

PROJECT ASSISTANCE COMPLETION REPORTI. BACKGROUND DATA

A. <u>Project Title:</u>	Small Hydroelectric Plants Development
B. <u>Project Number:</u>	527-0226
C. <u>Date of Authorization and Amount</u>	October 23, 1980 \$10,000,000 Total \$ 9,000,000 Loan \$ 1,000,000 Grant
D. <u>Date of Obligation and amount</u>	November 24, 1980 (initial date and subsequent incremental fundings and deobligations) \$9,300,000 Total \$9,000,000 Loan \$ 300,000 Grant June 29, 1982 \$250,000 Total - Loan \$250,000 Grant February 16, 1984 \$200,000 Total - Loan \$200,000 Grant September 21, 1988 (\$500,000 Total) Deobligation (\$336,644 Loan) Deobligation (\$163,356 Grant) Deobligation July 31, 1989 (\$119,959 Total) Deobligation (\$119,959 Loan) Deobligation (- - - Grant) Deobligation September 29, 1989 (\$55,375 Total) Deobligation (- - - - Loan) Deobligation (\$55,375 Grant) Deobligation

Total to Date
\$9,074,666 Total
\$8,543,397 Loan
\$ 531,269 Grant

- * As due date for counterpart to claim reimbursement of eligible expenditures expired on 8/19/89 (nine months after PACD), Mission has started the process of deobligating \$120,422 from the Loan. This corresponds to the balance of unused resources. Final amounts disbursed by AID are the following:

\$8,954,245 Total
\$8,422,977 Loan
\$ 531,268 Grant

E. Food Program Local
Currency Generations:

None

F. Other Financial
GOP Contributions:

\$4,400,000 (Original amount stated
in ProAg)
\$5,337,216 (Actual amount as
of August 19, 1989)

G. Other Donor Financial
Contributions:

None

H. PACD:

November 20, 1985 (original)
November 19, 1988 (revised)

I. Implementing Agency:

ELECTROPERU (EP) and its
subsidiaries regional companies
HIDRANDINA, ELECTRONORTE, ELECTROCENTRO
and ELECTRORIENTE

II. PROJECT PURPOSE

The purpose of the Project is to promote rural and regional socioeconomic development through the development of an institutional base capable of providing reasonably priced, hydro-generated electrical energy for social and productive uses in rural towns in the sierra and high jungle. Most of the following End of Project Status Indicators, identified at the design of the Project, were verifiable at the end of the Project (discussed in detail in Sections IV and V).

- Institutionalization of the Mini-Hydroelectric Development Program. ELECTROPERU's Electrification management actively engaged in project development and implementation.

- Hydroelectric plants in operation in rural areas of San Martin, Junin and Cajamarca with a total capacity of 8.4 MWs.

- 100% of total energy available for sale is consumed by domestic and industrial units.

- Approximately 53,000 families using electric lighting.

The Project consisted of the following five components:

			<u>AMOUNTS IN U.S.\$</u>	
			<u>Original</u>	<u>Final</u>
1. Studies	Financed by the	Loan	(200,000)	200,000
2. Construction	" "	Loan	(8,800,000)	8,222,976
3. Promotion Campaign	" "	Grant	(100,000)	33,690
4. Technical Assistance	" "	Grant	(870,000)	497,579
5. Maintenance	" "	Grant	(30,000)	---
			10,000,000	8,954,245

III. PROJECT INPUTS

In order to achieve the objectives of the Project, the following activities were financed:

A - AID Loan/Grant:

Component 1. Studies

a. Pre-feasibility Studies: A U.S. consultant was selected by AID to develop the methodology used for conducting the pre-feasibility studies and to prioritize the potential sites for small hydroelectric subprojects according to social, economic and technical benefits.

b. Feasibility Studies: Feasibility and final engineering studies (including construction plans and technical specifications) were carried out for those subprojects selected on the basis of their combined technical, social and economic returns and which were approved by the Departmental Development Committees. In most cases, the studies were carried out by local engineering firms selected after formal competition.

Component 2: Construction of Small Hydroelectric Plants

a. Civil Engineering Works: Approximately 65% of this activity was carried out by local private firms selected through public bidding. The remaining 35% was constructed by force account through ELECTROPERU (EP) regional subsidiary companies. For the latter, the value of the unskilled labor supplied by the communities was considered as a down payment made by the beneficiaries for the construction of the distribution system. (According to Peruvian Law, the cost of the distribution system and household connections must be assumed by the potential beneficiaries).

b. Electric Engineering Works: These works comprised the construction of transmission lines, primary systems, distribution systems and household connections. All the activities were carried out by local private contractors selected through public bidding.

c. Equipment and Machinery: AID Loan funds were used to purchase 70% of the hydroelectric equipment from manufacturers selected by EP through international bidding. In addition, several instruments for hydrologic studies and land survey and vehicles in support of the final engineering studies were procured directly by AID.

Component 3: Promotion campaign.

The AID Grant supported an educational component designed to promote the potential productive uses of electricity among rural communities.

Component 4: Technical Assistance

In support of the studies and construction activities, the Project funded long- and short-term technical assistance. This was provided by U.S. and national specialists. Additional support was also provided through the acquisition of minicomputers, short wave radios, training in third countries and the procurement of technical books.

Component 5: Training on Maintenance

Under this component, it was planned that four mechanics would receive training on turbine generator maintenance from a short-term U.S. consultant. Spare parts for the hydroelectric equipment would also be purchased. As it turned out, project funds were not required for the first purpose. EP through one of its subsidiary companies, has in Lima a well assembled factory where hydroelectric equipment from all its power plants is repaired and where a training school for mechanics exists. Basic spare parts were included within the procurement of the hydroelectric equipment for each subproject.

B. GOP Resources

With exception of the technical assistance, ELECTROPERU shared proportionally with AID the financing of the studies, promotion campaign and construction activities mentioned in III-A above.

IV. PROJECT OUTPUTS/ACCOMPLISHMENTS

The Project goal for improving the quality of life of the rural poor by increasing their productivity through the use of hydroelectric power and to contribute to Peru's lessened dependence on petroleum has been generally attained (discussed in detail in Section V). Although not all the subprojects have been completed due to Peru's crucial economic situation and terrorist attacks, forty communities are at present benefiting from low cost hydrogenerated electricity and twenty more will benefit next year when EP completes construction activities with counterpart resources. On the institutional scenario, within the Ministry of Energy and Mines and EP, the small hydroelectric development program has received high priority, since among other benefits, it reduces domestic kerosene consumption, a fuel highly subsidized by the Government of Peru.

1. Planned Output

A methodology for conducting pre-feasibility studies and for prioritizing the potential sites to be constructed.

Project Accomplishment

The methodology was developed by the U.S. consultant Arthur D. Little Inc., in close coordination with EP specialists. It was thoroughly used within the Project and incorporated by EP into its standard procedures for project development.

2. Planned Output

It was anticipated that approximately 80 prefeasibility and 36 feasibility studies would be conducted during the Project life.

Project Accomplishment

EP conducted 55 reconnaissance examinations of potential sites, 26 pre-feasibility studies and 15 feasibility studies including final engineering documents (construction plans, technical specifications and bidding documents).

3. Planned Output

Communities belonging to the subprojects selected for construction would be informed and trained on how to take advantage of electricity to increase economic activities and productivity.

Project Accomplishment

So far, fifty-two communities served by the ten subprojects selected for construction have received ample information not only on the productive, social and household uses of electricity, but also on procedures to obtain monetary resources from the Housing Bank, Savings & Loan, etc., to finance distribution systems and household connections (Refer to para III-A-2-a). To achieve these goals, TV audio-visual material was developed by the EP's Promotion Unit and intensively used by the company rural promoters. These efforts were complemented by rural promoters belonging to the Departmental Development Committees. This activity was key to the project's success, maintaining community members well organized in Pro-Electrification Committees, which made great contributions towards the completion of subprojects.

4. Planned Output

The Project would finance the complete installation i.e. civil works, hydroelectric equipment and the electrical works for approximately 28 small-scale hydroelectric installations in the 100 to 1000 kw. range with an expected average plant size of 300 kw.

Project Accomplishment

As an alternative indicated in the project paper and as a result of the application of the feasibility study methodology, EP determined that subprojects, with average plant capacities above 300 kw, showed the best economic indicators and guaranteed a more rational use of the hydroelectric resource. In most of the cases, each subproject benefited more than three communities.

Based on the availability of economic resources and time, ten subprojects with an average plant capacity of 595 kw. were selected for construction under the Project. In addition, EP started in 1988 construction of other two subprojects using their own resources. As of the date of this report, five subprojects have been fully completed and are in operation. The remaining five have their electrical and civil works with an average progress of 90% and 75% respectively. The hydroelectric equipment for all subprojects have been manufactured and in most cases transported to the sites. Although ELECTROPERU's economic resources are very limited, the company plans to complete one of the remaining subprojects in the last quarter of CY-89 and the other four in CY-90.

5. Planned Output

The project included the provision of 102 person/month of U.S. short and long term technical assistance: a long-term Project Advisor throughout the life of the Project and short term specialists in energy planning and economics environmental analysis, design and construction, training, pricing policy, billing and collection methods.

Project Accomplishment

This component was periodically revised and re-designed according to project needs. A long-term U.S. advisor was hired at the early stages of the project and he oriented successfully the Project Office, conducting and reviewing the studies for 18 months. Two U.S. specialists provided short-term assistance, developing technical specifications for hydroelectric equipment and training counterpart professionals in the analysis of environmental impacts of small hydroelectric subprojects. Later, when the project entered into its construction phase, USAID/Peru decided that it was more convenient to hire local construction specialists (mainly civil, mechanical and electrical engineers) to improve subproject supervision (around 420 person/months were financed by the AID Grant). In support of this personnel, two microcomputers were purchased for the project. Short wave radios were also procured to maintain close contact between each of the power houses constructed on the subprojects and the regional energy companies central offices.

Financial Summary

A. AID Contribution (As of 9/30/89 - 10 months after PACD)

	Loan	Grant	Total
Amount Obligated	\$ 8,543,397	\$ 531,268	\$ 9,074,665
Amount Committed	8,422,977	531,268	8,954,246
Accrued Expenditures	8,422,977	531,268	8,954,246
Pipeline	120,420	0	120,420

B. Food Program Local Currency Generations: None

C. Other GOP Financial Contributions (As of 8/19/89): U.S.\$ 5,337,216

D. Other Donor Financial Contribution: None

V. MISSION ASSESSMENT OF PROJECT

The Project goals have been attained. After the dedication of almost 50% of the subprojects of the small hydroelectric program, the quality of life of the rural beneficiaries - approximately 26,000 families - has substantially improved. In addition to lighting and household uses, electricity permits the use of school facilities in two and sometimes three shifts. The 24 hour/day provision of electricity has allowed the installation of small and/or cottage industries like wood, steel, carpentries and cheese making. Several old small mining cooperative enterprises have increased their production through the use of electricity. As a result of the implementation of the project, old traditional energy resources, like kerosene (highly subsidized by the state) and firewood, are gradually being replaced by electricity.

The project purpose of promoting rural and regional socioeconomic development through the development of an institutional base capable of providing reasonably price hydrogenerated energy has also been attained. ELECTROPERU's Small Hydroelectric Plants Program has been substantially strengthened through the implementation of this project. The EP Office responsible for this program has grown from a small unit with limited activities into the Provincial, Districtal and Rural Electrification Directorate, which through EP's subsidiary regional electrical companies is at present responsible for implementing a country-wide small hydroelectric plant development program.

Although not all the Project activities had been completed, the project evaluation team of the firm Arthur D. Little, Inc. determined in November 1986 that the Project had several highly successfully elements. Among those, whose success was confirmed by the PACD, are the following:

1. The establishment in EP of a methodology for the economic evaluation of small hydroelectric projects. Subprojects with adequate economic benefits were selected and constructed.

2. The interest of rural residents in furthering the development of rural electrification with the help of EP has been verified and encouraged, as well as the desire of rural residents to improve their standard of living through the productive use of electricity.

3. The development of a national private industry capable of manufacturing electromechanical and electrical equipment and materials for the small hydroelectric plants has been stimulated and supported (20% of the hydroelectric and 80% of the electrical equipment and materials were manufactured locally).

4. EP's staff has been trained in the selection, development, implementation and evaluation of small hydro projects. By August 1989 the Project financed short-term local advisors had been incorporated into EP's permanent staff.

5. Upon completion of pending project construction activities, ten small hydroelectric plants will have been built, at reasonable costs, permitting the delivery of electricity to 52 communities (some 26,000 families) in rural areas of the country.

It is also important to mention here, that most of the Project activities (development of technical documents, procurement, accounting, etc.) were carried out by EP's units normally responsible for those activities, following generally established procedures. Although development of the project through EP's global organization caused implementation delays, on the other hand, it was a key factor in institutionalizing the small hydroelectric program within EP.

Other factors which prevented the completion of the Project were:

- Peru's crucial economic situation (more acutely reflected in state owned utilities like EP), which prevented the timely and adequate provision of counterpart resources).
- Country-wide terrorist activities (EP installations continue to be terrorism targets).
- Scarcity of construction materials (overcome two years ago).
- Political changes. A new government (radically different from the previous one) was elected in 1985. As a consequence, EP's top and medium level staff was relocated.
- EP's decentralization. When the project had recently started construction activities, EP started a decentralization process transferring implementation responsibilities to its subsidiary regional electric companies.

- Unrealistic pricing policy (tariff rates). In an effort to lessen inflation driven user price increases the Government limited EP and its subsidiaries the ability to charge its customers realistic prices. As a result EP has been unable to provide the necessary counterpart resources in time, to complete the subprojects before the PACD. The new Government scheduled to take office in July 1990 following national elections will urgently need to address this issue if they intend to increase activities in the energy sector.

Although the PACD expired on 11/19/88, Mission continues to monitor EP activities to ensure that pending construction activities are completed by October 1990. The Mission has been informed by EP that it is doing its best to continue subprojects construction. In spite of the problems already discussed, EP is honoring its commitment (continuing construction activities) to complete the Project. In addition to the A.I.D. financed project, EP also continues to carry on (although at a very slow pace) its own small hydro projects. USAID/Peru believes that this is a strong indication of the seriousness with which EP looks at the small hydro program. The AID grant funds also financed the development of a proposal that may serve as the basis for the preparation of the information required to justify external financing for the development of another group of small hydroelectric power plants, making use of the capabilities developed during the implementation of the AID Project. Unfortunately, at this time, Peru's policy on payment of foreign debt prevents access to international financial sources.

As a result of the project experiences, the following bottlenecks were identified and should be addressed when designing and/or implementing similar projects:

1. Excessive delays when reviewing and approving claims set by contractors for extra work (mainly related to volume of earth moved). If studies cannot be sufficiently accurate, a unit price type of construction contract should be used instead of the lump sum.

2. Limitations of the counterpart implementing agency in providing on a timely basis, sufficient and appropriate technical personnel, transportation, secretarial support and communication facilities. Fortunately Grant funds helped to overcome these difficulties by hiring local advisors, renting some vehicles, purchasing short wave radios, etc.

3. Lack of definition of counterpart implementation responsibilities: Project Central Office or Regional Electric Companies.

4. Constant changes in personnel and procedures already established for supervising and controlling subprojects.

5. Unrealistic estimate of time required for the entire bidding process (IFB through contract award and initiation of work).

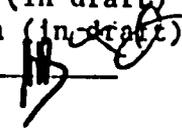
Finally, Mission shares the opinion of the Project evaluators which concluded:.... "Through the construction of the small hydroelectric plants, the Project has contributed significantly to achieving an important government objective, the improvement of the standard of living in rural areas of the country. For this reason, it is considered that the Project has been well focussed and has fulfilled its primary purpose."

Clearances:

Approved by:



Craig G. Buck
Director

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