000	10,331.000	10,890.440	11,489.041	12,129.544	12,814.882	13,548.193	
Residential		1,139.000	1,282.000	1,548.000	1,885.000	2,104.000	2,104.000	2,104.000	2,104.000	2,104.000	2,104.000	
Ind/Inst/Comm		5,996.000	6,468.000	6,980.000	7,466.000	7,992.000	8,551.440	9,150.041	9,790.544	10,475.882	11,209.193	
Public Lights		201.000	209.000	217.000	226.000	235.000	235.000	235.000	235.000	235.000	235.000	
Salvage Value												
Tariff Revenue (AxB)		623,560.000	756,105.000	918,225.000	1,053,470.000	1,188,065.000	1,306,852.800	1,378,684.896	1,455,545.239	1,537,785.805	1,625,783.212	
Installation Charges		85,000.000	86,000.000	1,050.000	1,050.000	1,050.000	1,050.000	1,050.000	1,050.000	1,050.000	1,050.000	
Total Revenue		708,560.000	842,105.000	919,275.000	1,054,520.000	1,189,115.000	1,307,902.800	1,379,734.896	1,456,595.239	1,538,835.805	1,626,833.212	
Costs												
Technical Assistance		250,000.000										
Trans. Line & Substation		519,000.000										
Distribution Line		1,142,000.000										
Materials & Equipment		1,661,000.000										
Transmission Line		1,070,000.000										
Distribution Line		1,143,000.000										
Construction		2,213,000.000										
Inflation & Conting.		376,000.000										
Total Project Costs		4,500,000.000										
Operational Costs												
Energy Purchase		297,000.000	322,000.000	354,000.000	387,000.000	418,000.000	438,900.000	460,845.000	483,887.250	508,081.613	533,485.693	
Distr. to Consumers		19,000.000	21,000.000	23,000.000	26,000.000	28,000.000	29,400.000	30,870.000	32,413.500	34,034.175	35,735.884	
Maintenance		55,000.000	56,000.000	57,000.000	58,000.000	60,000.000	61,320.000	62,669.040	64,047.759	65,456.810	66,896.859	
Administration		3,250.000	3,250.000	3,250.000	3,250.000	3,250.000	3,282.500	3,315.325	3,348.478	3,381.963	3,415.783	
Margin (Debt Service)		50,000.000	50,000.000	50,000.000	50,000.000	50,000.000	50,000.000	50,000.000	50,000.000	50,000.000	50,000.000	
Total Operational Costs		424,250.000	452,250.000	487,250.000	524,250.000	559,250.000	582,902.500	607,699.365	633,696.987	660,954.560	689,534.219	
Total Costs		4,500,000.000	424,250.000	452,250.000	487,250.000	524,250.000	582,902.500	607,699.365	633,696.987	660,954.560	689,534.219	
Net Cash Flow		(4,500,000.000)	284,310.000	389,855.000	432,025.000	530,270.000	629,865.000	725,000.300	772,035.531	822,898.252	877,881.245	937,298.993

TABLE 1 (Cont.)

PROJECT CASH FLOW (\$us.)

YEAR	1997	1998	1999	2000	2001	
Revenue (\$us.)						
A. Medium Tariff(\$us/kwh)	0.120	0.120	0.120	0.120	0.120	
B. [Produced Energy(mwh)]	14,332.857	15,172.406	16,070.744	17,031.966	18,060.474	
Residential	2,104.000	2,104.000	2,104.000	2,104.000	2,104.000	
Ind/Inst/Comm	11,993.837	12,833.406	13,731.744	14,692.966	15,721.474	
Public Lights	235.000	235.000	235.000	235.000	235.000	
Salvage Value					712,379.750	(Salvage Value Added to Total Revenue)
Tariff Revenue (AxB)	1,719,940.437	1,820,688.667	1,928,489.274	2,043,835.923	2,167,256.838	
Installation Charges	1,050.000	1,050.000	1,050.000	1,050.000	1,050.000	
Total Revenue	1,720,990.437	1,821,738.667	1,929,539.274	2,044,885.923	2,880,686.588	
Costs						
Technical Assistance						
Trans. Line & Substation Distribution Line						
Materials & Equipment						
Transmission Line Distribution Line						
Construction						
Inflation & Conting.						
Total Project Costs						
Operational Costs						
Energy Purchase	560,159.978	588,167.977	617,576.376	648,455.194	680,877.954	
Distr. to Consumers	37,522.678	39,398.812	41,368.752	43,437.190	45,609.050	
Maintenance	68,769.971	70,695.531	72,675.006	74,709.906	76,801.783	
Administration	3,449.940	3,484.440	3,519.284	3,554.477	3,590.022	
Margin (Debt Service)	127,550.000	127,550.000	127,550.000	127,550.000	127,550.000	
Total Operational Costs	797,452.568	829,296.759	862,689.418	897,706.767	934,428.808	
Total Costs	797,452.568	829,296.759	862,689.418	897,706.767	934,428.808	
Net Cash Flow	923,537.869	992,441.908	1,066,849.856	1,147,179.156	1,946,257.779	
						Discount Factor .10
						Net Present Value 798,459.77
						Internal Rate of Return 12.3 percent
						Payback Period 13 years

TABLE 2

SENSITIVITY ANALYSIS (Pessimistic)
PROJECT CASH FLOW (\$us.)

YEAR	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Revenue (\$us.)											
A. Medium Tariff(\$us/kwh)		0.085	0.090	0.095	0.100	0.105	0.110	0.110	0.110	0.110	0.110
B. [Produced Energy(mwh)]		7,336.000	7,959.000	8,745.000	9,577.000	10,331.000	10,890.440	11,489.041	12,129.544	12,814.882	13,548.193
Residential		1,139.000	1,282.000	1,548.000	1,885.000	2,104.000	2,104.000	2,104.000	2,104.000	2,104.000	2,104.000
Ind/Inst/Comm		5,996.000	6,468.000	6,980.000	7,466.000	7,992.000	8,551.440	9,150.041	9,790.544	10,475.882	11,209.193
Public Lights		201.000	209.000	217.000	226.000	235.000	235.000	235.000	235.000	235.000	235.000
Salvage Value											
Tariff Revenue (AxB)		623,560.000	716,310.000	830,775.000	957,700.000	1,084,755.000	1,197,948.400	1,263,794.488	1,334,249.002	1,409,636.988	1,490,301.277
Installation Charges		85,000.000	86,000.000	1,050.000	1,050.000	1,050.000	1,050.000	1,050.000	1,050.000	1,050.000	1,050.000
Total Revenue		708,560.000	802,310.000	831,825.000	958,750.000	1,085,805.000	1,198,998.400	1,264,844.488	1,335,299.002	1,410,686.988	1,491,351.277
Costs											
Technical Assistance	250,000.000										
Trans. Line & Substation	519,000.000										
Distribution Line	1,142,000.000										
Materials & Equipment	1,661,000.000										
Transmission Line	1,070,000.000										
Distribution Line	1,143,000.000										
Construction	2,213,000.000										
Inflation & Conting.	376,000.000										
Total Project Costs	4,500,000.000										
Operational Costs											
Energy Purchase		297,000.000	322,000.000	354,000.000	387,000.000	418,000.000	438,900.000	460,645.000	483,887.250	508,081.613	533,485.693
Distr. to Consumers		19,000.000	21,000.000	23,000.000	26,000.000	28,000.000	29,400.000	30,870.000	32,413.500	34,034.175	35,735.884
Maintenance		55,000.000	56,000.000	57,000.000	58,000.000	60,000.000	61,320.000	62,669.040	64,047.759	65,456.810	66,896.659
Administration		3,250.000	3,250.000	3,250.000	3,250.000	3,250.000	3,282.500	3,315.325	3,348.478	3,381.963	3,415.783
Margin (Debt Service)		50,000.000	50,000.000	50,000.000	50,000.000	50,000.000	50,000.000	50,000.000	50,000.000	50,000.000	50,000.000
Total Operational Costs		424,250.000	452,250.000	487,250.000	524,250.000	559,250.000	582,902.500	607,699.365	633,696.987	660,954.560	689,534.219
Total Costs	4,500,000.000	424,250.000	452,250.000	487,250.000	524,250.000	559,250.000	582,902.500	607,699.365	633,696.987	660,954.560	689,534.219
Net Cash Flow	(4,500,000.000)	284,310.000	350,060.000	344,575.000	434,500.000	526,555.000	616,095.900	657,145.123	701,602.815	749,732.428	801,817.059

TABLE 2 (Cont.)

PROJECT CASH FLOW (\$us.)

YEAR	1997	1998	1999	2000	2001	
Revenue (\$us.)						
A. Medium Tariff(\$us/kwh)	0.110	0.110	0.110	0.110	0.110	
B. [Produced Energy(mwh)]	14,332.837	15,172.406	16,070.744	17,031.966	18,060.474	
Residential	2,104.000	2,104.000	2,104.000	2,104.000	2,104.000	
Ind/Inst/Com	11,993.837	12,833.406	13,731.744	14,692.966	15,721.474	
Public Lights	235.000	235.000	235.000	235.000	235.000	
Salvage Value					712,379.750	(Salvage Value Added to Total Revenue)
Tariff Revenue (AxB)	1,576,612.067	1,668,964.612	1,767,781.834	1,873,516.263	1,986,652.101	
Installation Charges	1,050.000	1,050.000	1,050.000	1,050.000	1,050.000	
Total Revenue	1,577,662.067	1,670,014.612	1,768,831.834	1,874,566.263	2,700,081.851	
Costs						
Technical Assistance						
Trans. Line & Substation Distribution Line						
Materials & Equipment						
Transmission Line Distribution Line						
Construction						
Inflation & Conting.						
Total Project Costs						
Operational Costs						
Energy Purchase	560,159.978	588,167.977	617,576.376	648,455.194	680,877.954	
Distr. to Consumers	37,522.678	39,398.812	41,368.752	43,437.190	45,609.050	
Maintenance	68,769.971	70,695.531	72,675.006	74,709.906	76,801.783	
Administration	3,449.940	3,484.440	3,519.284	3,554.477	3,590.022	
Margin (Debt Service)	127,550.000	127,550.000	127,550.000	127,550.000	127,550.000	
Total Operational Costs	797,452.568	829,296.759	862,689.418	897,706.767	934,428.808	
Total Costs	797,452.568	829,296.759	862,689.418	897,706.767	934,428.808	
Net Cash Flow	780,209.499	840,717.853	906,142.417	976,859.496	1,765,653.043	
						Discount Factor .10
						Net Present Value 53,494.94
						Internal Rate of Return 10.2 percent
						Payback Period 15 years

TABLE 3

SENSITIVITY ANALYSIS
PROJECT CASH FLOW (\$us.)

(optimistic)

YEAR	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Revenue (\$us.)											
A. Medium Tariff(\$us/kwh)		0.085	0.095	0.105	0.115	0.125	0.135	0.135	0.135	0.135	0.135
B. [Produced Energy(mwh)]		7,336.000	7,959.000	8,745.000	9,577.000	10,331.000	10,890.440	11,489.041	12,129.544	12,814.882	13,548.193
Residential		1,139.000	1,282.000	1,548.000	1,885.000	2,104.000	2,104.000	2,104.000	2,104.000	2,104.000	2,104.000
Ind/Inst/Comm		5,996.000	6,468.000	6,980.000	7,466.000	7,992.000	8,551.440	9,150.041	9,790.544	10,475.882	11,209.193
Public Lights		201.000	209.000	217.000	226.000	235.000	235.000	235.000	235.000	235.000	235.000
Salvage Value											
Tariff Revenue (AxB)		623,560.000	756,105.000	918,225.000	1,101,355.000	1,291,375.000	1,470,209.400	1,551,020.508	1,637,488.394	1,730,009.031	1,829,006.113
Installation Charges		85,000.000	86,000.000	1,050.000	1,050.000	1,050.000	1,050.000	1,050.000	1,050.000	1,050.000	1,050.000
Total Revenue		708,560.000	842,105.000	919,275.000	1,102,405.000	1,292,425.000	1,471,259.400	1,552,070.508	1,638,538.394	1,731,059.031	1,830,056.113
Costs											
Technical Assistance	250,000.000										
Trans. Line & Substation	519,000.000										
Distribution Line	1,142,000.000										
Materials & Equipment	1,661,000.000										
Transmission Line	1,070,000.000										
Distribution Line	1,143,000.000										
Construction	2,213,000.000										
Inflation & Conting.	376,000.000										
Total Project Costs	4,500,000.000										
Operational Costs											
Energy Purchase		297,000.000	322,000.000	354,000.000	387,000.000	418,000.000	438,900.000	460,845.000	483,887.250	508,081.613	533,485.693
Distr. to Consumers		19,000.000	21,000.000	23,000.000	26,000.000	28,000.000	29,400.000	30,870.000	32,413.500	34,034.175	35,735.884
Maintenance		55,000.000	56,000.000	57,000.000	58,000.000	60,000.000	61,320.000	62,669.040	64,047.759	65,456.810	66,896.859
Administration		3,250.000	3,250.000	3,250.000	3,250.000	3,250.000	3,282.500	3,315.325	3,348.478	3,381.963	3,415.783
Margin (Debt Service)		50,000.000	50,000.000	50,000.000	50,000.000	50,000.000	50,000.000	50,000.000	50,000.000	50,000.000	50,000.000
Total Operational Costs		424,250.000	452,250.000	487,250.000	524,250.000	559,250.000	582,902.500	607,699.365	633,696.987	660,954.560	689,534.219
Total Costs	4,500,000.000	424,250.000	452,250.000	487,250.000	524,250.000	559,250.000	582,902.500	607,699.365	633,696.987	660,954.560	689,534.219
Net Cash Flow	(4,500,000.000)	284,310.000	389,855.000	432,025.000	578,155.000	733,175.000	889,356.900	944,371.143	1,004,841.406	1,070,104.471	1,140,521.894

TABLE 3 (Cont.)

PROJECT CASH FLOW (\$us.)

YEAR	1997	1998	1999	2000	2001		
Revenue (\$us.)							
A. Medium Tariff(\$us/kwh)	0.135	0.135	0.135	0.135	0.135		
B. [Produced Energy(mwh)]	14,332.837	15,172.406	16,070.744	17,031.966	18,060.474		
Residential	2,104.000	2,104.000	2,104.000	2,104.000	2,104.000		
Ind/Inst/Comm	11,993.837	12,833.406	13,731.744	14,692.966	15,721.474		
Public Lights	235.000	235.000	235.000	235.000	235.000		
Salvage Value					712,379.750	(Salvage Value Added to Total Revenue)	
Tariff Revenue (AxB)	1,934,932.991	2,048,274.751	2,169,550.433	2,299,315.413	2,438,163.942		
Installation Charges	1,050.000	1,050.000	1,050.000	1,050.000	1,050.000		
Total Revenue	1,935,982.991	2,049,324.751	2,170,600.433	2,300,365.413	3,151,593.692		
Costs							
Technical Assistance							
Trans. Line & Substation Distribution Line							
Materials & Equipment							
Transmission Line Distribution Line							
Construction							
Inflation & Conting.							
Total Project Costs							
Operational Costs							
Energy Purchase	560,159.978	588,167.977	617,576.376	648,455.194	680,877.954	Discount Factor	.10
Distr. to Consumers	37,522.678	39,398.812	41,368.752	43,437.190	45,609.050	Net Present Value	1,670,534.77
Maintenance	68,769.971	70,695.531	72,675.006	74,709.906	76,801.783	Internal Rate of Return	14.4 percent
Administration	3,449.940	3,484.440	3,519.284	3,554.477	3,590.022	Payback Period	11 years
Margin (Debt Service)	127,550.000	127,550.000	127,550.000	127,550.000	127,550.000		
Total Operational Costs	797,452.568	829,296.759	862,689.418	897,706.767	934,428.808		
Total Costs	797,452.568	829,296.759	862,689.418	897,706.767	934,428.808		
Net Cash Flow	1,138,530.424	1,220,027.992	1,307,911.015	1,402,658.646	2,217,164.884		

D. Economic Analysis

A primary assumption underlying the economic feasibility of the proposed electrification project amendment is that once road construction between the Chapare and the Santa Cruz region is completed, an immediate surge of commerce and investment will take place. Chapare farmers will be able to transport produce directly to larger markets in Santa Cruz, thereby reducing the intermediaries' profit margins and increasing the personal incomes of local producers. Likewise, the increased demand for products and services within the Chapare will encourage Santa Cruz producers and suppliers to commercialize more of their products in that region. Therefore, the proposed Chapare rural electrification system will enhance private sector investment and agricultural production and improve living conditions in the Chapare. This initiative will be supported and strengthened by the construction of the Chapare-Santa Cruz highway now underway with IDB financing.

Two types of economic benefits are considered within the project economic analysis: the direct benefits measured by net revenues received under the project (as presented in the Project Cash Flow Statement) and other benefits external to the project executing agencies received by the consumer of electricity and referred to as "surplus benefits." *

Given the two broad categories of Project consumers (i.e. domestic and commercial), there exist three basic types of surplus benefits which are applicable to each category of consumer:

1. Quantifiable Benefits: The reduced cost of electrical energy compared with alternative energy sources for providing the same service (electric lighting, power machinery, water pumping, etc.);
2. Social Benefits: The additional value placed on higher quality, availability, and dependability of service.
3. Productivity Benefits: The excess value to the consumer of an incremental increase in services over the incremental cost of that service.

These three surplus benefits are in addition to the direct benefits derived by the project (i.e. the amounts paid for electricity).

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* Methodological Note: The aggregate benefits of this rural electrification project are the sum of revenues to ENDE (direct benefits) and consumers' surplus benefits. The revenues are based directly on accounting statements and future projections of costs, prices and demand. An estimate of surplus benefits is dependent on sample studies of each use of electricity and its substitutes, to determine the average surplus for each category of consumer. Findings from studies made in other countries were used in arriving at the following calculations.

a. Domestic Consumer Surplus Benefits

The first of three considerations for estimating domestic surplus benefits is the quantifiable, monetary savings resulting from the reduced cost of using electricity as compared to alternative power sources. The cost comparisons include the amortized cost of connection as well as the cost of power itself. Typically, in newly electrified rural communities, the first uses of electricity are for electric lighting (all houses will utilize electricity) and electric irons (perhaps 50 percent) followed by uses for electric radios and refrigerators (20 to 40 percent), and finally electric powered sewing machines and stoves (less than 10 percent). In poor communities, only one-fifth of the households would have more than electric lights and an iron.

However, it has not been firmly established by economic data that domestic consumers use electrical power primarily to save money. The evidence demonstrates that household use of electricity is primarily based on non-monetary reasons. This was confirmed in a survey conducted in a Honduran village where respondents stated they wanted electric power because of its convenience, quality, reliability and continual availability. In no case was cost considered. The relatively low weight given to expected cost savings was also documented in an AID sponsored study of several communities in Costa Rica and Brazil.

The second consideration of surplus social benefits requires that a value be placed on qualitative improvements. A measure of this benefit is what the consumer would be willing to pay, over and above what ENDE will charge for the service. An indication of this differential is the higher rate that consumers have actually paid in various areas of the country which are serviced by municipal or private systems.

Lacking specific data as to what this price differential might be for consumers served by the project, it is most likely that some customers disposed to subscribing to the minimum service would not be willing to pay higher prices than those charged by ELFEC. Therefore, surplus benefits related to qualitative or social improvements, although real in nature, are not sufficient enough to be quantified above the actual tariff charged to consumers.

A third estimate of consumer surplus benefits is based on productivity increases measured by the excess value to the consumer of an incremental increase in service compared to the incremental cost. An example of this would be initially replacing one kerosene lamp with the equivalent of one 25 watt light bulb used 3 hours a night. Subsequently, as a result of the higher value placed on the light bulb, a service might be extended to 5 hours per night, the wattage of the bulb might be increased to 50 and/or additional bulbs might be used. The additional service would be valued by the consumer more than the price paid to ELFEC.

Thus, an estimate of the domestic consumer's surplus benefit amounting to approximately 100 percent of the rate paid to ELFEC would not appear to be too high. 1/ However, given the dearth of realistic data, and based on the conservative approach taken in this analysis, an average surplus value would probably be lower than 100 percent in most instances applicable to the project.

b. Commercial Consumer Surplus Benefits

The commercial users' surplus benefits are much more conducive to measurement than those of domestic consumers. Essentially, the benefit to the productive user is equivalent to the change in operational costs and resultant profitability when project-provided energy is substituted for an alternative source (diesel generated power, for example). (See Annex D).

The productive uses of electricity will cover a wide range of activities, including such home industries as corn grinding, weaving and other cottage industries; a diversity of small services, processing and manufacturing services; larger industries; privately and publically owned water pumps for potable and sanitary systems; and pumps for irrigation and machinery for other farm uses. In addition, cases where an economic activity cannot take place at all without electrical energy (such as the retail sale of frozen foodstuffs which requires use of cold storage powered by electricity) the total net profit to the enterprise is considered a surplus benefit.

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1/ This was the estimate for a group of rural villages in El Salvador in an unpublished report prepared by the World Bank, "Costs and Benefits of Rural Electrification - a case study in El Salvador. Central Projects Staff Public Utilities Department". The study is an internal document, not for distribution.

To quantify the change in profits that would result from switching from an alternative power source to electricity, a sample survey was undertaken from a representative range of productive users in El Salvador. 1/ It was estimated that surplus benefits for small productive users amounted to approximately 93 percent of electricity charges, and to about 31 percent for large productive users. The average for farm and agroindustrial consumers was estimated to be 162 percent of electricity charges, not taking into consideration qualitative benefits.

Although costs vary from country to country, the basic relationships underlying these estimates for El Salvador are assumed to be similar to those in other developing countries, and therefore the results should be roughly similar.

c. Quantification of Surplus Benefits

A value of 25 percent was selected to represent surplus benefits for both domestic and productive users. This value is not an estimate of actual value. It is, rather, an estimate of minimum value based on the limited data at hand and experience garnered in other countries. As such, the direct benefits of the project (ENDE's net revenues) only partially account for the project's economic benefits which should be increased substantially (possibly by as much as 60-100 percent) by taking into account the quantitative and qualitative aspects of consumer's surplus. The following table shows how the project's net cash flows are increased given an additional 25 percent increase in surplus project benefits. Based on these additional benefits, the project's adjusted IRR would be 18.3 percent, with a payback period of 9 years.

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1/ World Bank, Ibid.

TABLE 4

Project Internal Rate of Return Adjusted for Surplus Benefits

Year	Residential Com/Indus. Municipal (KWh)	X.25	Base Case Economic Net Cash Flow (\$US)	Adjusted Net Cash Flow
1987	7,336	1,834	284,310	440,200
1988	7,959	1,989	389,855	587,881
1989	8,745	2,186	432,025	661,581
1990	9,577	2,394	530,270	793,637
1991	10,331	2,582	629,865	926,881
1992	10,890	2,722	725,000	1,051,713
1993	11,489	2,872	772,035	1,116,707
1994	12,129	3,023	822,898	1,186,784
1995	12,814	3,203	877,881	1,262,328
1996	13,548	3,387	937,298	1,343,745
1997	14,332	3,583	923,537	1,353,523
1998	15,172	3,793	992,441	1,447,614
1999	16,070	4,017	1,066,849	1,548,972
2000	17,031	4,257	1,147,179	1,658,138
2001	18,060	4,515	1,946,257	2,488,072

IRR = 18.3 percent
Payback Period = 9 yrs.

d. Additional Intangible Benefits

There are additional intangible benefits which arise from electrification that improve the quality of life of the rural poor but which do not lend themselves well to quantification. These benefits occur at both the household and community levels within the target group.

At the household level, electricity will lengthen the time available for productive work. Because cultural mores require that most Bolivian women in the Chapare spend the major portion of their daylight hours on such tasks as food preparation, farm work and child care, they

have little time for additional income-producing activities such as weaving and other handicrafts. With electricity, women will be able to weave in the evenings with reduced eye strain. Weavers report that a sweater or small rug valued at \$25 or \$30, requires between three to six weeks to complete. 1/ With electric lighting, production time will be reduced and, by extension, household incomes increased. Electric irons will decrease the drudgery of housework for rural women. Electrically powered corn grinders, which are likely to be installed in the community, can save women as much as three hours a day in labor time. Radios will add a source of entertainment, news, and education, and children will be able to study their lessons at night.

At the community level, electricity will make a contribution to the improved health of the target group by making feasible low-cost pumping of potable water, refrigeration of medicines and certain foods, and sterilization of medical instruments in health posts. Adult education courses can be offered in the evenings, thereby affording people education without the cost and separation from family necessary for attending schools in urban areas.

The decreasing demand for charcoal due to the introduction of electric irons will lead to less cutting of trees, which will save resources for future, profitable exploitation as well as help reduce erosion. Street lighting will contribute to the safety of residents. Moreover, electricity will facilitate the organization of recreation, entertainment, and civic and religious activities after dark.

The target group will also benefit from the opening of new employment possibilities. In a town with electricity, a large number of businesses and kiosks are run by women, and there is no reason to assume that the pattern will not be the same in the communities affected by this project. The same result can be predicted for tailor and seamstress occupations. Economically, therefore, women will benefit from these new employment opportunities.

1/ Information supplied by Dr. James Converse, Department of Rural Sociology, Cornell University, based on personal interviews.

In summary, target group members will benefit from this project by adopting electricity for productive uses. A recent village electricity utilization study conducted in Latin America showed that 15 percent of low income workers claim to use electricity in their work. The non-user responses indicate that target group members recognize the potential for applying electricity to work uses. This high rate of adoption for productive purposes by the target group (compared to productive uses found in evaluations of rural electrification projects elsewhere in the developing world) may be partially explained by the high level of artisan activity and cottage industries found among Latin American poor rural residents.

E. Social Analysis

The successful implementation of rural electrification projects in Bolivia has had a dramatic effect on creating employment opportunities, stimulating productivity and increasing the profitability of commercial and industrial enterprises. In the rural areas of Santa Cruz, and in other areas of developing countries, evaluations have shown that rural electrification commonly creates new jobs in such fields as the repair of electrical appliances, wire installation services and cold storage facility operation and maintenance. The electrification of a working environment significantly improves the quality of employee work and increases job satisfaction through the provision of lighting, heating or cooling and the convenience and efficiency of using power tools and machines. For example, saw mill operators and corn and rice mill owners can demonstrate that their businesses are more profitable because of the use of electrically operated machinery and the ability to work additional hours after dusk. In a similar manner, managers of plaza kiosks, local general stores and other small business owners state that business has improved because they can now provide services in the evening hours. Store and restaurant owners also report that electrically operated refrigerators enable them to preserve perishable foodstuffs for much longer periods of time. In the absence of electrification, such conditions and supplementary employment opportunities do not exist.

Thus, a reliable, affordable source of electric power will enable rural families in the Chapare project area to increase their income earning options and provide for a better standard of living, by making productive use of electricity in the home, on the farm and in commercial and industrial enterprises. Families located in the project area will benefit from improved living conditions and a reduction of household drugery (with the addition of small electric appliances and pumped water for cooking and washing). In addition, rural enterprises and other industry will be attracted to the project area given the supply of electrical energy, thereby generating additional employment for low-income families.

Other qualitative social benefits will arise as a result of the electrification project, such as those made possible because of improved health services and expanded educational opportunities. The reliability of electricity is a key factor in meeting the critical needs for medical surgery and diagnostic services, as well as the preservation of certain medical supplies and serums. In rural medical clinics and health posts which are dependent upon diesel-fueled power generators, there is realistic concern over not having proper maintenance and repair of the motorized equipment. Furthermore, preventive health care measures which reduce worker morbidity rates attributable to illnesses such as gastro-intestinalitis are greatly enhanced by potable water and deep well systems, which are largely dependent on an efficient, electrically powered pumping capability.

One of the major constraints to expanding educational opportunities for adults in rural areas is the absence of electricity to provide lighting for late afternoon and evening classes. Many classroom facilities in the Chapare are utilized for two or three types of educational programs. These programs include primary school and adult literacy classes employing rotational sessions which at times extend sixteen hours a day, twelve months a year, and require a permanent source of electrical power to be able to provide effective instruction and training.

For these reasons, the proposed Chapare electrification project will meet the urgent need for a dependable and affordable source of power to complement and advance many of the region's socially-oriented activities.

F. Environmental Examination Summary

An Initial Environmental Examination was undertaken for the Project Amendment by the Regional Environmental Management Specialist (REMS). A negative determination was made by the REMS on January 18, 1985 (see Annex C).

General

The project, as a rural electrification effort limited to the construction and installation of both primary transmission lines and a secondary distribution system with no thermal generation elements, has no significant adverse environmental impact. The potential for adverse effects, however, are addressed below.

1. Assessment of Potential Impact

a. Short Term Effects

Short term effects are essentially those imposed on the environment during the construction stages of the project. Since construction activities will be limited to the installation of poles and wire in rural areas, no detrimental impact is anticipated. Existing physical land characteristics and foliage will be little disturbed, and there is no chance of affecting native ecological systems.

b. Long Term Effects

To the extent that the proposed electrical service will stimulate the growth of industry, these industries will be relatively small with a limited potential for pollution. Most of the industrial entrepreneurs benefitting from the project will be dispersed in sparsely populated areas, such that the environment can absorb the resulting impact without notable damage.

The electrical service is also expected to increase the growth of agriculture by stimulating farm production and facilitating better water usage and control systems. This would tend to minimize adverse effects on soil, such as erosion, and preserve existing land contours which in itself is a positive environmental effect.

The electric distribution lines may be viewed as unsightly and thus a disturbance to the countryside. However, this must be considered a relatively low price to pay for the overall economic and social benefits realized from the system.

2. Commitment of Resources

National resources irreversibly committed during the implementation of the project are limited to lands in rural areas that will serve as right-of-way clearances for distribution lines. The area committed will consist of long, narrow strips of land between poles that could be developed in the future for agricultural purposes.

The Santa Isabel and San José substations are fairly isolated and will not interfere with existing life or environmental activity. The substations at Huaracacni, Villa Tunari and Chimoré are in built-up areas and transformer noise is not expected to adversely affect the surrounding populated areas.

The combined cycle plant at Huaracachi will not increase noise pollution beyond what is already caused by the gas turbines. The cooling towers will produce noticeable water vapor; however, no discomfort will be caused as a result of the vapor. Small quantities of more heavily mineralized water will be released from the cooling towers and from the boilers, and will be disposed of in storm sewers. This water is not considered dangerous or noxious.

Finally, the expansion of the transformer stations will not cause adverse environmental effects. The transmission and subtransmission lines will have no discernable impact other than a visual one, no environmental damage or pollution will be caused during construction, and no individuals will be displaced by the newly constructed facilities.

VI. CONDITIONS AND COVENANTS

A. Conditions Precedent to Disbursement for the Electrification Subproject

1. Prior to any disbursement of the Assistance, or the issuance by AID of documentation pursuant to which disbursement will be made to finance the Chapare Electrification component of the Project, Bolivia will, except as A.I.D. may otherwise agree in writing, furnish to A.I.D. in form and substance satisfactory to A.I.D.:

a. A legal opinion of the Attorney General of Bolivia, or other legal counsel acceptable to A.I.D., to the effect that project loan agreement amendment No. 2 has been duly authorized and/or ratified by the Borrower and executed on its behalf and that it constitutes a valid and legally binding obligation of the Borrower in accordance with all its terms.

b. A certified statement of the name of the person(s) authorized under the loan agreement to act as Borrower's representative under the agreement, with authenticated specimen signature(s) of said representative(s).

B. Conditions Precedent to Subsequent Disbursements

1. Prior to disbursement of the Assistance, or the issuance by AID of documentation pursuant to which disbursement will be made to finance other than technical assistance costs for the Chapare Electrification components, Bolivia will, except as A.I.D. may otherwise agree to in writing, furnish to A.I.D. in form and substance satisfactory to A.I.D.:

a. A financial plan for the Subproject, accompanied by a letter from the Ministry of Finance detailing the GOB's contribution during the life of the project.

b. A detailed implementation and evaluation plan covering the first year of Subproject activities which shall include a description of ENDE's procurement procedures, and construction and installation schedule.

c. A time-phased plan for the delivery of all construction equipment and materials from ENDE's storage facility in Santa Cruz, to the warehouse in Cochabamba and delivery to project sites.

C. Special Covenants

1. The Cooperating Country, except as A.I.D. shall otherwise agree in writing, shall covenant that:

a. In conjunction with representatives from USAID, periodically review the ENDE tariff structure for the purpose of gradually eliminating the subsidized tariffs charged to Bolivian nationalized corporations and ensuring that private sector tariffs being charged are adequate to cover the cost of operation and maintenance and provide for a self-supportive system of electrical transmission and distribution.

b. It will continue to provide budgetary support to ENDE at a level which is adequate to continue the system of regular maintenance and to cover any costs of maintenance which have not been assumed by the beneficiaries.

c. It will provide funds necessary to continue the construction and maintenance of the electrification system in the same geographic area as the Subproject, for a minimum of five years after Subproject completion.

5 C (1) - COUNTRY CHECKLIST

Listed below are statutory criteria applicable generally to FAA funds, and criteria applicable to individual fund sources: Development Assistance and Economic Support Fund.

A. GENERAL CRITERIA FOR COUNTRY ELIGIBILITY

1. GENERAL CRITERIA FOR COUNTRY ELIGIBILITY

1. FAA Sec. (481). Has it been determined that the government of the recipient country has failed to take adequate steps to prevent narcotic drugs and other controlled substances (as defined by the Comprehensive Drug Abuse Prevention and Control Act of 1970) produced or processed, in whole or in part, in such country, or transported through such country, from being sold illegally within the jurisdiction of such country to U.S. Government personnel or their dependents, or from entering the U.S. unlawfully?
2. FAA Sec. 620(c). If assistance is to a government, is the government liable as debtor or unconditional guarantor on any debt to a U.S. citizen for goods or services furnished or ordered where (a) such citizen has exhausted available legal remedies and (b) the debt is not denied or contested by such government?
- .. FAA Sec. 620(e)(1). If assistance is to a government, has it (including government agencies or subdivisions) taken any action which has the effect of nationalizing, expropriating, or otherwise seizing ownership or control of property of U.S. citizens or entities beneficially owned by them without taking steps to discharge its obligations toward such citizens or entities?

In 1983, Bolivia signed a series of agreements with the United States Government to reduce the illegal production of coca and control narcotics trafficking. This project will be an integral part of that effort to strengthen the effectiveness of the narcotics control program. In addition during 1984, Bolivia has taken firm action using the armed forces and the Police organization to enforce measures prohibiting the illegal growing of coca and narcotics trafficking.

No.

No.

4. FAA Sec. 532(c), 620(a), 620 (f), 620D; FY 1982 Appropriation Act Secs. 512 and 513. Is recipient country a Communist country? Will assistance be provided to Angola, Cambodia, Cuba, Laos, Vietnam, Syria, Libya, Iraq, or South Yemen? Will assistance be provided to Afghanistan or Mozambique without a waiver? No.
5. ISDCA of 1981 Secs. 724, 727 and 730. For specific restrictions on assistance to Nicaragua, see Sec. 724 of the ISDCA of 1981. For specific restrictions on assistance to El Salvador, see Secs. 727 and 730 of the ISDCA of 1981. N/A
6. FAA Sec. 620(j). Has the country permitted, or failed to take adequate measures to prevent, the damage or destruction by mob action of U.S. property? No.
7. FAA Sec. 620(l). Has the country failed to enter into an agreement with OPIC? Yes. Bolivia is a member of the Andean Pact
8. FAA Sec. 620(o); Fishermen's Protective Act of 1967, as amended, Sec. 5. (a) Has the country seized, or imposed any penalty or sanction against, any U.S. fishing activities in international waters? No.
- (b) If so, has any deduction required by the Fishermen's Protection Act been made.
9. FAA Sec. 620(a); FY 1982 Appropriation Act. Sec. 517, (a) Has the government of the recipient country been in default for more than six months on interest or principal of any AID loan to the country? No.

(b) Has the country been in default for more than one year on interest or principal on any U.S. loan, under a program for which the appropriation bill appropriates funds?

No.

10. FAA Sec. 620(s). If contemplated assistance is development loan or from Economic Support Fund, has the Administrator taken into account the amount of foreign exchange or other resources which the country has spent on military equipment? (Reference may be made to the annual "Taking into Consideration" memo: "Yes, taken into account by the Administrator at time of approval of Agency OYB." This approval by the Administrator of the Operational Year Budget can be the basis for an affirmative answer during the fiscal year unless significant changes in circumstances occur.)

Yes.

11. FAA Sec. 620(t). Has the country severed diplomatic relations with the United States? If so, have they been resumed and have new bilateral assistance agreements been negotiated and entered into since such resumption?

No.

12. FAA Sec. 620(u). What is the payment status of the country's U.N. obligations? If the country is in arrears, were such arrearages taken into account by the AID Administrator in determining the current AID Operational Year Budget? (Reference may be made to the "Taking into Consideration" memo.)

No arrearages.

13. FAA Sec. 620A; FY 1982 Appropriation Act Sec. 520. Has the country aided or abetted, by granting sanctuary from prosecution to, any individual or group which has committed an act of international terrorism? Has the country aided or abetted, by granting sanctuary from prosecution to, any individual or

No.

group which has committed a war crime?

14. FAA Sec. 666. Does the country object, on the basis of race, religion, national origin or sex, to the presence of any officer or employee of the U.S. who is present in such country to carry out economic development programs under the FAA?

No.

15. FAA Sec. 669, 670. Has the country, after August 3, 1977, delivered or received nuclear enrichment or re-processing equipment, materials, or technology, without specified arrangements or safeguards? Has it transferred a nuclear explosive device to a non-nuclear weapon state, or if such a state, either received or detonated a nuclear explosive device, after August 3, 1977? (FAA SEC.620E permits a special waiver of Sec. 669 for Pakistan.)

No.

16. ISDCA of 1981 Sec. 720. Was the country represented at the Meeting of Ministers of Foreign Affairs and Heads of Delegations of the Non-Aligned Countries to the 36th General Session of the General Assembly of the U.N. of Sept. 25 and 28, 1981, and failed to disassociate itself from the communique issued? If so, has the President taken it into account? (Reference may be made to the Taking into Consideration memo.)

Bolivia was represented at the Meeting of Ministers by the Torrelio Government. It did not formally disassociate itself from the communique issued.

17. ISDCA of 1981 Sec. 721. See special requirements for assistance to Haiti.

N/A

V. FUNDING SOURCE CRITERIA FOR COUNTRY ELIGIBILITY

1. Development Assistance Country Criteria

- a. FAA Sec. 116. Has the

Department of State determined that this government has engaged in a consistent pattern of gross violations of internationally recognized human rights? If so, can it be demonstrated that contemplated assistance will directly benefit the needy?

No.

2. Economic Support Fund Country Criteria

a. FAA Sec. 502B. Has it been determined that the country has engaged in a consistent pattern of gross violations of internationally recognized human rights? If so, has the country made such significant improvements in its human rights record that furnishing such assistance is in the national interest?

N/A

b. ISDCA of 1981, Sec. 725(b). If ESF is to be furnished to Argentina, has the President certified that (1) the Govt. of Argentina has made significant progress in human rights; and (2) that the provision of such assistance is in the national interest of the U.S.?

N/A

c. ISDCA of 1981, Sec. 726(b). If ESF assistance is to be furnished to Chile, has the President certified that 1) the Govt. of Chile has made significant progress in human rights; (2) it is in the national interest of the U.S.; and (3) the Govt. of Chile is not aiding international terrorism and has taken steps to bring to justice those indicted in connection with the murder of Orlando Letelier?

No.

PROJECT CHECKLIST

A. General Criteria for Project

1. FY 1982 Appropriation Act, Sec. 523
FAA Sec. 634A; Sec. 653(b).

(a) Describe how authorization and appropriations committees of Senate and House have been or will be notified concerning the project;
(b) Is assistance within (Operational Year Budget) country or international organization allocation reported to Congress (or not more than \$1 million over that amount)?

Committees will be notified using normal congressional notification procedures.

No. Congress has been advised.

2. FAA Sec. 611(a)(1). Prior to obligation in excess of \$100,000, will there be (a) engineering, financial or other plans necessary to carry out the assistance and (b) a reasonably firm estimate of the cost to the U.S. of the assistance?

Yes.

Yes.

3. FAA Sec. 611(a)(2). If further legislative action is required within recipient country, what is basis for reasonable expectations that such action will be completed in time to permit orderly accomplishment of purpose of the assistance?

GOB has agreed to issue required Decree as scheduled.

4. FAA Sec. 611(b); FY 1981 Appropriation Act, Sec. 501. If for water or water-related land resource construction, has project met the standards and criteria as set forth in the Transfer and Standards to Planning Water and Land Resources, dated October 15, 1978? (See AID Handbook 1 for new guidelines.)

Yes.

5. FAA Sec. 611(c). If project is capital assistance (e.g. construction), and all U.S. assistance for it will exceed \$1 million, has Mission Director certified and Regional Assistant Administrator taken into consideration the country's capability effectively to maintain and utilize the project?

Yes.

6. FAA Sec. 209. Is project susceptible to execution as part of regional or multilateral project? If so, why is project not so executed? Information and conclusion whether assistance will encourage regional development programs.
- Yes. The GOB is negotiating with the Interamerican Development Bank concerning financing
7. FAA Sec. 601(a). Information and conclusions whether project will encourage efforts of the country to: (a) increase the flow of international trade; (b) foster private initiative and competition; and (c) encourage development and use of cooperatives, and credit unions, and savings and loan associations; (d) discourage monopolistic practices; (e) improve technical efficiency of industry, agriculture and commerce; and (f) strengthen free labor unions.
- Project will encourage efforts in all of the noted areas, but (f).
8. FAA Sec. 601(b). Information and conclusions on how project will encourage U.S. private trade and investment abroad and encourage private U.S. participation in foreign assistance programs (including use of private trade channels and the services of U.S. private enterprise).
- Private U.S. suppliers may sell goods to project.
9. FAA Sec. 612(b), 636(h); FY 1982 Appropriation Act, Sec. 507. Describe steps taken to assure that, to the maximum extent possible, the country is contributing local currencies to meet the cost of contractual and other services, and foreign currencies owned by the U.S. are utilized in lieu of dollars.
- Bolivia will provide of total project costs. There are no U.S. owned local currencies.
10. FAA Sec. 612(d). Does the U.S. own excess foreign currency of the country and, if so, what arrangements have been made for its release?
- No.
11. FAA Sec. 601(e). Will the project utilize competitive selection procedures for the awarding of contracts, except where applicable procurement rules allow otherwise?
- Yes.

- 12. FY 1982 Appropriation Act, Sec. 521.
If assistance is for the production of any commodity for export, is the commodity likely to be in surplus on world markets at the time, and is such assistance likely to cause substantial injury to U.S. producers of the same, similar or competing commodity? No.

- 13. FAA 118(c) and (d). Does the project comply with the environmental procedures set forth in AID Regulation 16? Does the project or program take into consideration the problem of the destruction of tropical forests? Yes.
Yes.

- 14. FAA 121 (d). If a Sahel project, has a determination been made that the host government has an adequate system for accounting for and controlling receipt and expenditures of project funds (dollars or local currency generated therefrom)? N/A

B. Funding Criteria for Project

1. Development Assistance Project Criteria

- a. FAA Sec. 102(b), 111, 113, 281(a).
Extent to which activity will (a) effectively involve the poor in development, by extending access to economy at local level, increasing labor-intensive production and the use of appropriate technology, spreading investment out from cities to small towns and rural areas, and insuring wide participation of the poor in the benefits of development on a sustained basis, using the appropriate U.S. institutions; (b) help develop cooperatives, especially by technical assistance, to assist rural and urban poor to help themselves toward better life, and otherwise encourage democratic private and local governmental institutions; (c) support the self-help efforts of developing

countries; (d) promote the participation of women in the national economies of developing countries and the improvement of women's status; and (e) utilize and encourage regional cooperation by developing countries?

Project will have a direct impact in all these items with the exception of "e".

- b. FAA Sec.103, 103A, 104, 105, 106. Does the project fit the criteria for the type of funds (functional account) being used? Yes.
- c. FAA Sec.107. Is emphasis on use of appropriate technology (relatively smaller, cost-saving, labor-using technologies that are generally most appropriate for the small farms, small businesses, and small incomes of the poor)? Yes.
- d. FAA Sec.110(a). Will the recipient country provide at least 25% of the costs of the program, project, or activity with respect to which the assistance is to be furnished (or is the latter cost-sharing requirement being waived for a "relatively least developed" country)? Yes.
- e. FAA Sec.110(b). Will grant capital assistance be disbursed for project over more than 3 years? If so, has justification satisfactory to Congress been made, and efforts for other financing, or is the recipient country "relatively least developed"? (M.C. 1232.1 defined a capital project as "the construction", expansion, equipping or alteration of a physical facility or facilities financed by AID dollar assistance of not less than \$100,000, including related advisory managerial and training services, and not undertaken as part of a project of a predominantly technical assistance character. No.

f. FAA Sec. 122(L). Does the activity give reasonable promise of contributing to the development of economic resources, or to the increase of productive capacities and self-sustaining economic growth?

Yes.

g. FAA Sec. 281(b). Describe extent to which program recognizes the particular needs, desires, and capacities of the people of the country; utilizes the country's intellectual resources to encourage institutional development, and supports civil education and training in skills required for effective participation in governmental processes essential to self-government.

Project will meet Bolivia's need to reduce illicit coca production and to expand agricultural and industrial productivity. Bolivia's research and education institutions will be used.

2. Development Assistance Project Criteria
(Loans Only)

a. FAA Sec. 122 (b). Information and conclusions on capacity of the country to repay the loan, at a reasonable rate of interest.

Bolivia has demonstrable problems in repayment of new short-term debt credits, such a long term loan as the proposed project poses no difficulty.

b. FAA Sec. 620(d). If assistance is for any productive enterprise which will compete with U.S. enterprises, is there an agreement by the recipient country to prevent export to the U.S. of more than 20% of the enterprise's annual production during the life of the loan?

N/A

ISDCA of 1981, Sec. 724(c) and (d). If for Nicaragua, does the loan agreement require that the funds be used to the maximum extent possible for the private sector? Does the project provide for monitoring under FAA Sec. 624(g)?

N/A

Economic Support Fund Project Criteria

a. FAA Sec. 53i(a). Will this assistance promote economic or political stability? To the extent possible, does it reflect the policy directions of FAA Section 102?

N/A

- b. FPA Sec. 531(c). Will assistance under this Chapter be used for military, or paramilitary activities? N/A
- c. FPA Sec. 534. Will ESP funds be used to finance the construction of the operation or maintenance of, or the supplying of fuel for, a nuclear facility? If so, has the President certified that such use of funds is indispensable to non-proliferation objectives? N/A
- d. FPA Sec. 609. If commodities are to be granted so that sale proceeds will accrue to the recipient country, have Special Accounts (counterpart) arrangements been made? N/A

STANDARD ITEM CHECKLIST

A. Procurement

1. FAA Sec. 602. Are there arrangements to permit U.S. small businesses to participate equitably in the furnishing of commodities and services financed?

Yes.

2. FAA Sec. 604(a). Will all procurement be from the U.S. except as otherwise determined by the President or under delegation from him?

Yes.

3. FAA Sec. 604 (d), If the cooperating country discriminates against marine insurance companies authorized to do business in the U.S., will commodities be insured in the United States against marine risk with such a company?

Bolivia does not so discriminate.

4. FAA Sec. 604 (e); ISDCA of 1980 Sec. 705(a). If offshore procurement of agricultural commodity or product is to be financed, is there a provision against such procurement, when the domestic price of such commodity is less than parity? (Exception where commodity financed could not reasonably be procured in U.S.)

N/A

5. FAA Sec. 604(g). Will construction or engineering services be procured from firms of countries otherwise eligible under Code 942, but which have attained a competitive capability in international markets in one of these areas?

No.

Sec. 901. Is the shipping excluded from compliance with requirement in Section 901(b) of the Merchant Marine Act of 1936, as amended, that at least 50 percentum of the gross tonnage of commodities (computed separately for dry bulk carriers, dry cargo liners, and tankers) financed, shall be transported on privately owned U.S. flag commercial vessels to the extent that such vessels are available at fair and reasonable rates.

No.

7. FAA Sec. 621. If technical assistance is financed, will such assistance be furnished by private enterprise on a contract basis to the fullest extent practicable? If the facilities of other Federal Agencies will be utilized, are they particularly suitable, not competitive with private enterprise, and made available without undue interference with domestic programs?

Yes.

8. International Air Transport. Fair Competitive Practices. Act. 1974. If air transportation of persons or property is financed on grant basis, will U.S. carriers be used to the extent such service is available?

Yes.

9. FY 1982 Appropriation Act Sec. 504. If the U.S. Government is a party to a contract for procurement, does the contract contain a provision authorizing termination of such contract for the convenience of the United States?

Yes.

B. Construction

1. FAA Sec. 601(d). If capital (e.g. construction) project, will U.S. engineering and professional services be used?

No. Local procurement will be used.

2. FAA Sec. 611(c). If contracts for construction are to be financed, will they be let on a competitive basis to maximum extent practicable?

Yes.

3. FAA Sec. 620(k). If for construction of productive enterprise, will aggregate value of assistance to be furnished by the U.S. not exceed \$100 million (except for productive enterprises in Egypt that were described in the CP)?

N/A

C. Other Restrictions

1. FAA Sec. 122(b). If development loan, is interest rate at least 2% per annum during grace period and at least 3% per annum thereafter?

Yes.

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- 2. FAA Sec. 301(d). If fund is established solely by U.S. contributions and administered by an international organization, does Comptroller General have audit rights? N/A

- 3. FAA Sec. 620(h). Do arrangements exist to insure that United States foreign aid is not used in manner which, contrary to the best interests of the United States, promotes or assists the foreign aid projects or activities of Communist-block countries? Yes.

- 4. Will arrangements preclude use of financing?
 - a. FAA Sec. 104(f); FY 1982 Appropriation Act. Sec. 525: (1) To pay for performance of abortions as a method of family planning or to motivate or coerce persons to practice abortions; (2) to pay for involuntary sterilization as method of family planning, or coerce or provide financial incentive to any person to undergo sterilization; (3) to pay for any biomedical research which relates, in whole or in part, to methods or the performance of abortions or involuntary sterilizations as a means of family planning; (4) to lobby for abortion? Yes.

 - b. FAA Sec. 620(g). To compensate owners for expropriated nationalized property? Yes.

 - c. FAA Sec. 660. To provide training or advice or provide any financial support for police, prisons, or other law enforcement forces, except for narcotics programs? Yes.

 - d. FAA Sec. 662. For CIA activities? Yes.

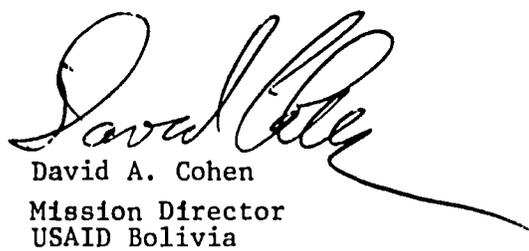
 - e. FAA Sec. 636(i). For purchases, sale, long-term lease, exchange or guaranty of the sale of motor vehicles manufactured outside U.S., unless a waiver is obtained? Yes.

- f. FY 1982 Appropriation Act. Sec. 503.
To pay pension, annuities, retirement pay, or adjusted service compensation for military personnel? Yes.
- g. FY 1982 Appropriation Act. Sec. 505
To pay U.S. assessments, arrearages or dues? Yes.
- h. FY 1982 Appropriation Act, Sec. 506.
To carry out provisions of FAA Section 209(d) (Transfer of FAA funds to multilateral organizations for lending? Yes.
- i. FY 1982 Appropriation Act. Sec. 510.
To finance the export of nuclear equipment, fuel, or technology or to train foreign nationals in nuclear fields? Yes.
- j. FY 1982 Appropriation Act, Sec. 511.
Will assistance be provided for the purpose of aiding the efforts of the government of such country to repress the legitimate rights of the population of such country contrary to the United States Declaration of Human Rights? No.
- k. FY 1982 Appropriation Act. Sec. 515.
To be used for publicity or propaganda purposes within U.S. not authorized by Congress? Yes.

page 1 of 1

CERTIFICATION PURSUANT TO SECTION 611(e)
OF THE FOREIGN ASSISTANCE ACT OF 1961,
AS AMENDED

I, David A. Cohen, the principal officer of the Agency for International Development in Bolivia, having taken into account among other factors the maintenance and utilization of projects in Bolivia previously financed or assisted by the United States, do hereby certify that in my judgement Bolivia has both the financial capability and human resources capability to effectively maintain and utilize the capital assistance portion of this project:
Chapare Electrification Project


David A. Cohen
Mission Director
USAID Bolivia

AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON, D C 20523

ANNEX C

LAC/DR-IEE-85-42

ENVIRONMENTAL THRESHOLD DECISION

Project Location : Bolivia

Project Title and Number : Chapare Electrification Amendment
: 511-0543

Funding : \$4,400,000 (G) \$12,500,000 (L)

Life of Project : Four years

IEE Prepared by : Howard L. Clark, REMS
USAID/Lima

Recommended Threshold Decision : Negative Determination

Bureau Threshold Decision : Concur with Recommendation

Comments : Concurrence subject to
incorporation of IEE
recommendations in PP Amendment

Copy to : David Cohen, Director
USAID/La Paz

Copy to : Howard, L. Clark, USAID/Lima

Copy to : Eric Zallman

Copy to : Chapare Project Officer,
USAID/La Paz

Copy to : IEE File

James S. Hester Date JUN 26 1985

James S. Hester
Chief Environmental Officer
Bureau for Latin America
and the Caribbean

ANNEX C

INITIAL ENVIRONMENTAL EXAMINATION (I.E.E.)

Project Location	: Bolivia
Project Title and Number	: Chapare electrification Project Amendment
Funding	: Chapare Regional Development Project (511-0543)
Life of Project	: PACD August 31, 1988
IEE Prepared by	: Howard L. Clark, Ph. D. REMS January 18, 1985
Recommended Threshold Decision	: Negative Determination

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ACTION AID 00

LIMA 0147 00 01 02 212000Z 7653 01/03 0101000

ACTION OFFICE [LAC-01]
INFO LAC-03 GC-01 GCLA-01 GCL-01 STFH-01 SAST-01 AGRI-01
RELO-01 HAST-01 7016 AT X21

INFO LOG-00 COPY-01 ARA-00 /001 W
-----207403 212001Z /52/53

P 711939Z FEB 85
FM AMEMBASSY LIMA
TO AMEMBASSY LA PAZ PRIORITY
SECSTATE WASHDC 1851

UNCLAS LIMA 0147

AIDAC

FOR MIKE LOFSTROM, PDI, AID/LA PAZ; JIM HESTER, LAC/DR,
AID/W

E.O. 12356: H/A
SUBJECT: INITIAL ENVIRONMENTAL EXAMINATION, CHAPARE
ELECTRIFICATION AMENDMENT.

A. FIELD ENVIRONMENTAL EVALUATION BY REMS, 16-17 JANUARY
1985.

I TRAVELED BY CAR FROM COCHABAMBA TO ALL OF THE PROPOSED
TRANSMISSION LINE SITES (SANTA ISABEL TO VILLA TUNARI;
VILLA TUNARI TO CHIMORE, SAN FRANCISCO, SANUSABE, AND
THE IBUELO SPUR), MOST OF WHICH WILL BE ALONG EXISTING
ROADS. MOST OF THE SANTA ISABEL TO SAN JOSE
HIGH-TENSION LINE WILL BE IN RELATIVELY INACCESSIBLE
MOUNTAINOUS TERRAIN, BUT THE ROUTE IS GENERALLY VISIBLE
FROM THE ROAD. BELOW SANTA ISABEL, THE LINES GENERALLY
WILL BE ALONGSIDE THE ROAD. HOUSE CONNECTIONS FROM THE
TRANSMISSION LINES WILL BEGIN AT COMUNIDAD PADRESAMA,
ABOUT 10 KM BEFORE VILLA TUNARI. THE USAID AND ELEC
PERSONNEL TRAVELLING WITH ME HAD DETAILED MAPS SHOWING THE
PROPOSED ROUTES, AND KNEW THE AREA WELL ENOUGH TO POINT
OUT SPECIFIC LOCATIONS.

1. SANTA ISABEL -- SAN JOSE

THE MOUNTAINOUS SANTA ISABEL -- SAN JOSE AREA IS A
MODERATELY RICH CLOUD-FOREST, WITH TREES 15-25 M HIGH,
DENSE EPiphyTE COVER (BRYOPHYTES, LICHENS, BROMELIADS)
ON MOST LIMBS AND TRUNKS, WITH TREE FERNS FAIRLY COMMON
IN THE UNDERSTORY. EXCEPT NEAR THE MAIN ROAD, THE AREA
APPEARS TO BE UNDISTURBED, WITH LITTLE EVIDENCE OF
AGRICULTURE OR SETTLEMENT. THE MOUNTAIN SLOPES ARE
MOSTLY QUITE STEEP. JUDGING FROM ROAD-CUTS, THE
TOPSOIL IS MOSTLY UNDERLAIN BY UNCONSOLIDATED SEDIMENTS
RANGING FROM LARGE BOULDERS TO PEBBLES, IN ADDITION TO
SOME EXPOSED ROCK OUTCROPS. IT IS, THEREFORE, VERY
PRONE TO LANDSLIDES. THE SPECIES DIVERSITY IS POSSIBLY
HIGH, OR AT LEAST INCLUDES MANY UNIQUE SPECIES. THE
AREA MERITS FURTHER STUDY FOR POSSIBLE USE AS A REGIONAL
PARK, AS IT PROBABLY CANNOT SUPPORT ANY MORE INTENSIVE
LAND USE.

THE DETRIMENTAL ENVIRONMENTAL EFFECTS OF THE TOWERS TO
BE INSTALLED FOR THE 115 KV HIGH-TENSION LINE WILL BE,
IN MY OPINION, MINIMAL, AS THERE WILL BE FEW TOWERS
(ABOUT 157), AND THERE WILL BE NO NECESSITY FOR
MAINTENANCE OF A CLEARED RIGHT-OF-WAY BELOW THE LINES.
THE LINES WILL PRIMARILY GO FROM MOUNTAIN TOP TO
MOUNTAIN TOP, WITH A 900 M ALTITUDINAL DROP IN THE 9 KM
DISTANCE. THERE WILL BE A VISUAL EFFECT, PARTICULARLY
IMPORTANT IF THE AREA WERE TO BECOME A PARK, BUT THE
POSITIVE ENVIRONMENTAL EFFECTS OF HYDROELECTRIC POWER
REPLACING SOME OF THE PRESENT PETROLEUM-BASED ENERGY USE
IN THE LOWER VALLEY, AND THE LACK OF A CLEARED

RIGHT-OF-WAY THROUGH THE CLOUD-FOREST AREA, OVERLOOK
ANY POTENTIAL VISUAL IMPACT OF THE HIGH VOLTAGE LINES
AND TOWERS IN THIS SECTION OF THE VALLEY.

2. SAN JOSE -- VILLA TUNARI.

EXCEPT FOR A FEW AREAS NEAR SAN JOSE AND CD. CAMPOVIA
WHERE LINES WILL FOLLOW THE RIVER, THE 34.5 KV LINES
WILL REMAIN NEAR THE ROAD, MOSTLY THROUGH
PRESENTLY-DISTURBED VEGETATION OR CULTIVATED FIELDS
FROM JUST ABOVE SAN JOSE, THE VEGETATION BEGINS CHANGING
FROM CLOUD FOREST TO SECONDARY WAIN-FOREST (ECOCROPIA,
VISHIA, MYRTACEAE, ARFACLEA), ZINGIBERACEAE, MORE
LIANAS, FEW EPiphyTES) AND CULTIVATED FIELDS (YUCA,
SUGAR CANE, RICE, ETC.).

THE RIGHT-OF-WAY AND LINE CONSTRUCTION IN THIS AREA WILL
NOT SIGNIFICANTLY ALTER THE EXISTING VEGETATION, AND
WILL HAVE MINIMAL OTHER ENVIRONMENTAL EFFECTS. THE ONLY
POSSIBLE AREA OF CONCERN IS NEAR SAN JOSE, WHERE
CONSTRUCTION ON RELATIVELY STEEP SLOPES AND
UNCONSOLIDATED SEDIMENTS NEAR THE RIVER COULD LEAD TO
LANDSLIDES OR SOIL MOVEMENTS DAMAGING THE TRANSMISSION
LINES. CONSULTATION WITH SOILS SPECIALISTS OR
GEOMORPHOLOGISTS WOULD BE USEFUL BEFORE FINAL ROUTE
SELECTION IN THIS AREA.

3. VILLA TUNARI -- CHIMORE, IBUELO SPUR, SAN FRANCISCO,
SANUSABE.

THESE MOSTLY-INHABITED AREAS ARE IN FLAT TERRAIN,
ORIGINALLY LOWLAND TROPICAL RAIN-FOREST, NOW MOSTLY IN
CULTIVATION WITH YUCA, RICE, CORN, SUGAR CANE, PAPAYA,
AND COCA. THE PRIMARY FACTOR IN THE LOCAL ECONOMY IS
THE PRODUCTION OF COCA, ALTHOUGH THE LAND AREA DEVOTED
TO COCA IS APPARENTLY LESS THAN THAT OF THE FOOD CROPS.
CONSTRUCTION OF THE TRANSMISSION LINES WILL LEAD TO
NEGLECTIBLE CHANGE OF THE EXISTING ENVIRONMENTAL

CONDITIONS IN THIS AREA, AND THE SUBSTITUTION OF
REMOPLY-GENERATED HYDROELECTRIC POWER FOR THE PRESENT
PETROLEUM-BASED ENERGY SOURCES WILL HAVE A POTENTIALLY
BENEFICIAL EFFECT IN REDUCING EXHAUST AND NOISE FROM
LOCAL DIESEL GENERATORS AND LIQUID-PROPANE OR KEROSENE
STOVES, REFRIGERATORS, AND LIGHTS. THIS WILL BE OF
GREATER IMPORTANCE AS THE LOCAL POPULATION DENSITY
INCREASES.

B. CONCLUSIONS AND RECOMMENDATIONS.

IN GENERAL, THERE WILL BE MINIMAL DIRECT EFFECTS ON THE
EXISTING ENVIRONMENTAL CONDITIONS IN THE CHAPARE VALLEY
AS A RESULT OF THE PROPOSED CONSTRUCTION OF ELECTRIC
TRANSMISSION LINES. THERE ARE NO ADVERSE ENVIRONMENTAL
CONDITIONS WHICH PRECLUDE THE CONSTRUCTION OR
MAINTENANCE OF THE LINES AS PROPOSED. CARE MUST BE
TAKEN IN CONSTRUCTION IN THE MOUNTAINOUS AREA FROM SANTA
ISABEL TO BELOW SAN JOSE, BECAUSE OF THE POSSIBILITY OF
LANDSLIDES OR SOIL SLOPE AFTER CONSTRUCTION. IT IS
IMPORTANT THAT NO RIGHT-OF-WAY OR ROAD BE CLEARED IN THE
CLOUD-FOREST BELOW THE 115 KV LINES, EXCEPT AS NECESSARY
NEAR THE TRANSMISSION TOWERS.

IT IS UNKNOWN WHAT THE POSSIBLE INCREASES IN POPULATION
OR INDUSTRY WILL BE IN THE AREA AS A RESULT OF THE
AVAILABILITY OF ELECTRIC POWER. THIS WILL PRESUMABLY
ALTER THE USE AND AVAILABILITY OF MANY OF THE NATURAL
RESOURCES PRESENTLY UTILIZED IN THE VALLEY, SUCH AS
SOILS AND WATER SUPPLIES. THESE AND RELATED
SOCIO-ECONOMIC ASPECTS ARE NOT INCLUDED IN THE PRESENT
IEE, BUT SHOULD BE CONSIDERED AS PART OF THE PROJECT
ELECTRIFICATION AMENDMENT, USING EXISTING INFORMATION
FROM THE CHAPARE PROJECT PAPER AND POSSIBLY ADDITIONAL
DATA FOR LONG-TERM PROJECTIONS OF THE EFFECTS OF
ALTERING THE VALLEY ECOSYSTEM. THESE PROJECTIONS SHOULD
CONSIDER BOTH POTENTIALLY ADVERSE EFFECTS ON

Department of State

TELETYPE UNIT
ANNEX C
Page 4 of 4

PAGE 04 OF 07 LTRN 01947 PD 01 07 212000Z 7653 073733 801595
ENVIRONMENTAL CONDITIONS AND SYSTEMS EXISTING IN THE
CHAMPAINE VALLEY AND, CONCOMITANTLY, THE LIMITS ON GROWTH
IMPOSED BY THE EXISTING ENVIRONMENTAL CONDITIONS OF
RELATIVELY INFERTILE SOIL, HIGH RAINFALL, ETC.

RECOMMENDED THRESHOLD DECISION: NEGATIVE DETERMINATION,
HOWARD L. CLARK, PH.D., REMS, USAID/LIMA, 22 JANUARY
1985. JORDAN

UNCLASSIFIED

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ANNEX D

F. Technical Studies

Cost Comparison between Diesel fuel and Rural Electrification

The following economic assesment compares the cost of using diesel-fueled generators to service the energy needs of Chapare inhabitants, versus the cost of electrical energy supplied under the proposed Chapare electrification system.

Therefore, the analysis justifies the quantifiable aspects of the use of project-supplied energy. Table 4 presents an analysis of 19 communities located in areas serviceable under the project's electrical distribution system. Each of the communities is considered "urbanized", or having significant population clusters requiring some form of municipal public lighting, industrial electrical service as well as residential lighting and refrigeration.

The demand for each of these electrical services (i.e. municipal, industrial/commercial and residential) was estimated by community. Corresponding cost estimates for diesel-fueled power were made based on current data for generators and auxiliary stand-by equipment, diesel fuel, related transport costs and the cost of maintaining the equipment over a 10 year useful life (See following Tables 4 and 5). For all 19 Chapare communities the total demand for Kilowatts of electrical energy was 4,318.31 KW. On the basis of projected demand, the average cost of diesel-fueled energy was estimated to be 12c (US) per KW/h. Thus, diesel-fueled energy supplied at 12c (US) per KW/h compared to an average cost of 8.5c (US) per KW/h for electricity supplied under the Chapare electrification system, represents a significant cost savings to consumers using the project electrification system. In addition to the financial savings of electricity under the proposed system, users will benefit from lower overall maintenance costs and a more reliable, long-lasting source of energy than that supplied by diesel-fueled generators.

Agropecuaria Copacabana

The following micro-economic analysis serves to justify, on the agroindustrial level, the use of project-supplied energy compared to other available sources of power. Agropecuaria Copacabana (AC), is one of the primary agroindustrial interventions supported under the Chapare project. The project is designed to have a significant impact on increasing the production and demand for pork products and in establishing strong economic ties with Chapare small farm producers who participate in the project. AC was formed in 1973, and is considered the most important commercial livestock operation in the Chapare and one of the major producers of quality pork within the Cochabamba valley.

Through the CRDP, AC will receive approximately \$1.75 million to finance the production, fattening, slaughtering, processing and marketing of a variety of swine products, such as fresh canned pork, bacon, ham, lard and sausages. The basic concept of the project is for AC to provide Chapare farmers with "modules" of piglets, to fatten and sell for processing. Based on a multiplier effect, it is expected that 100 production modules in operation during the first year of the project, will increase to 600 modules per year by the end of year 2. At the same time, AC itself will raise 8,000 piglets per year under the project. Both Chapare farmers and AC operations will increase the production of hogs manyfold, foster concurrent increases in personal incomes and expand market outlets for pork and pork products.

In order to efficiently carry out the objectives of the hog fattening sub-project, an adequate source of electric power is required to provide lighting and some refrigeration for AC's proposed storage and first stage processing facilities to be established in the Chapare. In addition, electrical energy is needed for lighting of personnel housing, laboratory testing facilities, electrical water pumps and other production related machinery. AC has developed plans to meet these energy needs through the use of a 400 KW, diesel-fueled generator, utilizing standard back-up generator capabilities. The following is an analysis of the cost per kilowatt hour (KW/h) associated with the purchase and maintenance of a 420 KW diesel-fueled electrical generator to supply power for the operation of the AC hog-fattening project.

Table 4
Cost per KW/h of Diesel-Fueled Generator
(420 KW Capacity)

420 KW KW/h generating capacity per yr.	748,000 hrs.
Costs	
Fuel Cost per yr. + transport	\$ 92,664
Maintenance Cost	3,016
Depreciation Cost (10 yr. life)	21,175
Financial Cost (15% I-rate, 5 yr. loan)	31,762
 Total Cost	 \$148,616 =====
 \$148,616 / 748,800 KW/h = 19.8 c (U.S.) per KW/h	

Productos del Valle, S.A.

One of the major agroindustrial interventions supported under the Chapare project is the processing of citrus and the development and production of other fruit products. Productos del Valle, S.A., is one of the leading fruit processing firms in Bolivia, measured in terms of variety and quality of its products. During the Chapare project intensive review, a feasibility study conducted by USAID indicated that Del Valle could increase its fruit processing plant capacity significantly by investing in new fruit processing machinery, improving the efficiency of its existing plant facility and by establishing several fruit collection centers and a refrigerated storage and processing facility, at convenient locations within the Chapare.

A basic requirement for Del Valle to proceed with the investment in a storage and processing facility in the Chapare, is the availability of a reliable and cost effective source of energy needed for the refrigeration and first-stage processing of citrus and other types of fruit. The following analysis will present a comparison of costs between the purchase, installation and operation of a diesel-fueled 400 kilowatt generator needed to meet the energy requirements of the storage facility, and the use of electrical power provided under the Chapare electrification project amendment.

Table 4 shows the cost per kilowatt hour (KWh) for the purchase and operation of a 400 KW generator powered by diesel fuel. When the cost per KWh of the 400 KW generator (\$.1988) is compared with the average cost per KWh of electricity supplied under the project (\$.085), it is apparent that the project offers a more cost effective source of electrical energy. Additional factors which support the use of electrical energy supplied under the project to the Productos del Valle facility, include the expected useful life of electric service distribution to the Chapare, estimated at 20 years, and the permanent nature of the electric system allowing for 24 hr. power service without the normal non-operational hours expected for maintenance of the generator system. In addition, the relative stability of tariffs charged by the ENDE system (estimated in \$US.) compared with the probable fluctuation in the price of diesel fuel and the associated transport costs of the generator system, is another positive aspect in favor of the electrification project.

On the basis of cost per KW/h, AC would have to spend 19.8c (U.S.) per KW/h to provide for all of the firm's electricity needs through the use of a diesel-fueled 420 KW generator, having an average useful life of 10 years.

By comparison, under the Chapare electrification system the average cost per KW/h of electrical energy is less than half the cost of diesel-powered electricity, or approximately 8.5c (U.S.) per KW/h (during the first five years of the project).

The following analysis presents the cost per KW/h of electricity provided under the project, based on the Chapare system-wide generation capacity of 7.336 million KW/h per year.

Costs

Maintenance cost per yr.	\$ 55,000
Depreciation cost per yr.	83,000
Energy Purchase from ENDE	297,000
Distribution cost to customers	19,000
Administration	3,250
Financial cost (2% Interest)	55,000
Margin	111,310
Total Cost	\$623,560

$\$ 623,560 / 7.336 \text{ million KW/h} = 8.5c \text{ (U.S.) per KW/h}$

Additional factors which support the use of electrical energy supplied under the project for the operation of AC's storage and processing facilities, include the expected useful life of electric service distribution to the Chapare, estimated at 20 years, and the permanent nature of an electrical system which allows for 24 hour power service without the normal non-operational hours expected for maintenance of the generator system. In addition, the relative stability of tariffs charged under the ENDE system (estimated in \$ U.S.) compared with the probable fluctuation in the price of diesel fuel and the associated transport costs of the generator system, is another positive aspect in favor of the electrification project.

TABLE 5 (continued)

ESTIMATED ELECTRICITY DEMAND FOR URBANIZED PROJECT COMMUNITIES

San Rafael					
Pub. Ligh. Demand	0.13	15.00			2.00
Ind/Com. Demand	56.00	3.00			31.00
Residential Demand	1.11	35.00			42.54
Total KW					105.21
Eterazama					
Pub. Ligh. Demand	0.13	20.00			1.75
Ind/Com. Demand	90.00	2.00			72.00
Residential Demand	1.11	80.00			97.24
Total KW					170.99
Samosabete					
Pub. Ligh. Demand	0.13	25.00			3.44
Ind/Com. Demand	0.00	0.00			0.00
Residential Demand	1.11	60.00			72.93
Total KW					75.37
Dorado					
Residential Demand	1.11	32.00			38.90
Total KW					38.90
San Isidro II					
Residential Demand	1.11	20.00			24.31
Total KW					24.31
Lauca					
Residential Demand	1.11	40.00			48.62
Total KW					48.62
Senda Tres					
Residential Demand	1.11	34.00			41.33
Total KW					41.33
San Pedro					
Residential Demand	1.11	60.00			72.93
Total KW					72.93
Central Norte					
Residential Demand	1.11	70.00			85.09
Total KW					85.09
San Francisco II					
Residential Demand	1.11	390.00			474.05
Total KW					474.05
Total					
Total Pub. Ligh. Demand	0.13	420.00			57.75
Total Ind/Com. Demand	31.20	63.00			1565.70
Total Residential Demand	1.11	1888.00			2294.86
Total KW					4318.31

TABLE 5

ESTIMATED ELECTRICITY DEMAND FOR URBANIZED PROJECT COMMUNITIES

<u>Project Community</u>	<u>KW/User</u>	<u>Number of Users</u>	<u>Total KW</u>	<u>KW+Reserve Capacity(10%)</u>
Villa Tunari				
Pub.Ligh.Demand	0.13	105.00	13.13	14.44
Ind/Com.Demand	729.00	19.00	729.00	801.90
Residential Demand	1.11	309.00	341.45	375.59
Total KW				1191.93
Chimora				
Pub.Ligh.Demand	0.13	100.00	12.50	13.75
Ind/Com.Demand	437.00	11.00	437.00	480.70
Residential Demand	1.11	250.00	276.25	303.88
Total KW				798.33
Nueva Canaán				
Pub.Ligh.Demand	0.13	16.00	2.08	2.29
Ind/Com.Demand	69.00	3.00	207.00	228.90
Residential Demand	1.11	90.00	99.45	109.40
Total KW				187.50
Ibuelo				
Pub.Ligh.Demand	0.13	15.00	1.95	2.08
Ind/Com.Demand	173.00	9.00	155.70	170.30
Residential Demand	1.11	109.00	120.45	132.49
Total KW				304.85
Sinaota				
Pub.Ligh.Demand	0.13	20.00	2.60	2.75
Ind/Com.Demand	50.00	2.00	50.00	55.00
Residential Demand	1.11	50.00	55.25	60.78
Total KW				118.53
Chipiriri				
Pub.Ligh.Demand	0.13	22.00	2.86	3.04
Ind/Com.Demand	183.00	14.00	185.40	201.30
Residential Demand	1.11	60.00	66.30	72.93
Total KW				277.26
San Miguel				
Pub.Ligh.Demand	0.13	10.00	1.30	1.39
Ind/Com.Demand	0.00	0.00	0.00	0.00
Residential Demand	1.11	69.00	76.25	83.87
Total KW				85.24
V. 14 de Septiembre				
Pub.Ligh.Demand	0.13	20.00	2.60	2.75
Ind/Com.Demand	0.00	0.00	0.00	0.00
Residential Demand	1.11	60.00	66.30	72.93
Total KW				75.68
Paracti				
Pub.Ligh.Demand	0.13	52.00	6.76	7.15
Ind/Com.Demand	0.00	0.00	0.00	0.00
Residential Demand	1.11	70.00	77.35	85.09
Total KW				92.24

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TABLE 6:

COST/KWH OF URBANIZED PROJECT COMMUNITIES IN THE REGION (Us.)

	Villa Tunari	Chinora	Nueva Canaan	Ibuelo	Sinaota	Chipiriri	San Miguel	V.14 Septiembre	Paracti	San Rafael	Eterazana
Required KW	1,192.000	798.600	188.060	325.000	118.000	277.000	85.000	76.000	92.000	106.000	199.000
Number of 400KW Generators	3.00	2.00	0.50	1.00	0.30	0.70	0.25	0.20	0.25	0.30	0.50
Total Investment (Us.)	635,238.000	423,492.000	105,873.000	211,746.000	63,523.800	148,222.200	52,936.500	42,349.200	52,936.500	63,523.800	105,873.000
Cost of a Generator	92,736.000	92,736.000	92,736.000	92,736.000	92,736.000	92,736.000	92,736.000	92,736.000	92,736.000	92,736.000	92,736.000
Cost of Auxiliary Equipment	119,010.000	119,010.000	119,010.000	119,010.000	119,010.000	119,010.000	119,010.000	119,010.000	119,010.000	119,010.000	119,010.000
Time of Use											
Years of Life	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000
Fuel consumption gal/hr	30.600	30.600	30.000	30.000	30.600	30.600	30.600	30.600	30.600	30.000	30.500
Number of hrs/day	24.000	24.000	24.000	24.000	24.000	24.000	24.000	24.000	24.000	24.000	24.000
Total hrs-maintenance (4)	1,152.000	1,152.000	1,152.000	1,152.000	1,152.000	1,152.000	1,152.000	1,152.000	1,152.000	1,152.000	1,152.000
Number of effective hrs/yr	7,608.000	7,608.000	7,608.000	7,608.000	7,608.000	7,608.000	7,608.000	7,608.000	7,608.000	7,608.000	7,608.000
Number of effective hrs/10yrs	76,080.000	76,080.000	76,080.000	76,080.000	76,080.000	76,080.000	76,080.000	76,080.000	76,080.000	76,080.000	76,080.000
Operating Costs											
Fuel (Gal/hr)	90.600	60.600	15.000	30.600	9.000	21.000	7.500	6.000	7.500	9.000	15.000
Maintenance (3.25% of Generators)	9,041.760	6,027.840	1,506.960	3,013.920	904.176	2,109.744	753.450	602.754	753.450	904.176	1,506.960
Depreciation (10 yrs)	635,238.000	423,492.000	105,873.000	211,746.000	63,523.800	148,222.200	52,936.500	42,349.200	52,936.500	63,523.800	105,873.000
Costs of Fuel Generated											
Generation of kWh	90,687,360.000	60,711,840.000	14,303,040.000	24,726,000.000	8,977,440.000	21,074,160.000	6,466,800.000	5,722,080.000	6,999,360.000	6,064,400.000	15,139,920.000
Fuel Cost	9,038,304.000	6,025,536.000	1,505,334.000	3,012,768.000	903,630.400	2,108,937.600	753,192.000	602,553.600	753,192.000	903,350.400	1,506,360.000
Maintenance Cost	90,417.600	60,278.400	15,069.600	30,139.200	9,041.760	21,097.440	7,534.500	6,027.840	7,534.500	9,041.760	15,069.600
Depreciation Cost	635,228.000	423,492.000	105,873.000	211,746.000	63,523.800	148,222.200	52,936.500	42,349.200	52,936.500	63,523.800	105,873.000
Cost/kWh											
Fuel Cost	0.100	0.099	0.105	0.122	0.101	0.100	0.116	0.104	0.103	0.112	0.099
Maintenance Cost	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Depreciation Cost	0.007	0.007	0.007	0.009	0.007	0.007	0.008	0.007	0.008	0.008	0.007
Total	0.108	0.107	0.114	0.132	0.109	0.108	0.125	0.113	0.115	0.121	0.107

TABLE 6 (continued)

COST/KWH OF URBANIZED PROJECT COMMUNITIES IN THE REGION (1962)

	Saacsabete	Dorado	San Isidro II	Lauca	Senda Tres	San Pedro	Central La Cruz	Francisco
Required KW	76,600	39,900	24,000	49,000	41,000	73,000	85,000	474,000
Number of 400kW Generators	0.26	0.10	0.10	0.15	0.12	0.20	0.25	1.25
Total Investment (Sus.)	42,349,200	21,174,600	21,174,600	31,761,900	25,409,520	42,349,200	52,936,500	264,682,500
Cost of a Generator	92,736,000	92,736,000	92,736,000	92,736,000	92,736,000	92,736,000	92,736,000	92,736,000
Cost of Auxiliary Equipment	119,010,000	119,010,000	119,010,000	119,010,000	119,010,000	119,010,000	119,010,000	119,010,000
Time of Use								
Years of Life	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000
Fuel consumption gal/hr	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
Number of hrs/day	24,000	24,000	24,000	24,000	24,000	24,000	24,000	24,000
Idle hrs/maintenance (4)	1,152,000	1,152,000	1,152,000	1,152,000	1,152,000	1,152,000	1,152,000	1,152,000
Number of effective hrs/yr	7,608,000	7,608,000	7,608,000	7,608,000	7,608,000	7,608,000	7,608,000	7,608,000
Number of effective hrs/10yrs	76,080,000	76,080,000	76,080,000	76,080,000	76,080,000	76,080,000	76,080,000	76,080,000
Operating Costs								
Fuel Gal/hr	6,000	3,000	3,000	4,500	3,600	6,000	7,500	37,500
Maintenance (2.25% of Generators)	602,784	301,392	301,392	452,088	361,670	602,784	753,480	3,767,400
Depreciation (10 yrs)	42,349,200	21,174,600	21,174,600	31,761,900	25,409,520	42,349,200	52,936,500	264,682,500
Costs of kWh Generated								
Generation of kWh	5,782,060,000	2,967,120,000	1,825,920,000	3,727,920,000	3,119,280,000	5,553,840,000	6,466,800,000	36,061,920,000
Fuel Cost	602,553,600	301,276,800	301,276,800	451,915,200	361,532,160	602,553,600	753,192,000	3,767,960,000
Maintenance Cost	6,027,840	3,013,920	3,013,920	4,520,680	3,616,704	6,027,840	7,534,800	37,674,000
Depreciation Cost	42,349,200	21,174,600	21,174,600	31,761,900	25,409,520	42,349,200	52,936,500	264,682,500
Cost/kwh								
Fuel Cost	0.104	0.102	0.165	0.121	0.116	0.108	0.116	0.104
Maintenance Cost	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.001
Depreciation Cost	0.007	0.007	0.012	0.009	0.008	0.008	0.008	0.007
Total	0.113	0.110	0.178	0.131	0.125	0.117	0.125	0.113
Average Total Cost/kwh	0.120							

12 ¢ (U.S.) per KW/H diesel-fueled generators

8.5 ¢ (U.S.) per KW/h Chapare Electrification System

UNCLASSIFIED

LA PAZ 5121

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TE PRIORITY #6121/01 244 **
FM AMEMBASSY LA PAZ
TO SIGSTATE WASHDC PRIORITY 1754
BT
UNCLAS SECTION 01 OF * LA PAZ 06121

CLASS: UNCLASSIFIED
CERGI: AID 08/30/84
APPRV: DIR: EMBASSY
DRFTD: RD: JFASULLO/RT: FUS
N: JP
CLDAR: 1ASSELIN2HILL3COE
DISTR: AID AMB DCM
POL NAU

AIDAC

USAID FOR AA/LAC AND STATE FOR ACTING ASST SECY OF STATE
FOR INM FROM AMBASSADOR AND DIRECTOR, USAID

F.O. 12356: NA
SUBJECT: CHAPARE ELECTRIFICATION

1. BACKGROUND:

- AS PART OF A COMPREHENSIVE USG PROGRAM TO REDUCE
ILLICIT COCA PRODUCTION IN BOLIVIA, IN 1983, USAID/BOLIVIA
DEVELOPED THE DOLS 14.4 MILLION CHAPARE REGIONAL DEVELOP-
MENT PROJECT WHICH IS DESIGNED TO IMPROVE THE PROFITA-
BILITY OF LEGITIMATE AGRICULTURAL AND FORESTRY SYSTEMS OF
FARMERS IN THE CHAPARE COCA GROWING REGION. REALIZATION
OF THIS OBJECTIVE IS BASED, IN LARGE PART, ON THE ESTAB-
LISHMENT OF AGROINDUSTRIES AND OTHER AGRO-PROCESSING
ENTERPRISES WHICH CAN EXPAND MARKET OUTLETS FOR DIVERSI-
FIED CHAPARE AGRICULTURAL PRODUCTS. IN THIS CONNECTION,
IT WAS EVIDENT TO THE CHAPARE PROJECT DEVELOPMENT TEAM
DURING THE DESIGN STAGE THAT A RELIABLE SOURCE OF ELECTRIC
POWER WOULD BE CRITICAL TO THE ACHIEVEMENT OF THE AGRO-
INDUSTRIAL, AND HENCE, BROADER PROJECT OBJECTIVES.
(CURRENTLY, THERE ARE ONLY A FEW DIESEL-OPERATED GENERA-
TORS IN THE ENTIRE CHAPARE WHICH PROVIDE A LIMITED SOURCE
OF POWER).

POVI

RD 2

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POVI

*CONT
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RF3

- DURING THE DEVELOPMENT OF THE PP, THE INTERAMERICAN
DEVELOPMENT BANK (IDB) WAS CONCURRENTLY DESIGNING A MAJOR
ELECTRIFICATION PROJECT WHICH, AT THE MISSION'S REQUEST,
INCLUDED FINANCING FOR THE CONSTRUCTION OF A HIGH TENSION
TRANSMISSION LINE FROM THE CORANI DAM IN COCHABAMBA TO SANTA CRUZ,
PASSING THROUGH AND PROVIDING A SOURCE OF POWER TO THE
CHAPARE. IT HAS BECOME APPARENT HOWEVER THAT THE IDB-
FINANCED COCHABAMBA-SANTA CRUZ ELECTRIFICATION PROJECT
WILL NOW EXPERIENCE A SIGNIFICANT DELAY (NOW ESTIMATED AT
2 TO 3 YEARS) DUE TO DESIGN PROBLEMS, COUNTERPART FUNDING
PROBLEMS, AND OTHER APPROVAL DELAYS RELATED TO THE
BROADER PROJECT. SUCH A DELAY IN IMPLEMENTING AN ELECTRI-
FICATION PROJECT IN THE CHAPARE WILL SERIOUSLY JEOPARDISE
THE SUCCESS OF THE CHAPARE DEVELOPMENT PROJECT AND COULD
CONSEQUENTLY REDUCE THE EFFECTIVENESS OF NARCOTICS CONTROL
EFFORTS IN THAT AREA. FOR THIS REASON, USAID AND THE
EMBASSY REQUEST ADDITIONAL FUNDING OVER AND ABOVE THE
MISSION'S FY 85 CYE IN ORDER TO AMEND THE CHAPARE
REGIONAL DEVELOPMENT PROJECT TO INCLUDE A CRITICAL
ELECTRICITY COMPONENT.

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7. IN ORDER TO RESOLVE THE PROBLEM DESCRIBED ABOVE, THE MISSION HAS IDENTIFIED AND EXAMINED THREE POSSIBLE SUB-PROJECT DESIGN ALTERNATIVES. THESE INCLUDE THE FOLLOWING:

- A. AWAIT THE INITIATION OF THE LARGE IDE RURAL ELECTRIFICATION PROJECT WHICH INCLUDES CHAPARE. AS PLANNED, THE PROJECT WOULD FINANCE THE COORDINATION OF A 112 KILOMETER PRIMARY DISTRIBUTION LINE FROM THE CORANI POWER STATION TO THE CHAPARE, AS WELL AS THE INSTALLATION OF A SUBSTATION NEAR VILLA TUNARI. DETAILED PLANS AND SPECIFICATIONS FOR THIS PROJECT ALREADY HAVE BEEN PREPARED BY BOLIVIA'S NATIONAL POWER COMPANY, ENDE. HOWEVER, AS INDICATED EARLIER, EXTENSIVE DELAYS IN APPROVING THE IDE PROJECT NO LONGER MAKE THIS ALTERNATIVE A FEASIBLE OPTION TO BE CONSIDERED WITHIN THE TIME FRAME REQUIRED BY THE CHAPARE PROJECT.

- B. A SECOND ALTERNATIVE FOR DELIVERING ELECTRIC POWER TO THE CHAPARE WOULD INVOLVE THE INSTALLATION OF A NUMBER OF DIESEL-OPERATED GENERATORS AND DISTRIBUTION LINES IN THE LARGER POPULATION CENTERS IN THE CHAPARE (I.E., VILLA TUNARI, CHIMORE, VILLA 14 DE SEPTIEMBRE AND PUERTO VILLARROEL). THIS ALTERNATIVE, AFTER A CAREFUL EXAMINATION, HAS BEEN DETERMINED NOT TO BE FEASIBLE AT THIS TIME BECAUSE OF HIGH UNIT COSTS, THE EXTENSIVE DELAYS WHICH WOULD BE INVOLVED (9 MONTHS TO A YEAR) IN OBTAINING THE NEEDED GENERATORS, AND PAST EXPERIENCE WITH FREQUENT BREAK-DOWNS OF SUCH EQUIPMENT IN TROPICAL CLIMATES SUCH AS THE CHAPARE.

- C. THE THIRD ALTERNATIVE INVOLVES THE INSTALLATION OF A PRIMARY DISTRIBUTION LINE ORIGINATING AT THE EXISTING SAN JOSE SUBSTATION, WHICH IS LOCATED NEAR THE CORANI HYDROELECTRIC PLANT. THIS LINE WOULD EXTEND 75 KILOMETERS INTO THE CHAPARE AS FAR AS CHIMORE. THE DISTRIBUTION LINE TO BE CONSTRUCTED WOULD BE CAPABLE OF SERVING THE COMMUNITIES OF VILLA TUNARI, CHIMORE, NUEVA CANAAN, IYUIC AND CHIPIRIRI, ALMOST ONE HALF OF THE ENTIRE PROJECT AREA. THE FUNDING NECESSARY TO COMPLETE THIS PRIMARY DISTRIBUTION SYSTEM, INCLUDING DISTRIBUTION LINES TO THE COMMUNITIES MENTIONED ABOVE, IS ESTIMATED TO BE

FOUR 2.0 MILLION.

3. OUR ANALYSIS OF THE THREE ALTERNATIVES FOR PROVIDING POWER TO THE CHAPARE INDICATES THAT OPTION 2-C FOR ELECTRIFICATION IN THE CHAPARE IS THE MOST FEASIBLE OPTION AT THIS TIME FOR THE FOLLOWING REASONS: (1) IT IS THE LEAST COSTLY OF THE THREE, (2) IT COMPLEMENTS THE IDE PROPOSAL, (3) ENDE HAS ALREADY COMPLETED THE DESIGN WORK, AND STRONGLY ENDORSES THIS OPTION AND (4) IT APPEARS TO BE THE ONLY EXPEDITIOUS APPROACH FOR DELIVERING A RELIABLE ENERGY SOURCE TO THE CHAPARE.

4. ACTION REQUESTED: FOR THE REASONS OUTLINED ABOVE, THE EMBASSY AND USAID REQUEST AID/W APPROVAL TO DEVELOP A DOIS 2.0 MILLION AMENDMENT TO THE CHAPARE REGIONAL DEVELOPMENT PROJECT FOR FINANCING THE ELECTRIFICATION COMPONENT. ASSUMING THAT THE USAID CAN OBTAIN NEEDED TECHNICAL ASSISTANCE IN A TIMELY MANNER, WE ANTICIPATE COMPLETING THE AMENDMENT PROCESS BY LATE NOVEMBER 1984. IT IS OUR FIRM BELIEF THAT THE SUCCESS OF THE CHAPARE REGIONAL DEVELOPMENT PROJECT AS WELL AS THE OVERALL NARCOTICS CONTROL PROGRAM REQUIRES THE PROVISION OF ELECTRIC POWER IN THE REGION. IT IS IMPORTANT TO NOTE THAT CHAPARE FARMERS PLACE ELECTRIFICATION AT THE TOP OF THEIR LIST OF REGIONAL DEVELOPMENT PRIORITIES. THE TIMELY INTRODUCTION OF ELECTRIFICATION WILL BE A MOST IMPORTANT STEP IN GAINING THE TRUST AND COOPERATION OF CHAPARE FARMERS FOR ECOTE DEVELOPMENT AND COCA REDUCTION PURPOSES.

5. IN CONNECTION WITH THE ABOVE, USAID/BOLIVIA'S DEPUTY DIRECTOR, DAVID A. COHEN, IS SCHEDULED TO BE IN AID/W ON CONSTITUTION DURING THE PERIOD OF SEPTEMBER 4-10, 1984, AND WILL BE AVAILABLE TO DISCUSS THE MISSION'S PROPOSAL FOR ELECTRIFICATION IN THE CHAPARE WITH APPROPRIATE AID/W PERSONNEL. BASSFORD

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STATE 293117

(4) AID AMB DCM ECON

Rec'd 10/4

VZCZCLP0219

File: PD&I

LOC: 246 123
02 OCT 84 2132
CN: 35648
CERG: AID
DIST: AIDE

OO RUFBLP

DE RUFHC #3117 2762134

ZNR UUUUU ZZE

O 022133Z OCT 84

FM SECSTATE WASHDC

TO AMEMBASSY LA PAZ IMMEDIATE 0308

BT

UNCLAS STATE 293117

Action: RD

Info: D

Reply due 10/5

AIDAC

EXO
PD&I
CONT
C
RF 3 SF

E.O. 12356: N/A

Action tkn _____

TAGS:

SUBJECT: CHAPARE REGIONAL DEVELOPMENT PROJECT NO. 511-0543

REF: LA PAZ 06121

file.

THE AA/LAC APPROVED THE SCOPE AND JUSTIFICATION OF THE PROPOSED DOLS. 2 MILLION AMENDMENT FOR THE SUBJECT PROJECT ON SEPTEMBER 28, 1984.

DAM

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STATE 293117

FOR MISS LOASTROM, PDI, AID/LA PAZ; JIM TESIN, LAG/DF, AID/

L.O. 12322: N/A

SUBJECT: INITIAL ENVIRONMENTAL EXAMINATION, CHAPARE

CONDITIONS IN THIS AREA, AND THE SUBSTITUTION OF REMOTELY-GENERATED HYDROELECTRIC POWER FOR THE PRESENT PETROLEUM-BASED ENERGY SOURCES WILL HAVE A POTENTIALLY BENEFICIAL EFFECT IN REDUCING EXHAUST AND NOISE FROM LOCAL DIESEL GENERATORS AND LIQUID-PROPANE OR KEROSENE STOVES, REFRIGERATORS, AND LIGHTS. THIS WILL BE OF GREATER IMPORTANCE AS THE LOCAL POPULATION DENSITY INCREASES.

B. CONCLUSIONS AND RECOMMENDATIONS.

IN GENERAL, THERE WILL BE MINIMAL DIRECT EFFECTS ON THE EXISTING ENVIRONMENTAL CONDITIONS IN THE CHAPARE VALLEY AS A RESULT OF THE PROPOSED CONSTRUCTION OF ELECTRIC TRANSMISSION LINES. THERE ARE NO ADVERSE ENVIRONMENTAL CONDITIONS WHICH PRECLUDE THE CONSTRUCTION OR MAINTENANCE OF THE LINES AS PROPOSED. CARE MUST BE TAKEN IN CONSTRUCTION IN THE MOUNTAINOUS AREA FROM SANTA ISABEL TO BELOW SAN JOSE, BECAUSE OF THE POSSIBILITY OF LANDSLIDES OR SOIL SLOPE AFTER CONSTRUCTION. IT IS IMPORTANT THAT NO RIGHT-OF-WAY OR ROAD BE CLEARED IN THE CLOUD-FOREST BELOW THE 115 KV LINES, EXCEPT AS NECESSARY NEAR THE TRANSMISSION TOWERS.

IT IS UNKNOWN WHAT THE POSSIBLE INCREASES IN POPULATION OR INDUSTRY WILL BE IN THE AREA AS A RESULT OF THE AVAILABILITY OF ELECTRIC POWER. THIS WILL PRESUMABLY ALTER THE USE AND AVAILABILITY OF MANY OF THE NATURAL RESOURCES PRESENTLY UTILIZED IN THE VALLEY, SUCH AS SOILS AND WATER SUPPLIES. THESE AND RELATED SOCIO-ECONOMIC ASPECTS ARE NOT INCLUDED IN THE PRESENT ONE, BUT SHOULD BE CONSIDERED AS PART OF THE PROJECT ELECTRIFICATION AMENDMENT, USING EXISTING INFORMATION FROM THE CHAPARE PROJECT PAPER AND POSSIBLY ADDITIONAL DATA FOR LONG-TERM PROJECTIONS OF THE EFFECTS OF ALTERING THE VALLEY ECOSYSTEM. THESE PROJECTIONS SHOULD CONSIDER BOTH POTENTIALLY ADVERSE EFFECTS ON ENVIRONMENTAL CONDITIONS AND SYSTEMS EXISTING IN THE CHAPARE VALLEY AND, CONCOMITANTLY, THE LIMITS ON GROWTH IMPOSED BY THE EXISTING ENVIRONMENTAL CONDITIONS OF RELATIVELY INFERTILE SOIL, HIGH RAINFALL, ETC.

RECOMMENDED THRESHOLD DECISION: NEGATIVE DETERMINATION,
HOWARD L. CLARK, PH.D., REMS, USAID/LIMA, 22 JANUARY
1985. JORDAN

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MINIMAL, AS THERE WILL BE FLAT TOWERS
 AND THERE WILL BE NO NECESSITY FOR
 A CLEARED RIGHT-OF-WAY BELOW THE LINES.
 LINES WILL PRIMARILY GO FROM MOUNTAIN TOP TO
 MOUNTAIN TOP, WITH A 300 M ALTITUDINAL DROP IN THE
 DISTANCE. THERE WILL BE A VISUAL EFFECT, PARTICULARLY
 IMPORTANT IF THE AREA WERE TO BECOME A PARK, BUT THE
 POSITIVE ENVIRONMENTAL EFFECTS OF HYDROELECTRIC POWER
 REPLACING SOME OF THE PRESENT PETROLEUM-BASED ENERGY USE
 IN THE LOWER VALLEY, AND THE LACK OF A CLEARED
 RIGHT-OF-WAY THROUGH THIS CLOUD-FOREST AREA, OVERRIDE
 ANY POTENTIAL VISUAL IMPACT OF THE HIGH-VOLTAGE LINES
 AND TOWERS IN THIS SECTION OF THE VALLEY.

4. SAN JOSE -- VILLA TUNARI.
 EXCEPT FOR A FEW AREAS BETWEEN SAN JOSE AND CD. CAMPOVIA
 THESE LINES WILL FOLLOW THE RIVER, THE 34.5 KV LINES
 WILL REMAIN NEAR THE ROAD, MOSTLY THROUGH
 PRESENTLY-DISTURBED VEGETATION OR CULTIVATED FIELDS.
 FROM JUST ABOVE SAN JOSE, THE VEGETATION BEGINS CHANGING
 FROM CLOUD FOREST TO SECONDARY RAIN-FOREST (CECROPIA,
 MIMOSA, MYRTACEAE, ARECACEAE, ZINGIBERACEAE, MORE
 LIANAS, FEW EPIPHYTES) AND CULTIVATED FIELDS (YUCA,
 SUGAR CANE, RICE, ETC.).

THE RIGHT-OF-WAY AND LINE CONSTRUCTION IN THIS AREA WILL
 NOT SIGNIFICANTLY ALTER THE EXISTING VEGETATION, AND
 WILL HAVE MINIMAL OTHER ENVIRONMENTAL EFFECTS. THE ONLY
 POSSIBLE AREA OF CONCERN IS NEAR SAN JOSE, WHERE
 CONSTRUCTION ON RELATIVELY STEEP SLOPES AND
 UNCONSOLIDATED SEDIMENTS NEAR THE RIVER COULD LEAD TO
 LANDSLIDES OR SOIL MOVEMENTS DAMAGING THE TRANSMISSION
 LINES. CONSULTATION WITH SOILS SPECIALISTS OR
 GEOMORPHOLOGISTS WOULD BE USEFUL BEFORE FINAL ROUTE
 SELECTION IN THIS AREA.

5. VILLA TUNARI -- CHIMORE, IBUELO SPUR, SAN FRANCISCO,
 SAMUSABE.

THESE MOSTLY-INHABITED AREAS ARE IN FLAT TERRAIN,
 ORIGINALLY LOWLAND TROPICAL RAIN-FOREST, NOW MOSTLY IN
 CULTIVATION WITH YUCA, RICE, CORN, SUGAR CANE, PAPAYA,
 AND COCA. THE PRIMARY FACTOR IN THE LOCAL ECONOMY IS
 THE PRODUCTION OF COCA, ALTHOUGH THE LAND AREA DEVOTED
 TO COCA IS APPARENTLY LESS THAN THAT OF THE FOOD CROPS.
 CONSTRUCTION OF THE TRANSMISSION LINES WILL LEAD TO
 NEGLIGIBLE CHANGE OF THE EXISTING ENVIRONMENTAL

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EMPRESA NACIONAL DE ELECTRICIDAD S.A.

CASILLA CORREO No. 505
CALLE COLOMBIA 0-0655
COCHABAMBA - BOLIVIA

DIRECCION CALEGRAFICA "ENELECTRIC"
TELEX No. 0251 ENDE B. V.
TELEFONO 48322

20 de febrero de 1985
GD-1514-85

Señor
Henry Basford
Director
Misión USAID
La Paz

Señor Director:

Ref.: Electrificación del Chapare

En relación con el proyecto de Electrificación del Chapare, que fue presentado a usted con nuestra GD-927-84, estuvo en nuestras oficinas en Noviembre del pasado año una Misión destacada por USAID para la revisión y evaluación de la información existente.

Como resultado de esa visita el Proyecto fue reformulado en sus alcances, habiéndose determinado un requerimiento de inversión de 5.419.000.- \$US, cuyas fuentes de financiamiento son las siguientes:

Aporte de USAID:	\$US. 2.500.000.-
Aportes Locales:	\$US. 2.919.000.-
- PL 480	\$US. 1.000.000.-
- Material Exist.	" 1.019.000.-
- Tesoro Gral de la Nación	" 900.000.-

En consecuencia la presente constituye nuestra solicitud formal a USAID para el financiamiento de \$US. 2.500.000.- de una parte, más \$US. 1.000.000.- de fondos del PL480 por otra parte; de conformidad con los alcances delineados por la Misión evaluadora arriba mencionada.

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EMPRESA NACIONAL DE ELECTRICIDAD S.A.

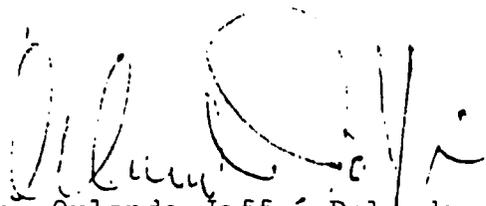
Hoja No. -2-

Carta No. GD-1514-85

De manera análoga a la empleada para la suscripción de los anteriores convenios de préstamo 511-LT-046, y 511-LT-049, al presente el Gobierno de Bolivia será el Prestatario y la Empresa de Luz y Fuerza Eléctrica Cochabamba, S.A.M. será el Subprestatario del crédito que estamos solicitando.

La Empresa Nacional de Electricidad, S.A., ENDE, actuará en calidad de Administrador y Ejecutor del Proyecto.

En la seguridad de contar con su atención favorable a este Proyecto de gran contenido social saludamos a usted muy atentamente,



Ing. Orlando Joffré Delgado
GERENTE GENERAL