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TECHNICAL SUPPORT TO ELECTRICAL INTEGRATION IN THE
CENTRAL AMERICAN ISTHMUS
(REGIONAL CO-OPERATION PROJECT)

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FOREWORD

This document describes a regional technical co-operation project aimed at supporting the process of electric integration in the Central American Isthmus.

Its execution, to be undertaken by ECLA/Mexico, would count on extra-budgetary backing and on the close collaboration of the government agencies responsible for the electric sector in the countries of the region.

I. INTRODUCTION

1. Background

The countries of the Central American Isthmus have been performing an important and well-organized task in the field of electric integration.

During the period 1965-1975, the Regional Electrical Standards Committee (Comité Regional de Normas Eléctricas, CRNE)^{1/} carried out a wide range of activities related to the regional standardization of the electrical systems in the six countries of the Isthmus. These include: an Electrical Standards Manual; a General Uniform Catalogue of Equipment and Material Codification, and a Regional Electrical Code. In addition, a preliminary study was completed on the feasibility of establishing a Regional Laboratory for Testing Electrical Equipment and Material.

Towards the end of 1980, ECLA/Mexico completed a pre-feasibility study on Central American regional interconnection. An important part of this study was the methodology developed which was adapted to the special characteristics of the electrical system in the region; it comprises mathematical models and electronic computer programmes. It should be mentioned that since the completion of the Interconnection Study, several of the basic parameters utilized have varied considerably. On the one hand, the electric energy demand has experienced a drastic fall due to the poor economic situation prevailing in the region. On the other, considerable progress in bilateral regional interconnections has taken place.

^{1/} Subsidiary to the Central American Economic Co-operation Committee.

As a matter of fact, the electrical systems of Honduras, Nicaragua and Costa Rica have been interconnected and those between Guatemala and El Salvador and Costa Rica and Panama are scheduled for completion in 1984. Finally, El Salvador and Honduras are at present studying the possibility of interconnecting their electrical systems.

In order to assess the implications of the aforementioned, in 1982 ECLA/Mexico completed a preliminary study regarding the energy flows, in a foreseeable future, on a totally interconnected regional system. The results indicated that these energy flows would be of considerable magnitude, even under the most conservative hypothesis; in other words, limited to marginal energy at practically no cost.

More recently, ECLA/Mexico in close collaboration with governmental agencies prepared a "Program of Regional Activities in the Electrical Subsector of the Central American Isthmus" which covers the following: transfer of electrical planning methodology; improved operation of the interconnected electrical systems; electrical standardization and testing; technical support for energy planning. The six governmental agencies concerned have sent this programme to the Inter-American Development Bank (IDB) for proper financing. The present project would allow for an early start and an eventual support of the works listed above.

Institutionally speaking, it should be mentioned that ECLA/Mexico acts as Permanent Secretariat of the Central American Electrification Subcommittee composed of high executives of the governmental electrical agencies of the Central American Isthmus. Dependent on this Subcommittee are the electrical interconnection and electrical standards working groups (Grupo de trabajo de interconexión, GRIE and Comité Regional de Normas, CRNE).

Working on their own, the governmental agencies have initiated the implementation of a Central American Electrical Council to co-ordinate all the regional activities under one sole body.

The energy crisis, which began in 1973 has had a negative effect on the fragile economies of the Central American countries, although it has at the same time urged these countries to initiate the planning of their entire energy sector. In this respect, the PEICA energy programme was put into effect from 1978 to 1981, with a view to consolidating all national efforts on energy planning. In addition, a new and more comprehensive regional programme (PRODECA) is under way. It comprises the four following modules: Module I, Energy Planning; Module II, Electrical Integration; Module III, Hydrocarbons Integration; Module IV, New and Renewable Sources of Energy. The first of these four modules has already been completed and sent to IDB by OLADE. As agreed by the respective countries, OLADE and ECLA, Module II will comprise the work of the Electrical Subsector's Regional Programme mentioned above. It should be noted that the electrical subsector has been undergoing a pioneering task in the energy sector and, as a direct consequence, several of the national electrical enterprises in the Central American Isthmus play a predominant role in the elaboration and execution of energy planning.

2. Justification

Due to the fact that electricity plays a relatively important role in the energy sector - it being one of its most dynamic components - it deserves special attention, particularly in the planning of the entire sector.

As matter of fact, electricity can, on the one hand, be generated with indigenous resources and thus displace hydrocarbons and, on the other, the interconnection of the electrical system facilitates the optimization of the energy resources as well as the investment required to meet the growing demands of the region as a whole.

The generalized use of medium and long-term electrical planning methodology, elaborated by ECLA, would gradually ensure the optimized development of the electrical systems in the region. It is, therefore, highly desirable that this methodology be transferred to the countries of the region as soon as feasible.

A wider geographic coverage and a greater magnitude of the electrical flows in the Central American Isthmus call for a thorough study of its operating problems and the expansion of the systems to ensure optimal solutions.

To update and promote the standardization of the electrical equipment and material at a regional level, would not only allow for a more expeditious expansion of the interconnected system, but would also result in economies of scale in the acquisition of equipment, in addition to producing inventory reductions and the possible exchange of stocks, in cases of emergency.

II. THE PROJECT

This project should, for a period of two years, provide technical support to the governmental agencies during their development and integration process.

1. Objectives

The eventual aims of the project are the rational and optimal utilization of the indigeneous energy resources for generating electricity, in order to alleviate the unfavourable situation of the balance of payments which Central America is experiencing today.

In the short range, the project should provide technical support to achieve the following objectives:

- The transfer of electrical planning methodology to be adopted by the countries of the region.
- The updating of national and regional programmes dealing with electrical standardization and codification of equipment and material.
- To carry on studies regarding the optimal operation of the already interconnected electrical systems.
- To complement the work on energy planning by the supply of inputs related to the development of the electrical subsector.

2. Expected results

The results foreseen at the conclusion of the project are:

- = Manuals for the application of models included in the electrical planning methodology.
- Training of local professionals for the application of the above methodology.

- Efficient and optimal operation of the interconnected electrical systems at subregional, and eventually, regional level.
- Electrical standards manuals and codification catalogues for updated equipment and material.
- Overall management of electric and energy planning.

3. Lines of action

This project will support the following lines of action:

a) Transfer of methodology

A field inventory of the computer installations, the methodologies applied, and the trained personnel available in each of the agencies will be carried out. Detailed manuals to be used in the training and teaching of planning methodology will also be formulated. Based on the above and on the results of a technical seminar to be held on this subject in the region, planning methodology would be transferred by the training of personnel and the implementation of the new models in the computer available in each country.

b) Standardization and codification

A revision and updating will be made of the material available on standardization and codification, including the basic characteristics of equipment and material, particularly those which are more commonly used. On this basis, a revised version of the standardization manuals and the codification catalogues will be made.

The necessary support will be given for the implementation of a functional system which will allow for a continued updating of the standards. This will include the reactivation of the Regional Standardization Committee (Comité Regional de Normas, CRNE).

c) Improved operation of the interconnected systems

An estimate of the electrical energy flows through the interconnected systems, both at subregional and regional levels will be made by determining the quantities, incidence and time stages for alternative energy scenarios. Estimates will be prepared for the reinforcements required in the interconnected installations for the above scenarios, and the necessary investment estimated. A critical appraisal will be made of the operational problems involved. Finally, technical and administrative recommendations will be submitted and an estimate of the corresponding financial implications prepared.

The need and convenience of having a regional centre for maintaining energy exchange will be duly evaluated. The following three alternatives will be taken into consideration: autonomous operation of the national systems and co-ordination of energy transfers with adequate systems of communication; operation similar to the previous one, plus a regional co-ordination and follow-up centre with the participation of the countries involved; regionally integrated operation with a load dispatching centre to control the transfers of energy. An estimate for the technical, operational, managerial and financial requirements will be made for the three alternatives just mentioned.

A regional seminar on this subject will be held. The local experts will report on the accomplishments and progress of their electrical systems placing special emphasis on the interconnections installed with their neighboring countries. A quick review of the more recent studies on interconnection will be made; this will include the effect that both

the present market situation and the actual status of the bilateral interconnections would have on the previous results and conclusions.

An analysis of the energy flows will be prepared, taking into account the restrictions imposed by the individual countries for the different scenarios, including the operational and financial implications involved; the methodologies for estimating the economic benefits, as well as each country's participation will be reviewed under each scenario; finally, discussions will be held regarding the energy transfers follow-up methods which will include the needs for communication, co-ordination and accounting in addition to the administrative, institutional and legal aspects of the contracts required.

d) Technical support for energy planning

Projections for electrical demand, which are considered an integral part of the overall energy forecast, will be made for alternative scenarios of intensive and massive use of electricity; studies will be carried out for substituting other energy sources for electricity generated from indigenous resources, specially in the industrial, transport and residential-commercial sectors; the national development programmes - generation and transmission additions - which include international interconnections, will be implemented together with the corresponding capital investments, operating expenses and financial implications.

4. Required inputs

The total cost of the project will amount to US\$ 270 800 with a two-year duration.

a) Contributions by ECLA

ECLA/Mexico will assign 12 man-months to the project from its professional staff and 12 man-months from its support manpower, plus secretarial services and space and communication facilities. This contribution will amount to approximately US\$ 100 000. (See Table 1.)

b) Extra-budgetary contributions

External financing will be required for an expert on electricity. The total cost for this expert, the field missions involved and the administrative expenses incurred, will amount to US\$ 180 800. (See Table 1.)

Table 1

BUDGET

<u>Item</u>	<u>Man/months</u>	<u>US dollars</u>
<u>Total cost</u>	<u>48</u>	<u>280 800</u>
<u>ECLA's contributions</u>	<u>24</u>	<u>100 000</u>
Direction and co-ordination	6	36 000
Energy economist	6	36 000
Research assistant	12	18 000
Secretarial, space and communication facilities	-	10 000
<u>Extra-budgetary contributions</u>	<u>24</u>	<u>180 800</u>
Electrical integration expert	24	144 000
Mission costs		16 000
Administrative expenses		20 800

JOB DESCRIPTION

Title of post: Economic Affairs Officer

Category and level: P-4

Organization: Economic Commission for Latin America

Duty Station: México City

Duties: Under the general supervision of the Head of the Natural Resources, Energy and Transport Section this Officer will undertake studies regarding the development and operation of the main electrical systems in the Central American Subregion. Specifically, he will:

- a) Prepare studies concerning the mid and long-term development programs of generation-transmission additions for the national electrical systems, with emphasis on regional integration possibilities;
- b) Undertake specific studies regarding the improved operation of the main electrical systems in the Subregion, through strengthening, expanding and adding new interconnecting lines as required to reach the ultimate goal of a totally integrated operation in the regional grid;
- c) Participate in interdisciplinary studies aimed at determining and increasing the role of the electrical subsector in the overall energy sector, considered in turn as part of the socio-economic development of the Central American region;
- d) Provide technical assistance in his field of competence to the countries of the subregion as may be required. Participate in technical meetings with other subregional, regional and international organizations as well as the national utilities interested in the studies mentioned.

Requirements: University degree in electrical engineering, preferably with specialization on systems development and operations. Ten years of professional experience directly related with both system development planning and operation of electrically interconnected systems. Knowledge of the Central American Isthmus desirable.

Languages: Spanish or English essential. Spanish desirable.