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MID-TERM EVALUATION OF
THE PAKISTAN RURAL ELECTRIFICATION
PROJECT (Project #391-0473)

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ACRONYMS

ACE	Associated Consulting Engineers
ABEs	Area Electricity Boards
ADB	Asian Development Bank
AEPES	American Electric Power Energy Services
ARD	Associates in Rural Development, Inc.
CADPAD	Computer assisted design
CPDTP	Comprehensive Power Distribution Training Plan
DTI	Distribution Training Institute
EBASCO	Ebasco Overseas Corporation, Inc.
ECC	Economic Coordinating Committee
E & E	the office of Energy and Environment of USAID
ELR	Energy Loss Reduction program
FACE	Fikri Associates Consulting Engineers
GCCGP	Guddu Combined Cycle Power Generation Project
GMD	General Manager (Distribution)
GOP	Government of Pakistan
IBRD	International Bank for Reconstruction and Development
IFB	invitation for bids
IIP	Institutional Improvement Plan
IRR	Internal Rate of Return
ITECO	International Training and Education Company
LDA	Lahore Development Authority
MD	Managing Director
MP	Technical Master Plan
MIS	Comprehensive Management Information System
PACD	Project Assistance Completion Date
PDP	Power Distribution Program
P & E	Planning and Engineering
PP	project paper
PTAT	Principal Technical Assistance Team
SUEP	Sister Utility Exchange Program
TA	technical assistance
T & G	transmission and grid
TOEFL	English language proficiency examination
TVA	Tennessee Valley Authority
USAID	U.S. Agency for International Development

WAPDA
WO
WOS

Pakistan Water and Power Development Authority
work order
work order system

PREFACE

This mid-term Evaluation Team was assembled by the Bureau for Asia and the Near East, using funds set aside by USAID/Islamabad within the Pakistan Rural Electrification Project (391-0473). Overall management and supervision of the team effort was provided by Dr. John Ashworth, of Associates in Rural Development (ARD), Inc, Burlington, Vermont. The team was comprised of specialists provided by ARD and Lee Wan Associates, Decatur, Georgia.

The evaluation team would like to express its gratitude to the individuals within the United States Agency for International Development Mission (USAID)/Islamabad, USAID/Lahore, and the Principal Technical Assistance Team (PTAT) for assisting in the collection of all of the background data, documents, and correspondence for a comprehensive evaluation of a project as complex and all-encompassing as the Rural Electrification Project. In particular, we would like to thank Mr. Charles Moseley and Mr. Kenneth Lue Phang of USAID and Mr. Donn Ruotolo and Mr. John Andrews of the PTAT for assembling all of the basic documents for our inspection, and for responding quickly and efficiently to our innumerable requests for clarification and additional data. Mr. Terence D'Souza was able to assist the team members in the navigation of the intricacies of USAID, procedures, as well as provide us with informative companionship on our field site visits.

The evaluation team would also like to extend its thanks to all the individuals within the Pakistan Water and Power Development Authority (WAPDA) Headquarters in Lahore and the Government of Pakistan (GOP) offices in Islamabad who devoted so much time to discussing current procedures, plans for the near future, and ongoing internal WAPDA programs that complement or parallel those being undertaken by the PTAT. We would also like to acknowledge the courtesy and assistance provided to team members by WAPDA field staff in our site visits to Faisalabad, Multan, Quetta, Lahore and Muridke.

Lastly, we would like to thank those individuals who suffered with us during the production of this report, and who gave up their nights and weekends to prepare the numerous drafts that were welded into this final product. Mr. Patrick William assisted in the reproduction of the many drafts and of the background material. Mr. Allah Ditta Gill ferried the evaluation team around to its many appointments with boundless good humor and patience. Most of all, we would like to thank Shaikh Mohammad Gulzar, who was able to efficiently convert our scribblings and marked up draft copy into a readable final copy.

1.0 INTRODUCTION

The Pakistan Rural Electrification Project was approved by the U.S. Agency for International Development in September 1982, providing for grant funds of \$43 million and loan funds of \$112 million (plus rupee counterpart funds equivalent to \$14.5 million) for the implementation of a major technical assistance program for the Distribution and power generation (component 4) function of WAPDA. An additional \$15 million was also earmarked for the use of the project under the Agricultural Commodities and Equipment Project for installation of electric tubewells.

After a major competitive procurement, the contract for the technical assistance component of the project was awarded in January 1984 to a consortium of U.S. firms: Ebasco Overseas Corporation, Inc. (EBASCO); American Electric Power Energy Services (AEPES); and International Training and Education Company (ITECO). These firms were joined by three Pakistani subcontractors, namely Fikri Associates Consulting Engineers (FACE), Associated Consulting Engineers (ACE), and EMMAY Associates Limited. A separate contract was awarded on November 1983 to Gibbs and Hill to provide technical assistance, engineering, procurement, site engineering, and construction management for the Guddu Combined Cycle Gas Turbine Power Plant.

The evaluation team was assembled by USAID/Washington, using specialists drawn from two firms: Associates in Rural Development, and Lee Wan Associates. The composition of the team was as follows: John Ashworth, team leader; John Blumgart, institutional specialist; Lucio Burgos, commercial procedures specialist; Rawleigh Gaines, training specialist; Donald Hertzmark, economic analyst; Ahmad H. Naseem, engineering specialist; and Eugene Tierney, engineering specialist.

The purpose of this mid-term evaluation was to provide USAID/Islamabad and AID/Washington with timely information on the current progress of the implementation of the project, the degree to which progress toward the original objectives has been satisfactory, and the soundness of changes in the project which have been made to date. For a complete description of the charge to the evaluation team, see the scope of work in Appendix A.

Two separate assessments of components of the Rural Electrification Project have also been undertaken in parallel to the main evaluation effort. The first, an examination of the Gibbs and Hill contract for the Guddu combined cycle generation plant, was conducted by Mr. James Stephenson during the period March-April 1986 under a personal services contract with the USAID/Islamabad mission. This assessment of Gibbs and Hill's performance to date and the set of recommendations for the expansion of the Gibbs and Hill contract is largely self-contained. Since this assessment had been completed prior to the completion of the main project assessment effort, the evaluation team was instructed not to devote effort to the Guddu component of the project, but to append the resulting report, minus confidential financial information, to the overall evaluation report (see Appendix B). However, since the Guddu component was such a large part of the overall project effort, and since it appears to have made an important contribution to WAPDA's overall capability, important conclusions of the Stephenson report have been excerpted and inserted throughout the main report as appropriate.

In addition, a separate assessment of the PTAT contract and an internal USAID operational audit were just beginning at the end of the main evaluation team visit. USAID has engaged a electric utility management specialist, Frank Dendrock, to examine the current EBASCO/AEPES/ITECO contract and the revisions proposed by the contractor consortium in response to the acceleration of the scope of work in in mid- 1985. Mr. Dendrock was scheduled to spend three weeks in June and three weeks in August or September examining the PTAT contract, contractor performance, proposed level of staffing, home office level of effort, etc. The USAID operational audit will be performed by a group of USAID/Islamabad specialists, and will provide additional information to be used in conjunction with the PTAT contract assessment.

As the result of this separate review of the EBASCO contract, the main evaluation team was instructed not to devote any time or attention to the pending contracting issues between USAID and EBASCO, despite their obvious implications for the ongoing implementation of the project and for its future shape. For example, USAID concern over the proposed expansion of technical assistance expenditure (from approximately \$18 million to \$38 million) and the unexpected high expenditures for U.S. home office staff led to a stop work order in February 1986, which effectively halted the Sister Utility Exchange Program. When the contact assessment is completed, it is expected that the recommendations and findings of that effort will be incorporated into the final evaluation report, and that the report will be attached to the main report as an appendix.

In order to carry out such a large-scale evaluation in a period of six weeks, the evaluation team had to rely on a mixture of analytic methods. An in-depth analysis of the project correspondence, reports, and basic documents was supplemented by interviews of the PTAT and WAPDA and USAID staff, as well as meetings with senior officials concerned with energy in the government of Pakistan. In order to determine the quality of the work being executed under the supervision of PTAT staff under the Energy Loss Reduction program, visits were taken to a number of nearby rehabilitated feeders. Fields visits were also taken by groups of team members to the Area Electric Boards in Faisalabad, Multan, Quetta, and Lahore, as well as to one of the planned model divisions in Muridke.

The evaluation report is organized topically, in order to present information on each of the major areas of project activity separately to interested audiences. The executive summary has been prepared as a stand-alone document. As requested by USAID, separate sections have been included on the three major planning reports prepared by the PTAT (Part Two), project progress (Part Three), management and institutional relationships (Part Four), and the evaluation team's recommendations for the expenditure of the funds set aside for Component five, rural system expansion (Part Five).

2.0 EXECUTIVE SUMMARY

During the period April 27-June 12, 1986, a seven-person mid-term evaluation team examined the current status, progress, and problems of the USAID-sponsored Rural Electrification Project. The project has focused on providing technical assistance to WAPDA of Pakistan in the areas of internal reorganization, institutional strengthening, modern utility practices and procedures, training, electrical distribution system rehabilitation, and system expansion planning and implementation.

The magnitude of this Project necessitated a substantial technical assistance effort, provided by three U.S. firms and three Pakistani engineering subcontractors, collectively known as the PTAT. Since August 1985, the already substantial U.S. expatriate staff was greatly enlarged by a USAID request to the Joint Venture management to accelerate the use of the scheduled level of effort to add counterparts for new management positions being created in the headquarters of the reorganized WAPDA Distribution Wing. The PTAT professional staff has grown to include sixteen U.S. long-term consultants, fifty long-term employees of the Pakistani sub-contractors, and numerous expatriate and local short-term specialists.

In the first two years of project implementation, the PTAT has concentrated on five major areas: the development of a set of planning documents; the reorganization of the WAPDA distribution function; the development of new procedures and utility practices, collectively entitled institution strengthening; training and curriculum development; and the provision of engineering services, primarily in the area of energy loss reduction and distribution system rehabilitation.

2.1 Major Project Planning Documents

The Rural Electrification Project was designed to have an initial period of joint PTAT/WAPDA systematic analysis and planning, which would result in the production of a set of three major reports. These would serve as blueprints to guide the direction of WAPDA/Distribution's effort over the period 1985-1993, and would determine the PTAT's program as well. While there have been major delays, particularly in the Institutional Improvement Plan, all of the reports have now been completed, at least in draft form. The analysis of these reports was one of the major tasks given to the evaluation team.

The Institutional Improvement Plan

The Institutional Improvement Plan (IIP) was originally designed to provide a blueprint for the evolution of WAPDA distribution into a more efficient and well-managed organization. It is an inadequate document, however, since it never analyzes WAPDA's institutional problems nor lays out options for their resolution. Rather it starts from two basic assumptions: 1) WAPDA distribution should be reorganized so it can become a separate institution in the near future; and 2) the reorganization should be based on the model of American Electric Power. The IIP then becomes an implementation program for reorganization along the AEP model. The changes proposed range from revised personnel procedures to the computerization of customer billings, but all within the context of new units within a revised organizational chart.

What is missing is a professional institutional analysis of how WAPDA operates: its norms, decision-making practices, personnel procedures, and relationship with other parts of the GOP. There is also a need to integrate this analysis with the other two major PTAT reports, the training and technical master plans, which is planned to take part in a fourth future summary report.

The IIP has also run into serious problems, even in its reduced role as a reorganization document, because of the long delay in winning WAPDA and GOP formal endorsement. It wasn't until mid-May 1986 that WAPDA nominated and the GOP endorsed the assignment of senior WAPDA staff to the slots in the WAPDA distribution organization, 17 months after the reorganization had been approved in concept by WAPDA. This delay has seriously slowed the effort to integrate PTAT and WAPDA in many technical areas, due to the lack of WAPDA counterparts.

USAID, WAPDA, and the PTAT have recognized the weakness of the IIP, and have had PTAT senior management develop a vastly superior summary IIP. This document does analyze many of WAPDA's institutional problems clearly and concisely, and makes a better case for the need for the reorganization on the AEP model. It can serve as the basis for a revised IIP, once a major institutional analysis of WAPDA's needs, procedures, norms, and internal incentives has been completed by a team of senior institutional analysis and change specialists.

The Master Plan for System Rehabilitation and Expansion (the Technical Master Plan)

The Technical Master Plan (MP) was prepared by PTAT for WAPDA/Power. Recognizing the need for long-term systematic planning for WAPDA/Distribution, USAID made the development and acceptance of the MP a condition precedent for the release of USAID funds for rural systems expansion. The MP was submitted to General Manager Distribution on November 25, 1985, and the GMD forwarded it to the GOP (Ministry of Water & Power) on March 2, 1986 for approval.

The Technical Master Plan represents a first step at instituting a planning process at WAPDA. As such, it is not a step-by-step implementation plan in the sense that is commonly understood. The Plan does not show the temporal, logical, or spatial relationships among various proposed activities. Indeed, lacking much of the data needed to construct such a detailed document, the plan focuses instead on aggregate expenditure levels under alternative funding scenarios. The four scenarios considered in the Plan differ according to measures of input levels. These measures include the number and type of customers, aggregate line losses, and total electricity sales through 1993. Scenario A represents the extension of current trends in WAPDA Distribution activities. Scenario B is the electrification program mandated in the Sixth Five Year Plan. The third and fourth scenarios are plans proposed by the PTAT as being technically feasible. They reduce the emphasis on rural electrification but accelerate the efforts to curb line losses. These scenarios also seek to increase the economic viability of WAPDA distribution by focusing attention on activities with the highest rate of return. However, since the MP was drafted in 1985, it does not reflect the latest national goals announced by the Prime Minister, namely: electrification of 90 % of

villages by 1990, and an end to load shedding by the same date. These will probably have to be factored into win ministerial approval for the MP.

The MP has succeeded in one of its major objectives, that of mobilizing resources from outside lenders. The creation and completion of the MP demonstrated the general areas of concentration, and showed a general level of consensus within the GOP on direction and levels of resources required. As the direct result of the MP, substantial funding appears to be secured from the World Bank and Asian Development Bank, supplementing funds from USAID.

The MP is less successful in addressing its audience within the other parts of the GOP. The document has not yet been integrated with other GOP energy planning activities. The mandated GOP plan (Scenario B) is only used as a reference point, and no revisions have yet been made to reflect the far more stringent requirement imposed recently to reach 90 % of villages with electricity by 1990. Required activities by other ministries or groups outside WAPDA are not discussed. The issue of electrical tariffs and how they should be set is not addressed.

One of the issues that any successful plan must face is that of allocating resources within an organization. The current version of the Technical-Master Plan, as an initiator of the planning process, does not yet provide WAPDA managers with a process and criteria for resource allocation. In order to do so, the planning process must address the important conflicts among various investment policies, identified by the evaluation team. These conflicts will require tradeoffs among competing projects. However, the Plan does not yet contain projects. Instead, it moves from the level of aggregate expenditures to the design of a Work Order System (WOS). Such a transition will improve the efficiency with which specific tasks are planned and implemented within WAPDA. The WOS will provide a set of procedures and guidelines for the engineering and financial design and control of rehabilitation and expansion activities. This system represents a clear improvement over current procedures. In the transition from the general to the specific, the Plan does not combat the organic and unplanned nature of WAPDA's system expansion and rehabilitation activities. The lack of clearly identifiable projects may be the chief weakness of the Plan. In fact, without a project unit of account, it is difficult to tell how the implementation of a WOS will improve the allocation of scarce WAPDA financial and human resources. To become an accepted part of the WAPDA planning process, the Technical MP will need to fill in the project level of activities. At that level, the implications of changes in assumptions regarding funding, urban v. rural emphasis, power plant construction, industrial growth, among other factors, can be carefully enumerated. Such an enumeration can allow WAPDA to implement its plans with a better idea of the impacts of the inevitable frequent changes in conditions and assumptions. This understanding can, in turn, allow WAPDA to bring the other GOP energy planning agencies into the power sector planning process in an informed manner. This would make the Technical MP WAPDA's plan and not just the recommendations of a set of outside consultants.

The Comprehensive Power Distribution Training Plan

The Comprehensive Power Distribution Training Plan (CPDTP) was prepared by a team of PTAT expatriate and local Pakistani consultants, in close

collaboration with WAPDA staff. It was formally approved in November 1985 and reissued in its final form in December 1985. It was the first of the basic planning documents to be completed and the only one which has received final approval from both WAPDA and USAID. It serves as the basis for the ongoing PTAT/WAPDA training program, and as a guide for all WAPDA Distribution training activities.

The Training Plan is a well-organized and well-executed plan, to meet WAPDA Distribution's current training requirements while addressing the organization's long-term manpower development goals. It consolidates all WAPDA Distribution Training activities into a centrally controlled operation. It provides a management tool that insures that as new procedures are introduced into WAPDA's institutional improvement, the training required will be available. This will hopefully insure the creation of a work force with the knowledge, skills, and proper attitudes needed to make these systems work properly and efficiently.

2.2 Project Progress to Date

Institutional Reorganization

The reorganization of the WAPDA Distribution function has been a major preoccupation of the USAID and PTAT staff for the past two years. The reorganization of the WAPDA Distribution function along the lines of American Electric Power appears to be as an autonomous entity well-structured. It will facilitate a later separation of the distribution function, although this does not appear to be likely in the near future and necessarily appropriate at WAPDA's current stage of development.

The implementation of the proposed restructuring and staffing of WAPDA Distribution has barely begun. The planned reorganization has been agreed to in principle for more than 17 months, but its implementation was delayed due to difficulties in getting the Institutional Plan completed and approved. The GOP has now only just completed the selection and appointment of the senior WAPDA staff for the new organization, so there will still be a 3-6 month delay before an effective working partnership between the new WAPDA managers and their PTAT counterparts can be established.

Unfortunately, reorganization has been substituted for the development of solutions to meet many of WAPDA's major institutional problems. The institutional improvement program has only indirectly addressed a number of the key problems that must be resolved soon if WAPDA is to undergo serious institutional reform and evolution. These include admittedly sensitive issues such as overstaffing, recruitment practices, low productivity, low compensation, centralization of decision-making, and illegal payments.

Institutional Improvement

The PTAT team has launched a comprehensive effort to transform WAPDA distribution support and administrative practices and procedures, in four major functional areas: purchases and stores, customer services, finance, and management services (computer utilization). A myriad of tasks are being undertaken, ranging from the development of model warehouse to computerization

of customer billings. The approaches and methodologies are sound, and in keeping with modern utility practices. WAPDA has benefitted from these utility consulting services, but has not begun to assimilate the skills required to execute them. With the notable exception of management services, in which the WAPDA computer staff have played an active role in planning, technical design and training, most of these practices and procedures currently exist only as PTAT reports or as PTAT consulting services provided to WAPDA. They have not yet been integrated into WAPDA's day-to-day activities, nor have the skills required to undertake them been satisfactorily transferred.

Training and Curriculum Development

Distribution training has been one of the most successful components of the Rural Electrification Project. There has been a functional integration of WAPDA, PTAT expatriates, and PTAT local staff in the execution of the training functions which could serve as a model of the other PTAT technical areas. The reports and curricula being developed are of uniformly high quality, and will be directly applicable to the short-term needs of WAPDA staff and the long-term institutional needs for increasing professionalism. Virtually all of the training program activities, with the noted exception of the Sister Utility Program, are on or ahead of schedule.

System Capacity Expansion

The inauguration of the first phase of the Guddu Gas Turbine Power Plant in April 1986 was a major step forward for the WAPDA, and a significant increment of badly needed baseload power for Pakistan's national electrical grid. When the steam cycle which will use the waste heat produced by the gas turbines is installed by the end of 1987, the total capacity will be a nominal 600 MW. Thus far, this component of the Rural Electrification Project has been on time and under the original total budget, primarily because of sharply lower bids than originally anticipated for capital equipment such as gas turbine generators, step-up transformers, and steam turbines. These unexpected cost savings have provided the funds to cover the greatly expanded level of effort for the Guddu plant contractor.

System Rehabilitation and Energy Loss Reduction Program (ELR)

The system rehabilitation and energy loss reduction program was established to reduce the extensive energy losses throughout WAPDA distribution network. Initially, PTAT encountered problems implementing the program, due to lack of reliable data and system maps. A crash program was initiated by WAPDA for correction of 54 feeders using existing WAPDA material. The design work was done by PTAT staff with little WAPDA participation, and the finished design specifications provided to WAPDA construction teams for the rehabilitation work. In continuation of the program the work orders will be prepared by the Area Electricity Boards (AEBs) with PTAT's assistance. This procedure will be an improvement over the previous one, as PTAT completed the design work with minimum WAPDA participation.

A work order system has been developed by a PTAT short-term specialist and the first phase is being implemented. It appears that full-scale integration of

the work order procedure into WAPDA's standard operating procedures will be undertaken only after the proposed distribution reorganization.

Lack of WAPDA participation and involvement, except perhaps at the General Manager/Distribution (GMD) level, has been and remains a serious problem in this program. As an example, a PTAT short-term specialist designed and tested a load-limiting device, using locally available materials, and submitted a report outlining its proposed use within WAPDA. Concurrently, the GMD travelled to Europe to review ripple control load management devices, which PTAT senior management admit is probably a preferable system because of its greater flexibility. Implementation of the proposed testing of the PTAT load management devices will be delayed until the pilot program has been approved, and until it can be resolved as to which type of load management control system should be used. Better coordination between the PTAT and WAPDA senior management could have minimized this duplication of effort.

Material procurement is over a year behind schedule due to different requirements and approvals by WAPDA and USAID. The contracts for the required materials for the ELR program have been placed with the suppliers but delivery will be over the next year, three years into a five year program. The invitation for bids (IFB) for the "Special Metering Packages" have not been issued by USAID/Islamabad despite having the specifications since September 1985. Without the instrumentation, the program results are theoretical.

The contract has been issued (ADB funded) for the computer mapping of 190 feeders but WAPDA has not created a centralized mapping function to maintain the completed maps. A mapping function has been created at all 8 AEBs, and plans have been laid for future upgrading.

System Planning

The improvement of WAPDA's institutional system planning capability and the transfer of engineering technology is one of the major goals of the Rural Electrification Project, and these goals are echoed in the Institutional Improvement Program (IIP). Presently, the WAPDA Distribution planning function is the responsibility of the AEBs, with only summary information being provided to WAPDA Distribution headquarters.

The IIP outlines the procedures and organizational changes required to modernize and streamline the engineering planning function. The implementation of the IIP will require the consultation and advice of the PTAT senior staff, working closely with each of the newly appointed WAPDA divisional heads. In order to insure that technical engineering technology transfer to the new distribution division is occurring, and that additional consulting tasks are not simply being passed along to the PTAT, PTAT and USAID will have to monitor each activity carefully.

As part of the system planning process, two model divisions are being organized, designed along the lines of American Electric Power. The two divisions were chosen as being representative of a cross-section of WAPDA's service areas (rural, industrial, and urban), as well as its customers. Implementation of the model division changes, including communications, vehicles, and computerization, is scheduled to begin in July 1986, once

reorganizational questions are settled. The model division reorganization should serve as a model of the participation of WAPDA throughout the design and implementation of a project.

The AEBs will be reorganized after the model divisions are operating and using the implementation procedures as outlined in the IIP. Reorganization of the distribution organization is vital to all phases of project. Until WAPDA issues the order to proceed all aspects of the engineering, planning and transfer of technology will proceed at a reduced rate.

Transmission and Grid Stations function is under review for transfer to the distribution organization resulting in some controversy within WAPDA. Since the transfer is expected to occur in 3 to 5 years time, and since the distribution organization is undergoing such strains with its new reorganization, this transfer might well be deferred until the reorganization is completed in 3 to 5 years.

2.3 Project Management

PTAT Management

The senior management of the PTAT has done an excellent job in managing a very large and diverse technical assistance effort, scheduling the work effort of more than 50 professionals in a wide range of technical areas. They have been highly responsive to both USAID and WAPDA senior management new initiatives, even when these have adversely affected the execution of other portions of the existing work plan. The chief consultants and managers of the PTAT local contractors appear, for the most part, to be managing their individual areas well, adhering to the schedules set forth in their specific work assignments.

PTAT senior management has been less successful in focusing the attention of their staff on the importance of WAPDA institutional development, which is supposed to be the major outcome of the technical assistance effort. To date, the PTAT focus in this area, reflecting that of USAID, has been almost exclusively on reorganization of the WAPDA Distribution headquarters, plus a more recent parallel effort to reorganize and strengthen WAPDA's divisions. Difficulties in getting the reorganization plan completed, approved, and staffed by WAPDA has slowed much of the transfer of skills and modern utility techniques to WAPDA personnel. The PTAT will need to bring into the project a group of professional management and institutional change specialists to accelerate the implementation of the institutional strengthening effort. The PTAT management must devote much more effort insuring that WAPDA staff begin immediately assuming more daily responsibility for the tasks being undertaken by the project, even if this slows the production of outputs and deliverables.

Gibbs and Hill Management

Gibbs and Hill has performed admirably under difficult working conditions, bringing the 4 X 100 MW gas-fired combustion turbine power plants into operation on time and under budget despite major problems with several of the subcontractors. In order to keep to the established timetables, Gibbs and Hill has been forced to take over many functions not originally envisaged for it, such as the engineering, design, and procurement for the Mari Gas Pipeline

barrage crossings and construction staff support at the combined cycle plant site. They have provided USAID with professional and timely information on planned activities, have been able to maintain time schedules despite a number of unforeseen occurrences, and have repeatedly expanded their level of effort to adapt to changing circumstances.

USAID Management

USAID/E&E senior management has provided good strategic level management of the project, and has worked closely with senior WAPDA and GOP decision-makers. USAID staff have also taken a key role in the coordination of energy activities with other major international donors. The day-to-day management of the project has been less successful. Current project oversight is insufficient. The USAID project staff, due in part to a very heavy load of project development responsibilities, have been unable or unwilling to devote the time required to project supervision. The existing work plan does not give USAID sufficient information for monitoring and evaluating project progress. Lines of formal and informal authority within the E & E office have proved to be a problem as well. Formally, there has been a number of project officers, some of whom have served only for a short period of time before being reassigned to other tasks. Informally, the contractor staff, the current project officer, and the program officer defer decisions to the E & E senior management, and tend not to take initiative without approval (despite the clear delegation of authority to them). This has been a particular problem during periods when the office head has been absent or occupied with other activities. More active mission oversight will be required in the future, preferably by an active project officer, unencumbered by other duties, based in Lahore.

The evaluation team finds a major management problem in the perception on the part of USAID, PTAT, and WAPDA of what the proper function of PTAT staff should be. At times, PTAT staff have been treated as adjunct staff members by both WAPDA and USAID management. At the request of WAPDA managers, USAID has repeatedly introduced major additional tasks for the PTAT staffs, tasks which are at best peripheral to PTAT's major objectives. In addition, many WAPDA senior managers regard PTAT staff as free engineering consultants who will do tasks for WAPDA, rather than act as advisors helping WAPDA to do tasks for themselves.

The evaluation team has not directly examined the USAID management of the Guddu component, nor was this covered by the report developed by James Stephenson. No interviews were undertaken with the Gibbs and Hill staff in Lahore or at Guddu by the main evaluation team, since this was beyond the mandate of this effort. It appears that USAID and Gibbs and Hill management have worked together closely to overcome a number of vexing problems and keep the construction on schedule.

2.4 Institutional Relationships

There have been close working relationships developed between PTAT and USAID management, on the one hand, and at the highest levels of WAPDA management on the other. This has resulted in a considerable amount of effective policy dialogue, due in good measure to the diligence of the USAID E & E office Chief

and PTAT project and program managers. As the project continues, these relationships should continue to strengthen. These ties will be extremely useful as the project begins to address the difficult questions: implementing real institutional changes (beyond just reorganization) in WAPDA; introducing annual and multiyear project planning in the distribution wing; pricing of electrical power; and elimination of subsidies within the power sector.

The PTAT/WAPDA working relationships at the operational level have been mixed, depending on three factors: the existence of a WAPDA counterpart, the other responsibilities of the WAPDA counterpart, and the working style of the chief PTAT consultant in each area. The delay in the reorganization of WAPDA distribution headquarters has seriously delayed the posting of several permanent WAPDA counterparts. Others are designated, but are loaded with other full-time routine tasks to accomplish, leaving them hardly any time to work with the PTAT. Some PTAT chief consultants are perfectly happy working as consultants to WAPDA, executing tasks themselves rather than insuring that WAPDA staff are learning how to do the work. The evaluation team feels that changes must be made immediately, so that PTAT and WAPDA staff are effectively integrated where needed. When it is time for the PTAT staff to leave, WAPDA staff must be ready to step in and take over without any visible effect. It must be in each WAPDA counterpart's career interest to work with PTAT, and PTAT staff must be judged not just on their output of deliverables but also on the extent to which those deliverables are produced and owned by WAPDA technical staff.

2.5 Major Problems Requiring Immediate USAID/PTAT Attention

Institutional Improvement

While the Institutional Improvement Plan and the institutional strengthening technical assistance program have important merits that warrant USAID support, they do not represent adequate remedies for WAPDA's larger problems. Specifically, they do not deal with the following institutional weaknesses, which must be resolved if WAPDA Distribution is to take on still larger and more complex roles in the future:

- Inadequate authority to manage its own affairs:

The erosion of WAPDA's autonomy over the years has resulted in an increasing discrepancy between its responsibilities and authority in such important areas as senior staff appointments, electricity pricing, internal organization, and relationships with other agencies.

- Management attitudes and style:

There is currently excessive centralization of decision-making in WAPDA Distribution, creating major disincentives for subordinate officers from ever making decisions, taking initiative, or trying out innovations that would increase efficiency. Due to excessive interference from superiors, there is widespread tendency to avoid resolving problems at lower levels within the organization.

- Personnel, manpower, and employment procedures:

There are major problems within WAPDA Distribution of inadequate compensation, compression of compensation and mobility at the senior levels, emphasis on seniority over merit in advancement and promotion, lack of career planning, and inadequate incentives procedures to retain key technical specialists. The very specialized role of WAPDA requires some differentiation from government pay scale and norms.

- Overstaffing:

WAPDA Distribution has many more low-ranking personnel than is common in other developing country utilities with the same service responsibilities, and only preliminary plans for removing surplus personnel as new, more efficient procedures such as those advocated by the PTAT staff are introduced. Planning must be undertaken so that as computerization, communications and new vehicles are introduced, staffing can be held constant or reduced by attrition as the distribution system continues to expand, or else existing staff can take over additional functions such as maintenance.

- WAPDA's Profile Problem:

Closely coupled with the personnel and procedures problems is the alleged problem of illegal gratuities that exists in some levels of WAPDA's Distribution System. Such a condition affects the employee behavior, WAPDA revenues, and WAPDA's image and relationship with the public. Remedial measures adopted by WAPDA should be strengthened and accelerated.

Problems such as these must be addressed systematically in high-level discussions with WAPDA and GOP senior management to insure meaningful institutional changes, as well as the implementation of the practices and procedures that PTAT has been developing. Additional skilled long-term management specialists may have to be added to the project for these functions.

Use of PTAT Consultants as Adjunct WAPDA and USAID Staff

Closer controls should be instituted by the USAID Program Office to minimize the use of PTAT staff for assignments that do not contribute directly to the strengthening of WAPDA distribution's institutional capacity to plan, upgrade its internal procedures, increase its efficiency, and execute its primary functions. The use of PTAT staff as general, all-purpose consultants to USAID and WAPDA for the power sector should be ended, and each new request should be justified not according to the rather loose scope of work but according to the overall goals of the project.

Use of PTAT staff as Engineering Consultants Rather Than Advisors and Counterparts

USAID and PTAT must take immediate steps to integrate the PTAT and WAPDA staffs, and to insure that the WAPDA counterparts take the lead in the preparation of all PTAT reports, procedures, and programs. High-level attention will be required to insure that WAPDA counterparts are, in fact, freed from their current responsibilities to participate, and that PTAT senior consultants are prevented from performing tasks for, instead of with, the WAPDA staff. USAID must be prepared to accept some slippage of deadlines as the WAPDA staff learn new procedures and skills.

Acceleration of the Transfer of Modern Utility Practices

In a number of technical areas, WAPDA staff have been only slightly involved in the technical activities being undertaken by the PTAT. In addition to the integration of WAPDA and PTAT staff at the headquarters level, much more should be done to provide hands-on experience in new techniques and practices to junior staff in headquarters as well as staff from WAPDA's AEBs and Divisions. Examples where this would be particularly helpful include rehabilitation and line loss reduction engineering work, as well as the development of procurement specifications. Selected younger staff from the field ought to be brought into the working of the PTAT teams for observation and hands-on training.

Shifting of Focus within the PTAT Staff

The increased attention that will be required for institutional change and reform will necessitate a substantial revision of the PTAT current and future staffing plans. If the level of expatriate technical assistance is to be maintained constant within the Rural Electrification project, USAID will have to require PTAT to reprogram at least four person-years of the planned activity effort into the recommended institutional change work. Several areas of planned PTAT effort have been identified by the evaluation team as being less crucial to WAPDA long-term improvement and might be cut back in the future, including training, transmission and generation coordination, and stores and inventory controls. The final shape of the revised technical assistance effort should be determined by senior management of WAPDA, USAID, and the PTAT.

Monitoring and Evaluation

Monitoring and baseline data collection was supposed to be a major part of the Rural Electrification project for, without it, there can be no measurement of the progress of each component and of the project as a whole. To date, no work has been done in this area by PTAT or WAPDA. There is a particular immediate need for a systematic instrumentation and monitoring of selected energy loss reduction work, to determine the actual energy savings and economic benefits. Development of the planned data base should be accelerated. Actual productivity and performance of WAPDA individual staff and work units within major administrative units, such as the model divisions, should be measured before and after the implementation of the proposed reorganization and improvements in areas such as customer service, complaint response, and maintenance. Performance tests are also needed as followup for training programs.

2.6 Evaluation Team Recommendations

1. Introduce An Institutional Strategy Team

It is recommended that a high-level team, from a major U.S. corporate reorganization or management consulting firm, be brought in immediately to work directly with USAID and the most senior levels of the GOP (WAPDA, Ministries of Finance, Planning, Water and Power). The participants should be high-level experts in mediation and the design of institutional reform. The

objective would be to reach consensus and agreement on the major institutional changes required for the problems outlined in the institutional improvement portion of section 2.5 above. A three person team (including at least one Pakistani management consultant) would be required for at least six months, working with GOP Cabinet ranking officials.

2. Provide a Followup Institutional Procedure and Process Team

Once objectives and strategy have been agreed upon in the first phase, a group of technical specialists should be introduced to assist in the preparation of a detailed implementation schedule. Candidates for running such an effort include some of the major accounting firms or management consulting firms specializing in corporate reorganization and restructuring. Pakistani experts, including perhaps persons drawn from the senior staffs of the three PTAT sub-contractors, should play a prominent role in this work. The effort will require 2-3 long-term staff for 18 months each, plus a number of short-term specialists.

3. Have WAPDA, assisted by PTAT, Rework The Energy Master Plan to transform it into an Implementation Plan for Energy Loss Reduction and System Expansion

The Technical Master Plan must be transformed into a series of discrete projects, complete with detailed implementation plans, resource requirements, and expected benefits. It should reflect a realistic assessment of what WAPDA can execute, given its current manpower and financial constraints. WAPDA Distribution and WAPDA (Power) Planning staff should provide the bulk of the required manpower, along with assistance from the Ministry of Planning and Finance. PTAT should provide one specialist as technical advisor to the WAPDA effort for six months, but the work should be largely performed by WAPDA and GOP staff.

4. Insist on the Speedy Implementation of the Reorganization Contained in the IIP

It is recommended that USAID again raise at the ministerial level the need to post immediately all the WAPDA staff approved for the reorganized WAPDA Distribution headquarters. These individuals should be freed from all other duties and physically assigned to these posts as soon as possible, but certainly within 90 days. Individuals who are already designated as counterparts but who are working on other tasks should be assigned to their new positions full-time.

5. Integration of PTAT and WAPDA staffs

It is recommended that USAID make continued support of the Rural Electrification project contingent on the total physical integration of the PTAT and WAPDA staff. This should be accomplished as rapidly as the counterparts are designated, and should include both the senior and junior staff in both organizations. WAPDA senior staff should be encouraged to take over major responsibility for the planning and execution of all the functions being covered by the PTAT. Within one year, USAID should perform a follow-up examination to determine that WAPDA staff are now actually performing the work, with PTAT staff reduced to an advisory and quality control capacity.

6. Allocate the Component 5 funds to a mixture of institutional improvement, tubewell electrification, and electrification of a geographically concentrated group of villages

The evaluation team recommends that \$2.5 million of the \$55 million held for Rural System Expansion be reprogrammed for the hiring of the institutional strategy and institutional procedures teams recommended above. It is further recommended that the \$17 million held aside in the Agricultural Commodities and Equipment Program be released for the electrification of 10,000 new tubewells, each fitted with the load management devices to eliminate operation during peak demand periods. Lastly, it is recommended that \$50-52.5 million of the Component Five money be released to electrify the largest villages not falling into WAPDA's current criteria, preferably in one or two geographical areas. These villages should be used as models on proper rural electrification, and will include total electrification for all commercial and residential customers. Additional load management devices should be added to existing tubewells in the area, so that peak demand is not increased. The AEB that has the responsibility for the area will conduct the engineering site investigation, prepare required maps, complete design, prepare work orders and construct the system.

7. Expand the Scope of Work and Level of Effort of the Contractor Gibbs and Hill to Reflect its Additional Responsibilities during the final 18 Months of Construction of the Guddu Combined Cycle Power Plant

USAID's consultant James Stephenson has recommended that the scope of revised work plan, submitted by Gibbs and Hill January 1, 1986 be accepted with minor revisions. This would mean the addition to the Gibbs and Hill contract of 350 person months of home office and field personnel above the currently authorized level of 782 person months approved in 1985. He has also recommended that a monthly process be instituted for comparing the projected home office and field office requirements, drawn from the revised Work Plan, with the expenditures submitted by the contractor.

8. Accelerate the Implementation of the Sister Utility Exchange Program and Short-Term Incountry Training

It is recommended that the financial issues currently blocking the implementation of the Sister Utility Exchange Program be resolved within the next 90 days, and that the proposed program be accelerated in order to have the program back on schedule by September 1986. In addition, the evaluation team strongly recommends that PTAT and USAID senior management insist that senior consultants and WAPDA counterparts begin to make use of the short-term in-country capability offered by the Training program. At least 300 WAPDA personnel should have been provided training through this mechanism by the end of 1986, and 1200 by the end of 1987.

9. Institute A Major Program of Monitoring and Data Collection

USAID should authorize the expenditure of \$1.1 million from existing project funds for the collection of baseline data and monitoring of project work orders, including the pending \$700,000 procurement for special meters to measure the impacts of the energy loss reduction program.

USAID-Rural Electrification Project

Mid-Term Evaluation

PART ONE: PROJECT BACKGROUND

3.0 PROJECT BACKGROUND AND HISTORY

3.1 The Original Project Mandate

The Rural Electrification Project was designed to meet three primary objectives:

- Expand reliable electrical service to a greater number of Pakistan's rural population for both productive and social uses;
- Improve the access of the rural poor to that service; and
- Assist the Government of Pakistan in overcoming a shortfall in electric power generation capacity.

The project, as originally designed, consisted of five interlinked and mutually dependent components. These are:

- Component one: Institutional improvement
- Component two: Distribution training and technology transfer
- Component three: Energy loss reduction program
- Component four: Power generation through the Guddu gas-fired, combined cycle power station and
- Component five: Rural system expansion.

It was contemplated that components 1,2,3 and 4 would commence immediately, with component 5 being delayed until additional generation capacity was installed and an overall master plan for distribution system expansion had been completed and approved.

3.2 Changing External Conditions that have Affected the Project

The Rural Electrification Project has undergone a considerable redirection in its first two years of existence, and is not presently a rural electrification as normally conceived of within the AID framework. This mission E & E staff maintains that the title Rural Electrification was a misnomer from the very beginning, and reflects the existence of a pre-existing project design rather than the intent of the project design team. It was always planned to be an institution-building, training, distribution infrastructure strengthening, and generation capability building project, the E & E staff maintain, with the extension of new service being predicated on a variety of systemic improvements occurring first. While this is true, the evaluation team feels

that the widening sense of crisis within the Pakistan Power sector since the inception of this project has also contributed to a general emphasis on short-term problem solving and staff work rather than institution-building and rural electrification.

First and foremost of the crises that plagued Pakistan's power sector was the unprecedented loadshedding that occurred throughout 1985. A combination of unusual events, led by the virtual absence of the normal monsoon rains and by the onset of hot dry weather during much of the normal planting season throughout much of the country, caused the WAPDA electrical system to almost grind to a halt. The lack of rains, combined with unusually high demands for irrigation, lowered the heights of the water impounded behind the Tarbela and Mangla Dams. Despite the addition of 350 MW of additional national hydroelectric generating capacity, actual hydroelectric power production dropped by more than 577 million kilowatt-hours, or more than 4.5% from 1984 to 1985. Although the overall WAPDA system was able to increase its total energy production by pushing the utilization of thermal power plants to more than 90%, the result was still massive loadshedding because of the growth in demand. As USAID/E & E staff correctly noted when reviewing an earlier draft of this evaluation, 1985 had been predicted as the year of the worst capacity shortfall prior to the completion of the project paper in 1982, based on projected demand and supply figures developed by WAPDA. However, the drought conditions increased the loadshedding far more than had been anticipated (912 MW had been predicted and nearly 1500 MW shortfall were reached at times in 1985). Some areas experienced more than eight hours of loadshedding each day, a practice that threatened output for farms relying on electric tubewells, disrupted industrial and commercial activities, and angered large segments of the population.

Faced with widespread loadshedding in 1985, WAPDA and USAID jointly decided that the efforts of the PTAT and Pakistani engineering staff should be focused almost exclusively on strengthening the existing distribution infrastructure. In practice, this has meant a concentration on the current WAPDA distribution network that connects the grid station to the secondary distribution lines and then to the service drops.

In addition, the GOP urgently requested PTAT assistance in mid-1985 for a crash energy loss reduction program for high-loss feeders. This effort in turn accelerated the attention paid to computerized feeder mapping, and the direction of field crews in retrofits to substantially decrease the distribution loss in the 11 kV lines and transformers. Feeder circuits were redesigned, rewired, reorganized, and the actual construction were supervised by PTAT personnel.

From the very beginning of the project, the activities under component 4 (power generation) of the project have been treated separately. It was contracted separately (with the award going to Gibbs and Hill), and run as a separate project within a project. Partly to minimize confusion, component four is normally referred to as the Guddu Combined Cycle Power Generation Project (GCCGP), while the four remaining components of the Pakistan Rural Electrification Project are collectively referred to as the Power Distribution Program (PDP). The evaluation team found this symbolic of the greater interest on the part of the PTAT and USAID staff on strengthening the

WAPDA/Distribution power distribution physical infrastructure and serving urban customers than on the extension of service to rural consumers, but were assured by senior E & E staff that this term was selected purely to differentiate components 1,2,3, and 5 from the Guddu contract.

3.2.1 90% Electrification by 1990

On May 26, 1985, the Prime Minister of Pakistan announced that he had directed WAPDA to electrify 90% of WAPDA's villages by 1990. In its initial response, WAPDA noted that this would necessitate the connection of and the provision of power to 23,000 villages in the next four years, or an average of 5,700 villages per year. This would require a massive increase over WAPDA's current rural electrification effort, which had connected only 5,600 villages to the grid in the period 1979-1984 and electrified an additional 1,400 villages in the twelve months ending in June 1985.

3.2.2 No Load-Shedding by 1990

In addition, due in part to the sharp public outcry during the 1985 outages, the Prime Minister publicly promised that there would be an end to loadshedding by WAPDA by 1990. This, coupled with the injunction to extend power to at least 23,000 additional villages and rapid growth of electrical usage by existing customers, will require the addition of more than 4,000 MW of generating capacity within the next five years.

3.3 Additional Power Generation

It was intended from the start of the Pakistan Rural Electrification Project that the support of new connections by USAID would be dependent on the addition of new generating capacity, as well as the reduction of existing losses within the distribution system. This intent was not to fund new rural feeders which would significantly reduce the quality of service to existing customers, but those which would co-exist with system strengthening and institution-building.

The successful dedication and commercial operation of the Guddu gas turbine generators in 1986 and the additional hydro-unit at Tarbela in 1985 increased the WAPDA generation capacity by 750 MW. The gas turbine plant, rated at 400 MW, is currently working well, and the Guddu steam cycle plant rated at 200 MW will be on the line in 1987. These units, along with the other WAPDA units scheduled for operation before 1990 will make a significant contribution towards the projected generation requirement. Prior to arrival of this evaluation team, a separate evaluation of component 4 of this project had been completed and the results are attached as Appendix B to this report. This new capacity is being supplemented by the savings being produced by the project's Energy Loss Reduction program. However, until the "Special Metering Package" is procured, estimation of the magnitude of the energy savings will be difficult. They are expected to be substantial, partly because of the elimination of many large unauthorized connections.

4.0 THE MASTER PLAN FOR SYSTEM REHABILITATION AND EXPANSION

The System Rehabilitation and Expansion Master Plan (which will henceforth be referred to by its more popular title as the technical Master Plan or (MP) was prepared by the PTAT for the Power Authority (WAPDA), Distribution Wing. It consists of a main volume with background and summary material and 4 volumes of detailed technical appendices.

The evaluation of the MP is organized in 3 stages. First, who is the audience for the MP? Second, how does it fit with the other two PTAT plans? Third, what is the MP and does it meet these objectives?

4.1 Origin of the Master Plan

During the period of the Fifth Five Year Plan, WAPDA underwent one of its biggest growth spurts in its 27-year history. The number of customers rose from 2.5 million to 3.9 million, with 80% of the new customers in the residential sector. Electricity sales increased even faster, from 6981 gWh to 11587 gWh, a 66% jump. Such rapid growth has proceeded in an organic fashion, with great apparent disparities between the productivity of investment in different regions and functional areas (generation, transmission, and distribution). Faced with plans to vastly increase the resources available to WAPDA's distribution function in the period 1984-1993, it was decided at the time of the rural electrification project paper creation to require the creation of a systematic master plan to map the best path to the national rural electrification goals. The preparation and approval of this Master Plan by WAPDA, the GOP and USAID was made a Condition Precedent for the expenditure of any of the USAID funds set aside in the Rural Electrification Project for rural system expansion.

4.2 Who Are the Audiences for the Master Plan?

A plan put together by the PTAT for the future of WAPDA Distribution must provide the information required by three distinct audiences:

- WAPDA itself
- The Government of Pakistan
- International lenders/donors

Each of these groups of readers has its own reasons for welcoming the creation of the WAPDA MP. In the case of WAPDA itself, the tremendous changes in the nature of the organization in the past few years have been shown by the growth in its capacity and geographical coverage, as well as the scope of its activities. In the period 1985-1992, power production and sales will double in the country. At the same time, WAPDA's generation will have shifted from a system based predominantly on hydro to one based largely on thermal power. On the distribution side, the utility is shifting from a primary orientation toward cities and industry to an environmental emphasis on rural electrification. It must plan carefully to accommodate these changes.

The large and growing role of energy in overall development activities has presented the Government of Pakistan (GOP) with the need to create new institutions in the energy sector. The need for effective national energy

- Plan A -- An extrapolation of previous WAPDA distribution activities over the preceding years (business as usual)
- Plan B -- The rural system expansion plan as mandated in the Sixth Five Year Plan is based on the elimination of load shedding, and the electrification of 90% of the nation's villages by 1990
- Plan C -- The WAPDA Distribution Action Plan recommended by PTAT if the WAPDA/Power investment budget for 1987-88 is 30 billion rupees
- Plan CG2 - The same as Plan C, only with additional capital investment of 8 billion rupees for a total of 38 billion rupees

The Master Plan provides an implementation plan built around the resources available under Plan C. This assumes a much more modest rural electrification program than mandated by the GOP (and far less than the announced target of electrification of 90% of the villages by 1990).

To assure timely implementation, the MP calls for early reorganization of the WAPDA Distribution function under one Managing Director (MD) for Distribution. This MD will have line supervision and administrative control over AEB's and their sub units. New activities, incentives, and procedures required for sound utility management will be established by this new organization.

To formulate a suitable program for distribution expansion in both urban and rural areas six basic options were studied. Plan A depicts the current (last five years) growth trends in WAPDA and extends them for the next eight years. Plan B projects expansion in accordance with the sixth five year plan for fiscal years 1985-86 through 1987-88 and develops requirements for GOP recommended saturation goals for rural electrification by the end of the seventh five year plan period (1992-93). The targets for potential rural domestic customer saturation in electrified villages are 30 per cent in 1988 and 60 per cent in 1990.

A number of trial variations on Plan B were made of both urban and rural saturations (Plans Ca, Cb and Cc) before arriving at recommended plan C. Plan C tailors expansion to projected generation under a Rs 30 billion development scenario (WAPDA's presently committed program) and estimates the load that can be shifted or shed to a time of peak under load management. To demonstrate the effects of additional generation capacity, plan CG2 (generation 2) was developed for the Rs 38 billion power expansion scenario under consideration by WAPDA. This plan is identical to recommended plan C through fiscal year 1987-88 but adds rural customers in 1988-89 and onward to utilize projected increases in generation capacity.

The technical section of the MP outlines objectives and procedures to improve the distribution functions of WAPDA. The contents follow general guidelines established for a US operating utility. The utility management operates on

the principle that the customer has the first consideration and should be served by the most efficient operation. To integrate this utility management principle throughout the distribution division of WAPDA, the MP identifies the needed physical inputs. A comprehensive plan for implementation will await a future version of the MP.

Master Plan Implementation

Implementation of the technical MP must be a coordinated effort with the Institutional Improvement Program and the Distribution Training Program. Contained in the MP is a schedule for accomplishment of all technical requirements outlined in the text. To assist WAPDA in maintaining this schedule a planning group will be organized with both WAPDA and PTAT team members represented. Some of the PTAT team responsibilities included the following:

- Assist WAPDA in improving distribution functional organization.
- Recommend Training policy, etc.
- Oversee implementation of technical improvements and procedures, and expansion programs listed below.

These activities include:

- Create a Work Order (WO) system.
- Recommend guidelines and standards.
- Develop a circuit mapping policy.
- Develop Rural & Urban distribution Master Plans.
- Develop a distribution rehabilitation plan.
- Create procurement bid documents.
- Develop data processing for distribution.
- Create a circuit analysis capability within WAPDA.
- Assist with WO preparation, implementation, inspection and certification.
- Create the capability within WAPDA to manage data collection, analysis and feedback for decision making.

Implementation of the work order system has started with the interim use of a manual system, and will proceed to the development and implementation of a computerized system. The new system will provide all of the data required for utility cost accounting and record keeping. The appropriate WAPDA departments will establish selection criteria for feeder rehabilitation and construction, as well as rural system expansion. The procedures for preparation of WOs will be developed during the period of implementation.

changes do occur, a good plan will assist managers and policymakers in getting new goals to reallocate resources. At the same time, the MP should be useful for mobilizing the resources needed to perform the work described. Finally, the MP needs to become a part of the regular planning process of WAPDA and of the energy sector in general. In particular, items requiring approvals outside WAPDA need to be identified since these are the areas of the most serious tradeoffs or controversies.

4.5.1.1 For the Donor Community

The MP has generally succeeded in mobilizing resources, especially from the two main development banks, the Asian Development Bank (ADB) and International Bank for Reconstruction and Development (IBRD). International lenders and donors will generally be pleased to see a completed MP which indicates enough general acceptance by the GOP of WAPDA Distribution's goals that the plan can be implemented. Indeed, the volume of resources brought forth for WAPDA Distribution by the Plan is testimony to its success. At the same time, if the MP fails to identify the hard decisions which must be made in choosing among alternative projects, then the Plan provides little assistance in the right way to spend the additional monies. Unfortunately, the current MP does not identify the tradeoffs among specific distribution projects on a regional, temporal, or monetary basis. Such distinctions are vital for lenders to identify specific parts to assemble into bankable projects.

The MP has clearly succeeded in providing resources to WAPDA. At the same time, the MP has helped establish the distribution wing organizationally and financially. In that sense the MP has helped to provide resources for WAPDA without showing how these resources are to be used (except in an aggregate sense).

4.5.1.2 For the Government of Pakistan

The merits of the document for its GOP audience may be rather less satisfactory. The MP document has not yet been coordinated with other GOP energy planning activities. The mandated GOP policy (Plan B) is simply used as a reference point (this needs to be updated in light of the new Prime Ministerial Mandate on rural electrification and load shedding). Required complementary activities by other ministries or efforts outside WAPDA that would enhance the chances for success of any of the MP scenarios are not identified. Examples of such GOP coordination might be policies for industrial location, or the more intensive use of gas turbine generators. A key policy issue within the GOP - who has responsibility for electricity tariffs - is not addressed. The stress on program elements obscures the need of the GOP to focus on the goals and on the institutions and efforts required to achieve these goals. In some other developing countries, representatives of government agencies outside the power sector form a part of the power planning team.

4.5.1.3 For WAPDA

As an internal planning document, the questions that must be asked of the MP are the following:

- Does the Plan show what activities are to be undertaken?

PTAT PLANNING DOCUMENTS

ESTIMATED DEGREE COMPLETE BY 5/86

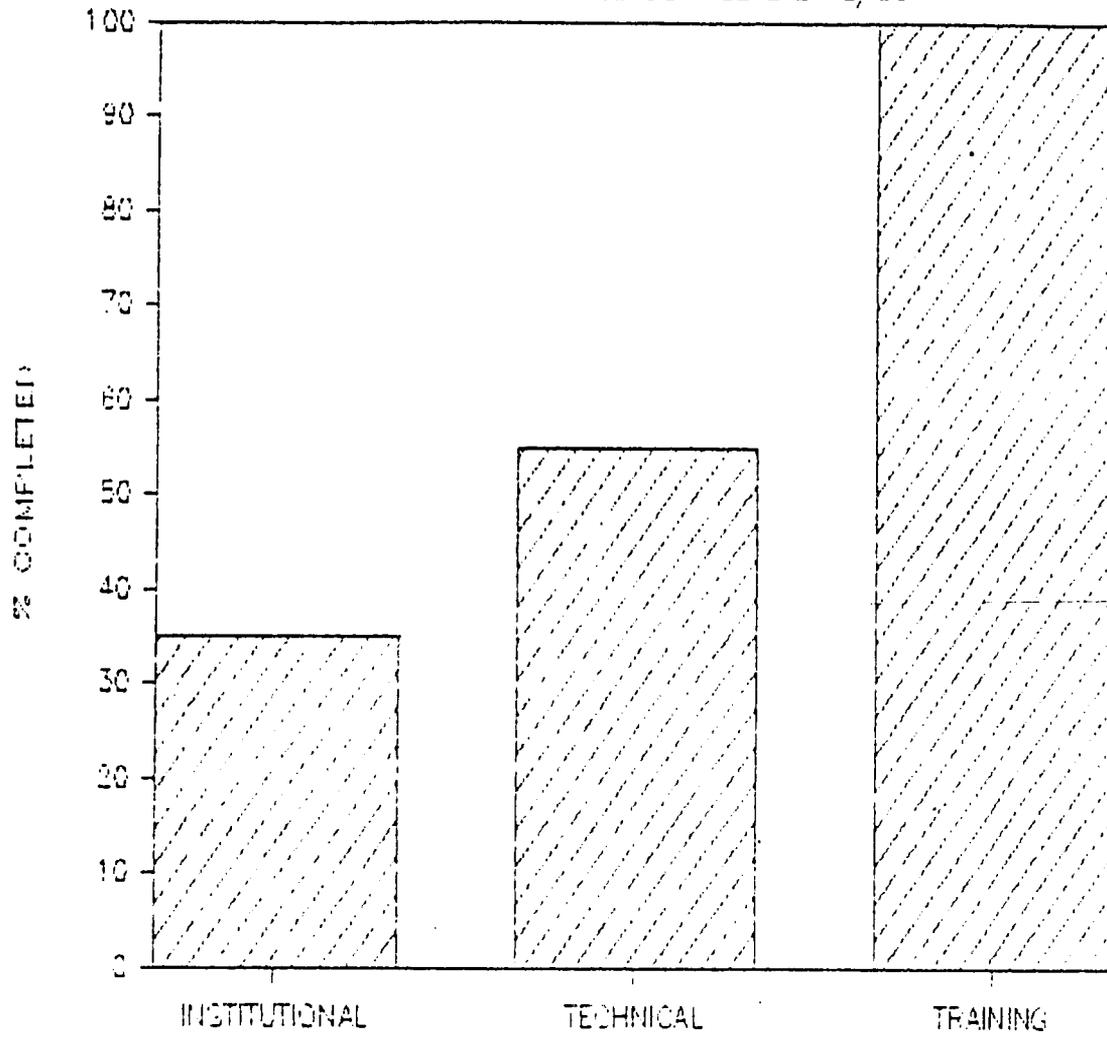


Figure 4-1

- Does the Plan provide a temporal sequence and set of priorities for such activities?
- Does the Plan show how the resources to perform the activities are to be raised?
- Does the Plan form part of a WAPDA planning process, can WAPDA use the MP when the PTAT leaves?
- Does the plan show the internal organizational requirements to meet the targets?

As currently drafted, the MP does not adequately address most of these issues.

A paucity of good baseline data hampers such efforts severely. At the same time, the quality of the data that are used appear uneven. For example, virtually no hard data are available for village or urban demand patterns. Nor are there any measurements of the effects of loss reduction on specific feeders. Lenders will require some sort of verification of project activities. The Appraisal Report for the IBRD 4th Power Sector Loan (1985) contains no estimate of project economic returns due to insufficient data. Constructing a data base to provide such verification is an intended activity under the MP. But while such essential data do not exist, the project is collecting primary data on load shedding, in order to later calculate estimates of financial and economic costs of power supply interruptions. The evaluation team is not convinced that load shedding data are more important than basic customer and line data. The Evaluation Team understands that PTAT proposed purchasing meters to measure the success of line loss reduction. This request has not been approved by USAID and WAPDA.

4.5.2 Weaknesses of the Master Plan

The current MP does not adequately show the temporal, logical, or spatial relationships among the various investment activities. Instead, the investments in loss reduction and rural system expansion appear to occur organically. Such organic (i.e. unplanned) expansion is one of the chief weaknesses of the current WAPDA method of operation. WAPDA is beginning to introduce a Work Order System (WOS) which will provide a set of procedures and guidelines for rehabilitation and system expansion investment activities. The WOS is designed to control both the engineering and economic aspects of resource allocation. The team feels that this system represents a clear improvement over existing procedures. However, there are no specifics in the MP on how this system would be applied. For example, what criteria would be used to determine whether one work order is of higher priority than another, or whether it is even acceptable? As a result the reader of the MP has no idea of how the allocation of WAPDA resources will improve with the implementation of the system. The examples of work orders given in Annex J would require another level of aggregation (into projects) to be useful as units of account in a Master Plan.

The internal organizational requirements to meet the Plan's targets are discussed briefly in the text. However, the discussion of the relationship

between structure and function is far better expressed in the new introduction to the Institutional Plan. This should be incorporated into the MP.

The MP does implicitly acknowledge the changed institutional requirements on the distribution side by the attention that is given to training and changes in operations at the AEB level. In addition, the MP explicitly discusses the shift in emphasis of WAPDA distribution to rural areas. This acknowledgement needs to be augmented by concrete proposals for how the AEB's will participate in the planning process. The need, in short, is to make the planning process WAPDA's process.

What will be involved is an effort on the part of PTAT to bring WAPDA staff into the technical formulation of elements of plans and systems. At the present time, the MP is something that has been imposed on WAPDA and the GOP by the USAID Condition Precedent. What will make it WAPDA's plan is to move into the WOS and beyond, to larger projects which can be brought up, designed, and evaluated by WAPDA personnel.

The MP should clearly indicate the nature and volume of the economic and financial choices that need to be made from those scenarios identified in the plan. At present, it does not. Alternatives should be clearly identified, presented, and evaluated. The identification of plans should contain the answers to the who, what, why, where, and how much questions. The presentation should lay out the relevant data in a clear and concise format, appropriate to the decisions to be made on the basis of the plan's recommendations. Finally, each alternative must be evaluated within the plan so that its impacts vis-a-vis the other alternatives can be judged. The eight basic questions that must be addressed are listed and explained in Appendix:B and detailed economical analysis in Appendix:C.

4.6 Recommendations for Strengthening the Technical Master Plan

- Show why institutional reform is a prerequisite of current goals. That is, why and how will changes in institutional form improve the performance of WAPDA? This must be related to the actual planning performance of the work order or project system.
- Update Plan B to the new Prime Ministerial Mandate.
- Explicitly integrate the current activity with the energy components of the present national 5 year plan. This should be accomplished by stating overall goals of the plan and showing how WAPDA activities will assist in the attainment of these goals. Resolve conflicts among means and ends at the MP level.
- Reorganize individual activities into projects. Accomplish this by disaggregating the list of activities into regionally discrete projects with time frames - i.e. establish a sense of cohesiveness among the activities that indicates the way in which these activities and projects depend upon one another. Each project should have distinct goals and means. Its results should be objectively verifiable and its dependence on other activities made explicit. Show how priorities are set and how the projects relate

to funding levels. Assemble activities and projects into Plans based on logical, geographical, and temporal connections. If Plans are to be constrained by funding, show how projects are to be included or excluded.

- Prepare a dissertation on implementation that can be included in the MP or the Executive Summary which outlines the implementation process and procedures. This summary should show the coordination and phasing of the Institutional Program, Training Program and Distribution Program during implementation. Show how slippage in any one program will affect the other programs.
- Employ operations research techniques to determine least cost paths of investment. In particular, use cost-effectiveness and critical path methods to build the logical sequence of project investments to meet Plan targets.
- Establish a data base activity and build it into every project. For example, combine the mapping and line loss activities programs to provide a computer data base of initial line efficiencies. Couple this activity with actual monitoring of feeders to establish base line data. Work with WAPDA and other GOP agencies to obtain data about customer demand patterns to improve load forecasting. Work with WAPDA in the establishment and updating of the data base and the institutionalization of the data base function.
- Explicitly address the following tradeoffs:
 - No load-shedding v. universal electrification
 - Revenue v. cost based tariffs in terms of annual variations in investment levels
 - Revenue targets v. widespread power theft in rural areas
 - Limits on revenues that can be raised from general and industrial consumers
 - Rural v. urban distribution expenditures
 - Distribution v. generation expenditures
- Include in the implementation section of the Master Plan a more detailed schedule for accomplishments. Show how accomplishments are to be measured. This will enable the reader to visualize project implementation and will help the project manager and participating agencies to maintain the time frame of implementation.
- Identify the strengths and weaknesses of each proposed Plan with regard to the following data elements:
 - Cost

- Generation requirements
 - Sources of funding
 - Sensitivity to variations in generation activities, funding, implementation of projects within Plan
 - Key roadblocks: what are they, how can they be overcome, what if they get more or less serious?
- WAPDA should estimate the responsiveness of various consumer classes to changes in prices as a component of overall tariff reform.
 - WAPDA should update the MP in accordance with other GOP and PTAT activities and work to make it WAPDA's Plan. Virtually all of the suggestions above and much of the discussion identify different activities for WAPDA to work on with PTAT.

The last two items must be implemented without delay in order to take advantage of the short time left to PTAT to make WAPDA capable of and interested in improving its allocation of resources. The funding climate may never again be as favorable for Pakistan as it is currently. WAPDA must be prepared to put these resources to their best uses.

4.7 Master Plan Approval

The Technical Master Plan was approved by the Ministry of Water and Power in late July 1986. With this approval, USAID should consider the condition precedent (i) "A Comprehensive National Rural Electrification Master Plan has been developed and is being implemented according to schedule", as satisfied and proceed with project implementation.

However, PTAT in cooperation with WAPDA should continue to improve the master plan to assure a more useful planning document. A regional concept of multi-year program should be developed for financial allocations towards budget preparation. This concept will develop a priority system that will enable the planner to meet the budget limitation and yet meet the requirements for system development. While preparing the planning document, PTAT should include in their consideration the recommendations outlined in Section 4.6 above.

5.0 THE COMPREHENSIVE POWER DISTRIBUTION TRAINING PLAN

5.1 Introduction

5.1.1 Need for WAPDA Comprehensive Distribution Training Plan

The training needs of the Distribution Wing differ greatly from those of Generation and Transmission. Distribution undertakes such efforts as the planning and installation of distribution networks, the marketing of electrical energy, all customer contacts, as well as financial accounting and management of the system. New procedures being introduced will require specialized training to provide a workforce with the skills, knowledge and proper attitudes needed for the system to work.

5.1.2 Origin of the Comprehensive Power Distribution Training Plan (CPDTP)

Training of WAPDA distribution staff has been a central priority since the inception of the rural electrification project. Indeed, completion of such a mutually acceptable Comprehensive Training Plan was made a condition precedent by USAID for the disbursement of funds for project training.

A team of PTAT expatriate and Pakistani consultants developed the training plan through a coordinated effort with WAPDA, and submitted it to USAID and the Government of Pakistan (GOP) in May 1985. The Training Plan was formally approved in November 1985, and re-issued in its final form in December 1985. It was the first of the three major PTAT planning documents to be developed and the only one to have been finally approved by WAPDA and USAID to date. It is now being delivered by WAPDA Training Department Heads to all Distribution Training facilities. This approved document serves as the basis for current training activities.

5.1.3 Relationship of the CPDTP

The Comprehensive Training Plan is vital to the success of the institutional improvement and technical Master Plans because improvements in organizational structure, procedures and spheres of operation cannot be successful without a properly trained and positively motivated staff. Training services are designed to serve all components of the Distribution Wing. The PTAT Training Consultants and their WAPDA counterparts have effectively worked with all sections in determining training needs for the various career tracks. All curricula materials must be approved by an Advisory Committee consisting of the Principal of the Distribution Training Institute (DTI, a newly designed training institution under this project), appropriate department head, WAPDA employees or supervisors familiar with the curriculum area, a representative of the corresponding division of the PTAT staff, the curriculum developer and the Principal Curriculum Consultant. The Advisory Committee's role is to monitor and approve methodology and technical content of each curriculum. The quality and relevancy of curriculum materials produced attests to the value of this system.

Training curriculum materials are being developed according to the perceived needs for institutional improvement and the technical manpower needs for

distribution rehabilitation. Since both of these fields are undergoing rapid change, a newsletter has been initiated and is published periodically by the training section to provide information about what is being produced in training. Continual input is requested from all sections to assure accurate and relevant curriculum publications.

5.2 Description of the CPDTP

The Training Plan contains 120 pages of text, plus 133 pages of annexes. The text is divided into five (5) major sections:

1. Introduction
2. Background
3. Detailed Plan Description
4. Implementation Plan and
5. Financial Schedules

The annexes "A" through "I" provide various backup data or studies required to effectively design a CPDTP. Much time had to be spent developing these data and executing studies in the absence of a Comprehensive Management Information System (MIS).

The primary goal of the CPDTP is the design and implementation of a comprehensive training program for Distribution employees which involves:

- i. Distribution Career Development Programs intended to train 60,000 employees within Distribution training institutes in Pakistan.
2. Utility personnel development programs in the U.S.A. through both seminars and on-the-job experiences intended to train 200 employees.
3. A Sister-Utility Exchange program in a U.S.A. electrical utility involving management, technical, commercial, financial and educational categories for 170 employees.
4. A long-term Academic Training Program for 20 WAPDA employees to provide master's level participation in fields critical to Distribution.
5. The design and initial operation of the Distribution Training Institute at Islamabad to provide a model training facility that should serve as a training resource and guide for further development and operation of Distribution training facilities.
6. The design and development of a training program administration of all Distribution training activities.

5.3 Assessment of the CPDTP

The Training Plan consolidates all WAPDA Distribution training activities into a centrally controlled operation, designed to meet Distribution's current training needs and long-term manpower development goals. The same team of expatriate and Pakistani Consultants that cooperatively developed the Plan with WAPDA are also responsible for assisting in the implementation of the programs.

The Plan was logically developed, building upon the known successes of previously USAID sponsored WAPDA training activities in the early 1960's by Harza Engineering Company while avoiding known problems of implementation of that program.

The twenty-two in-country courses projected in the Training Plan which are grouped in course clusters under Technical, Commercial, Accounts/Financial, and Management form a complete path for career development for WAPDA distribution employees. The evaluation team believes that successful completion of these courses will provide the required competencies at the job transition periods. Once the recently established reporting system is put in place, an accurate and reliable accounting of training will be maintained which also follows the individual employees record.

Although the projected goal of in-country training of 60,000 distribution employees appears optimistic, this undoubtedly is a global figure. By adhering to the implementation time schedules, approximately 32,000 employees will have been trained by the end of 1989. Many training sessions are designed to be only 2 to 15 days long which allows for handling large total numbers per year.

Although U.S. based utility personnel development programs are mainly designed to give WAPDA personnel an overall concept of an effective modern electric utility, the formal instructions and on-the-job experience should be more flexibly administered than that provided to the first two groups of students. Whenever possible, the individual trainee needs and interest for more practical application and on-the-job experience should be met.

The Sister-Utility Exchange program is a worthwhile concept and a central part of the Training Program. It has been delayed by a USAID stop order, and so has been only partially tried. If administrative details can be worked out which will insure a cost effective program it should be continued, as originally planned.

The long-term out-of-country academic program for 20 WAPDA employees to receive master's level training is probably the most important aspect of the training plan for providing future professional leadership in WAPDA Distribution Training. The distribution of specialty fields appears appropriate to meet training needs.

In short the CPDTP is a well-designed and well-executed plan for action. It has been accepted by both WAPDA and USAID, and serves effectively as the guide for training for the entire WAPDA Distribution function.

A series of supporting publications have been produced which augment the CPDTP. The titles and description of these publications may be seen in Appendix:E.

5.4 Recommendations for Strengthening the Training Plan

Since the Comprehensive Power Distribution Training Plan was written at an early stage in the project, conditions have changed. It is recommended that the plan be followed as a guide of operation but updated where the need for improvements becomes apparent.

6.0 THE INSTITUTIONAL IMPROVEMENT PLAN

6.1 Introduction

The April 1986 Institutional Improvement Plan (IIP), a paper of some 150 double spaced pages, plus a volume of annexes, constitutes one of the three basic planning documents of the project and one of its major outputs to date. The paper has been in preparation by PTAT and Pakistan Consultants for nearly a year and a half and has gone through numerous revisions in both Lahore and Columbus, Ohio. It is hoped that it is now ready for adoption by WAPDA so that it can be used as a road map for the reorganization and streamlining of WAPDA's power distribution functions. More recently, a 28-page draft summary of the Plan (titled "Institutional Improvement Program, Summary Paper") has been prepared by PTAT's leadership to facilitate review of the Plan by WAPDA's senior staff.

The nature and direction of the institutional plan were determined by two fundamental decisions that were made at the very start of the project and that were taken as givens by the PTAT team:

- the WAPDA distribution function should be reorganized so that it could become a separate institution within the near future; and
- the reorganization should be based on the American Electrical Power model.

The aim to create a stand-alone power distribution wing shapes the whole nature of the institutional plan. It is clearly seen as a higher priority than the diagnosis of the managerial and institutional problems within the current organization. In this, the PTAT was responding to very explicit guidance from USAID/Islamabad, which was in turn part of an ongoing policy dialogue with the GOP on the privatization of certain governmental functions. The aim to include within the Distribution wing all of the required support and line functions was the fundamental decision that drove the many drafts of organizational charts and the numerous personnel analyses that PTAT generated as the core of the institutional planning process.

In retrospect, it is not at all clear that AEP was the best choice for WAPDA or merely the most convenient (WAPDA was originally modeled after the TVA). It is clear, however, that "institutional improvement" has mostly consisted of trying to implant AEP's organization and techniques upon WAPDA with the danger that such efforts may tend to address the symptoms of WAPDA's problems rather than their causes.

Although the Institutional Improvement Plan is basically a self-contained document, it refers to both the Master Plan and the Training Plan. The Training Plan and the sister utility exchange plan are summarized and their importance for effecting institutional change is noted. However, the connection between training activities and institutional improvements is only briefly alluded to. Similarly there is reference in the Institutional Plan to the Master Plan and the training of WAPDA planning engineers in the U.S. but no real discussion is given of inter-relationships between the two plans.

6.2 Description of the Institutional Improvement Plan

The content of the Plan is contained in its chapters three (Detailed Program Description) and four (Implementation). Chapter three involves, on paper at least, wide ranging changes in WAPDA's organization at its headquarters and field levels as well as changes and additions to its functions. Organizationally, the most important changes are:

- a. the consolidation of WAPDA's distribution responsibilities into a "single self-sufficient organization" (that would encompass 8 primary functions and 56 sub-functions in place of its present 3 and 17), and
- b. affect a major decentralization/delegation of responsibilities and strengthening of functions of WAPDA's intermediate and "grass roots" networks, the Area Electricity Boards (AEB) and the Divisions/Circles and Subdivisions.

Accompanying the above would be plans to introduce changes and modifications into virtually every aspect of WAPDA's distribution apparatus. These are itemized in varying detail in chapter three of the Plan. The list is so long it is hard to summarize. It includes such changes as: (a) a strengthened and upgraded training function, (b) revised personnel procedures including major emphasis on occupational safety, (c) new computer-assisted Distribution Planning and Distribution Engineering Departments, (d) reorganized purchasing and computer-assisted inventory control procedures including the establishment of Purchasing, Materials Management, Materials Inspection and Stores Surveillance Departments, (e) a reorganized customer service system including a computerized customer accounts system and a model Customer Services Center, (f) the overhauling of WAPDA distribution's whole financial management function including valuations of its assets and liabilities, inventories, depreciation rates, computerized financial reporting, etc., (g) modernize and computerize all functions designated under the rubric of "management services" including the relocation of WAPDA's Computer Department and the introduction of computerized data processing into customer billing, work orders, inventory records, accounting systems, payroll, personnel records, etc.

Chapter Four of the Institutional Improvement Plan purports to be a plan for implementing the above changes. Rather it is a function-by-function account of proposed initiation and completion deadlines accompanied by some explanatory discussion. A much clearer and more logical approach is presented in the Summary Paper in which an "implementation strategy" is outlined.

The strategy proposes a two-pronged approach to be monitored and assisted by an Implementation Task Force. The first prong would deal with the reorganization of headquarters with its new and transferred functions, the appointment of five new General Managers, and the transfer or creation of their subordinate departments. It would be accompanied by the functional and physical integration of the PTAT team with senior WAPDA distribution staff.

The second prong would be directed at the field organization, beginning with its Divisions and Circles. Two representative "model divisions" have been selected for reorganization and strengthening along lines specified in a nearly completed Division Reorganization Study. These will be pilot tested

with improved procedures and work practices and provided with vehicles, computers and communications equipment. The initial two would be followed by two more in a year's time after which the pace would quicken with the objective of reaching and changing all 124 Divisions by 1989-90.

A third phase of the reorganization process, to deal with the intervening level of WAPDA Distribution, the AEBs, would commence after the changes at headquarters had been completed and the first pilot divisions had taken root. One AEB, probably Lahore, would be selected as a pilot. After study and reorganization it in turn would provide a model for the remaining seven AEBs, a process that is also supposed to be completed by 1989-90.

Since the proposed two model divisions will be working under the existing AEB, staffed with personnel operating on the existing pattern of procedures and not on the new functional position procedure basis, and above the AEB the Distribution Headquarters will have been reframed under the new institutionally improved pattern, the AEB will therefore become a bottle-neck in the functioning of the two model divisions. A solution to this problem could be the creation of a coordination office in the AEB to deal with the two model divisions. The help and guidance of the Headquarters organization should also be enlisted.

The foregoing organization changes would be accompanied by major changes in staffing to reflect the new functions to be added to Distribution's headquarters and to the strengthened AEBs and Divisions. Since many of these changes involve the shift of functions from other parts of WAPDA to Power Distribution, much of the increase in staffing in Distribution would involve transfers of existing personnel. However, a substantial net increase in staff to perform new functions is also contemplated. For example, the reorganization would require a quadrupling of higher rank positions at headquarters (from 37 to 155) and one third of such an increase would require the recruitment of new staff. However, the May 12, 1986, draft summary IIP indicates that the ratio of staff to customers and system growth will decrease over time, reflecting increasing efficiency and modernization.

Chapter Five, the final chapter of the Plan, which is carried forward into the summary paper (with some changes), contains a brief analysis of quantifiable costs and benefits associated with implementing the recommended organizational and functional changes. The analysis is believed to be incomplete and methodologically unsound, as indicated in the Evaluation Team's review of the analysis Appendix:F. However, it is doubtful whether further effort should be expended in refining the analysis since institutional improvements in WAPDA can undoubtedly be justified on their own merits.

6.3 Assessment of the Institutional Improvement Plan

Institutional analysis normally is composed of two distinct activities: a diagnostic and analytic phase, and a prescriptive and remedial phase. In the first phase, the organization should be examined as a whole, looking at its norms, procedures, and institutional relationships with the outside world. The goal of the diagnostic phase is to define a set of problems, listed in rank order of importance, that prevent the institution from carrying out its assigned functions in the most efficient and timely fashion. Some of the

problems will be beyond the ability of the organization to control, but they should still be carefully defined and described, since they affect the institution's performance. Alternative solutions to each problem should be carefully set forth, including a description of the expected benefits and the costs in terms not only of financial resources but also other scarce commodities (skilled manpower, computer facilities, etc).

Once the diagnostic phase is complete and decisions made by senior policy-makers on the options offered, then the remedial phase can begin. Tasks that need to be reformed are broken up in their constituent parts, and analyzed to see how procedures and existing practices can be reformed to bring them up to currently acceptable practices. While far more routine and exacting than the diagnosis phase, the remedial stage is every bit as vital to insuring long-term institutional change.

6.3.1 Strengths of the Institutional Plan

The overall institutional plan draft developed by the PTAT provides a fair blueprint for steps that could be undertaken in the second or remedial stage. While it makes no case for why the areas undertaken are at the highest level of priority, the evaluation team does find that the activities outlined briefly in the institutional plan are reasonable. The diagnosis of line and support functions, particularly at the headquarters level, that will be required in a new and separate Distribution Wing seems complete and well thought out.

The Institutional Plan summary is a far superior document and can serve as the basis for the revision and completion that will be required in the overall Institutional Plan. It does go through a logical process of defining many institutional problems and weaknesses (although some of the most obvious ones are not addressed), and then provides a justification for why certain remedial steps were initiated. Moreover, the summary has the great advantage of being concise, well written, and accessible to the outside reader. By relegating the reorganizational aspects to their more proper place, the summary provides a more useful document for decision-makers within the GOP, WAPDA, USAID, and other international financial institutions.

The Plan offers major recommendations on the proposed reorganization of WAPDA's distribution function. The Plan recognizes how unwieldy WAPDA's sprawling distribution system has become and how the flow of communications between the field and headquarters has become clogged. It notes the ineffectiveness of a centralized management approach. Implicitly, it reflects the need to redress the "poor sister" relationship between Distribution and the rest of WAPDA, of raising its status, increasing its autonomy and strengthening its ability to run its own affairs. Thus the main achievement of the Plan appears to be its proposals for the reorganization of WAPDA's distribution function. This aspect of the Plan offers the greatest promise for increasing WAPDA's organizational effectiveness.

Also the proposed method of implementation appears to provide a means for ordering priorities and accomplishing tasks in manageable pieces. For example, the reorganization of headquarters and the strengthening of the two pilot Divisions are to precede the effort to reorganize the first AEB. This

step-by-step approach for introducing the various changes in systems and procedures should provide an opportunity for trial and error and adaptation.

Neither the Institutional Improvement Plan nor its summary are based on a professional institutional analysis of WAPDA. Neither document provides insight into what makes WAPDA "tick" as a huge, dynamic, beleaguered, living institution in the Pakistan of the 1980s. Specifically:

- a) The Plan lacks a historical perspective showing how the present distribution functions of WAPDA have evolved over time. This was, however, being developed as an appendix to the Summary Plan, and will be available in future drafts. There is no discussion as to the functional and symbolic importance of WAPDA's mission for the modernization of Pakistan, nor is any attention given to the economic demands and political pressures that are exercised upon WAPDA distribution by Islamabad, the provinces, and local authorities.
- b) WAPDA's official and de facto position within the GOP is not discussed nor its relationship to the Ministry of Power and Water or other central government agencies. There is no discussion as to how WAPDA has attempted to respond to its circumstances or how they have changed the way it functions.
- c) There is little analysis of the internal dynamics of WAPDA, its career service, its system of rewards and punishments, its style of management, the role of the labor unions and its problems of overemployment and the problem of alleged illegal gratification. PTAT staff stated that these omissions were deliberate, because of political sensitivities to discussions of these matters. Instead it is implicitly assumed that all public utility problems are universal and that WAPDA's task is to "shape up" in the image of American Electric Power. This approach has led to heavy emphasis on matters of organization, procedure and technology.
- d) A recurring criticism of WAPDA is its excessive centralization of decision making that characterizes WAPDA's management style, the "pass the buck" mentality that affects its lower and middle echelons and which is encouraged by a lack of delegation of authority and an upper management insistence on supervising details. These problems are hardly analyzed or addressed in the Plan. Instead there is a discussion of the staff services (computerization, systems and procedures, organization and methods, etc.) that should be introduced and implemented, agency-wide under the heading of "management."
- e) Another major weakness attributed to WAPDA is its personnel management. It is characterized by redundant employees, a shortage of trained staff, staff turnover at the middle levels, lack of career planning, lack of adequate compensation or other incentives, and a personnel system that rewards length of service and loyalty over leadership, innovation and management skills. These problems do not receive attention in the Plan's section on personnel which

deals briefly with WAPDA's grade structure, personnel procedures and promotion practices. PTAT staff have related that this omission was deliberate, based on requests received from both USAID and WAPDA. Only the proposed safety program is emphasized. Little attention is given to the role training might play in strengthening WAPDA's personnel situation.

- f) Related to the above, but not discussed in the Plan, is WAPDA's problem of alleged "illegal gratification." It refers to the reportedly large number of WAPDA employees who are said to derive unaccounted-for financial benefits from WAPDA operations at many levels including such functions as procurement, hook ups, billing, and customer relations. The effect upon WAPDA's financial well being and staff behavior is said to be enormous. While this is a sensitive and difficult subject to deal with, it should not be totally publicly ignored. While this problem is being addressed indirectly by several tasks with the PTAT work plan (such as "customer services"), the evaluation team feels it should be raised to a much higher level of importance within the institutional improvement program.

More fundamentally, it is not at all clear that a reorganized distribution system as such will address many of WAPDA's major problems. How, for example, will reorganization ameliorate the erosion of WAPDA's authority, the problem of excess employment, a system of rewards and punishments that discourages initiative and accountability, and a management style that is at variance with the objectives of the proposed changes? These are among the real institutional problems that are not identified in the analysis nor dealt with in the recommendations of the "Institutional Plan."

6.4 Recommendations for Strengthening the Institutional Improvement Plan

As indicated above, the current "Institutional Improvement Plan" is basically an organizational, technical and procedural document. It needs to be supplemented and reinforced by a more profound, problem-oriented analysis of WAPDA as a living institution. This in turn could hopefully provide a conceptual basis for introducing meaningful institutional changes in WAPDA, including, especially its distribution organization, so that its present dysfunctions can be addressed and its capacity strengthened to handle the ever growing responsibilities that are planned for it. Leading subjects for further analysis and for additions to the Institutional Plan are the following.

6.4.1 The historical evolution of WAPDA's current role.

This topic would provide insight into how WAPDA's present problems are a result of internal and external circumstances that have evolved over its history (including exponential growth). It would suggest what changes in these circumstances would help WAPDA to address its current constraints. It would, among other things, examine how popular and public pressures have affected WAPDA's policies and patterns of behavior. It would examine the extent to which WAPDA's authority and autonomy have changed over time, and how that situation should be addressed.

6.4.2 WAPDA's institutional and legal role within the G.O.P. and in the Pakistan economy.

An analysis on this subject would outline WAPDA's current official and de facto relationship to other major Pakistani institutions (public and private) as well as external agencies (such as the donors). It would examine the G.O.P. decision making process as it affects WAPDA and how WAPDA itself contributes to that process. It would provide clarity to WAPDA's strengths and limitations as well as identify other Pakistani participants to be included in "policy dialogues" on major WAPDA issues.

6.4.3 WAPDA's system of management and management attitudes.

An examination on this subject would involve an "organization development" analysis of WAPDA's management structure and management style in the Pakistan context. It would try to examine the causes behind its paternalistic, over centralized approach, how such behavior patterns may be reinforced by Pakistani values and traditions, and what approaches or means of motivation might be successful in causing beneficial changes (for example on such matters as delegation of responsibility and increasing managerial innovation and initiative).

6.4.4 WAPDA's personnel, manpower and employment system.

Study of this complex subject would evaluate WAPDA's system of personnel management for its various categories of personnel, the way the system rewards and punishes its staff and employees, WAPDA's career, promotion and compensation structure in relation to other Pakistani entities, the role of seniority and the role and function of training. The study would relate that analysis to such WAPDA problems as low morale, congested staffing at senior levels, redundant staffing at other levels, lack of capable mid-level officers, dysfunctional labor union activities and the strengthening of employee motivation.

6.4.5 WAPDA's informal system of rewards and benefits.

Closely related to the above is the need to achieve a better understanding of how official compensation is being supplemented by a variety of informal practices and the impact of the latter on WAPDA's revenues, costs and operational effectiveness. Some of these problems may be intractable so long as conditions of acute power scarcity continue. But others are probably a function of poor management controls, inadequate financial procedures and a faulty compensation system.

The current Institutional Plan addresses none of the foregoing subjects which, it is believed, are essential to an understanding of WAPDA as an institution and hence a basis for designing ways to effect meaningful institutional change. A recommended strategy for taking these problems up with the GOP and an approach for dealing with them is discussed in sections 12.5 and 14.

7.0 INSTITUTIONAL STRENGTHENING AND ENGINEERING TECHNOLOGY TRANSFER

7.1 Institutional Reorganization

The functional organization proposed by PTAT and approved by the Authority, consolidates all requisite functions necessary for Distribution to develop and implement plans to meet the goals of the Authority and GOP.

7.1.1 Headquarters Organization:

Headquarters Organization, besides various other functions, includes Administration (Personnel and General Services) under the direct administrative line control of Deputy Managing Director Distribution as has been illustrated in the chart "WAPDA ORGANIZATION WITH DISTRIBUTION CONSOLIDATED" in the Institutional Improvement Program Summary Paper. This function is headed by a General Manager (Administration) working in conjunction with two Director Generals; one in charge of Personnel and the other in charge of General Services.

In the proposed interim Distribution Headquarters Organization, the Chief of Training reports directly to the Deputy Managing Director. The argument given is that during the initial stage of implementation, the Training Function will require substantial senior management support. Once the Training Function becomes fully operational, the Chief of Training will report to the General Manager Administration.

7.1.2 AEB Organization:

In the AEB organizational set-up two Directorates have been created, one each for Personnel and General Services. The Directors in charge will report directly to the Chairman of the AEB.

7.1.3 Circle Organization:

It has been pointed out by PTAT that the current circle organizations perform useful functions which cannot be performed by existing Divisions. These also consolidate information to assist the AEB's. It has been argued that once the Divisions have been enhanced and AEB's have access to the computer records and equipment to prepare consolidated reports rapidly, Circles in their present form may become redundant. However, PTAT has reserved its final recommendation until after the review of the performance of Model Divisions of Muridke and Sheikhpura...

7.1.4 Divisional Organization:

In the proposed Divisional Organization an Assistant Director Administration has been attached with the Divisional Manager. He will be in charge of Personnel, Safety and General Services. This will be an enhanced function of the Divisions which was ignored in the past.

7.1.5 Sub-Divisional Organization:

The Sub-Divisional Organization will remain unchanged in the near future. It is planned, however, to limit the number of Sub Divisions by confining them to

rural operations where distances make it inconvenient or impossible to provide timely service directly from the reinforced Divisions.

7.1.6 Resource Requirements:

The PTAT has examined in detail the implications of the enhancement of Headquarters Organization, Area Electricity Boards and Divisional Manager's organizational set-up. The staffing position of the proposed enhanced set-ups would be as follows:

<u>Organization</u>	<u>Existing</u>	<u>Transfer/Conversion</u>	<u>New</u>	<u>Total</u>
Headquarters	715	1354	1069	3138
AEB	1116	0	142	1258
Division	444	88	19	551

Half of the new positions are stated to be filled in by existing WAPDA staff, performing similar roles. There is a modest increase in the number of junior officers and support staff.

It has also been stated that there will be additions in the capital equipment and vehicles in each AEB to the extent of Rs 1,440,000 and Rs 1,157,000 in each Division. Out of this all the computers and most of the communication equipment will be financed by USAID grant funds.

7.1.7 Implementation Strategy:

An Implementation Task Force will be established to coordinate schedules, and monitor the work efforts and resolve problems.

The Distribution Headquarters functions must be established first and PTAT will provide the functional Department Heads with advice and support to enable the WAPDA staff to lead the implementation effort.

The Personnel System will improve the speed and accuracy of payroll processing, payroll records, personnel records, labor cost reporting and various Personnel Administration Functions.

7.1.8 Conclusion:

The recommendations made by the PTAT are workable and are likely to provide the expected results. This function of Personnel Administration and General Services is a continuation of the Institutional Development Process, and was not accorded due importance in the past.

7.2 Distribution Planning within WAPDA

The Rural Electrification Project Paper includes as goals in its first component Institutional Improvement of WAPDA and the transfer of engineering technology. The goal of the IIP is to establish and implement a comprehensive program to assist the evolution of distribution into a more effective, efficient and self-sustaining organization. This supports WAPDA's goals of improving the quality and availability of electric services

The IIP prepared by the PTAT team outlines the procedures and functions of the distribution planning and engineering group. These functions will be subsumed in a single division headquarters of the General Manager of Distribution (GMD). The plan proposes to establish at the GMD headquarters the functional organization for trained personnel to analyze and implement needed improvements in a timely fashion to achieve an orderly plan of expansion and rehabilitation.

WAPDA gave tentative approval for implementation of the IIP and the creation of a Distribution Wing at a meeting on January 28, 1985. However, to date they have not issued an implementation order to the General Manager (Distribution) to proceed. Until this action is taken it is difficult to proceed with the scheduling of activities for all of the involved personnel and establish target dates for accomplishment of each of the goals.

The existing WAPDA distribution planning function is performed by the AEB's. They forward only summary information to the GMD. Presently, WAPDA headquarters lacks sufficient information to plan the overall distribution investment program. To correct the currently uncoordinated planning, the IIP will have a sub-division for Planning and Engineering (P&E) at headquarters. This sub division will be charged to plan, design and engineer the successful modernization of the distribution organization and its functions.

Anticipated improvements within the technical area include a new functional organization with the following sub functions:

Distribution Engineering

- Systems Design
- Construction Standards
- Equipment and Material Evaluation (including technical specifications and product descriptions)
- Load Management

Distribution Planning

- Statistics and Load Forecasting
- Systems Analysis
- Plan of Service
- Mapping Procedures

The P&E sub-division's responsibilities in Distribution Engineering will include establishing and monitoring all standards regarding design and procedures. These standards will ensure uniform quality of service and will simplify procurement and subcontracting.

The distribution planning group will review loading of all feeders, especially rural ones and those serving large loads. In addition, the group will analyze the data needed for load forecasting and system planning. The mapping and systems analysis activities will be integrated to assist in computer sided circuit design and fault analysis.

7.2.1 Execution of Distribution Service within WAPDA

Implementation of the IIP for distribution will commence with the organization of the Headquarters Division. The Headquarters Organization will establish the summary plans and provide the technical guidance to lower level organizational units. The PTAT chief consultants will provide office areas in close proximity to the counterparts to assure coordination on setting up the revised distribution functions. As important as the organizational work is, successful implementation of the IIP calls for substantial engineering technology transfer during the performance of regular duties. The PTAT team members will assist the functional chief on a one-on-one basis.

The functions of the Distribution Planning, Engineering and Standards Divisions are many. They include the following:

- Establish a Distribution Planning Department
- Develop and maintain a distribution information system
- Establish distribution data base and mapping program
- Establish a distinct rural electrification program
- Develop rural electrification data base
- Establish a Distribution Engineering Department
- Establish and maintain a distribution standards program
- Establish and maintain technical specifications and product descriptions
- Develop load management programs and implementation steps

The magnitudes of the project implementation effort is evident from the range of objectives and functions. PTAT members assigned as counterparts to the technical department heads will be busy, having to meet the daily requirements to assure the implementation of sound utility practices. From past experience, we know they will receive many additional assignments for consultancy projects. Accordingly, their overall effort will have to be monitored by the PTAT and USAID assignment to assure technical engineering transfer to the new Distribution Wing.

WAPDA has agreed to let their staff take the leadership role in implementation. Progress to date has been rather slow. There should be a well-coordinated effort between WAPDA, USAID and PTAT to accelerate implementation by filling the vacant positions, informing all department heads of their assignments and functional responsibilities, and formulating a plan for speedy implementation.

7.2.2 Area Electricity Boards

The IIP contains a plan for restructuring the AEB's following the AEP model approach. This was approved, in principle, by the Member (Power) on August 18, 1985. The AEB's will be structured using a four-level management scheme for the distribution functions. These organizational improvements are designed to:

- Improve customer services and relations
- Assign basic work activities
- Establish a functional organization and assign responsibilities

- Improve allocation of resources
- Provide equipment and facilities and
- Increase efficiency of the work force.

The Distribution Planning and Engineering function will be assigned to a new department in the AEB. This department will receive assistance from the new Distribution P&E department headquarters in Lahore. Training on feeder analysis and engineering application will be provided to the engineers assigned to the AEB's. Accordingly all AEB engineers will receive this training.

This training program also involves the installation of computer and distribution analysis software at the AEB's. When the planning and engineering function is firmly incorporated within the AEB's, the mapping function will shift from headquarters to the AEB's.

The reorganization of the AEB's will transfer technology primarily through the training of engineers at the headquarters. By applying and using the computer, the training will be firsthand for the engineers. Most of the initial technical input provided by this project will take place at the distribution headquarters. However, in time all of the AEB engineers will have received training that is a direct result of the project transfer of technology.

7.2.3 Model Division

The IIP contains the detailed plans for establishing two model divisions in the Lahore area that will be reorganized following the American Electric Power Organization at the appropriate level of operation. These divisions were chosen because they provide a cross-section of area (rural, industrial and urban) and customers (industrial, residential, public, tubewell and rural). In addition, they are close enough to the headquarters staff and to PTAT for assistance and close supervision. The new division organization will include the following functions:

- Administration (Personnel, Safety and General Services)
- Planning
- Operations
- Safety and Maintenance
- Revenue
- Finance

The Division will be enhanced to improve safety, personnel services and customer services. The Sub-Division organization will remain unchanged during the first phase of the Division reorganization. The staffing requirement resulting from this action will be filled from the existing personnel.

The enhanced technical organization will be able to develop and implement plans for distribution expansion and rehabilitation without assistance. They will be provided with the tools (computer hardware and software) necessary to analyze their tasks. Availability of the computer capability will permit the automation of the work order system. This automation will provide documentation for the distribution works. In addition the automated system

will furnish data required to establish the division data base and the calculations for engineering design and operations. Additional transportation and communications equipment will be provided under the model division project that will enable more efficient use of the field staff.

By reorganizing the Divisions and reassigning staff, PTAT expects improved customer service and workforce efficiency. The reorganization also addresses the key issue of personnel responsibility. By establishing functional organizations staff performance can be measured and evaluated.

The evaluation team visited the Model Division candidate at Muridke and reviewed the proposed reorganization with the Division officials and the Sub-Division chief. The Division Chief and his deputies understand the project and are enthusiastic towards its implementation. We were all duly impressed with the capabilities that the Division staff displayed during the project review. The project as presented in the IIP is well prepared and should encounter minimum problems during implementation.

7.2.4 Distribution Transmission and Grid Station

On January 28, 1985, the PTAT team conducted a WAPDA-USAID Power Distribution Project Presentation to the Authority and USAID officials and received tentative approval for revisions to project components. One of these components was the Definition of Distribution, which states in sub-paragraph 3 "Plan, engineer, consult, operate and monitor, grid stations 66 kv transmission lines and 132 transmission lines, except those grid stations and transmission lines which serve two or more regions." Acting upon this approval WAPDA and USAID authorized the increase of one staff member for the PTAT team. USAID notified the PTAT home office by telex dated May 30, 1985, stating "It is also necessary to provide maximum assistance to the remnants of the old power wing (generation and transmission) to help them recuperate from the "Siamese Twin Surgery" and become administratively self-sufficient." The PTAT Generation and Transmission Coordinator arrived in country in October 1985 and began his consulting duties. He has prepared several scenarios of division and implementation Transmission and Grid (T&G) as there are several different opinions as to where the division begins. One believes that distribution should start on the first pole outside the grid station, another believes that it should include all of the 132 and 66 kv lines and grid station, and another believes that it should include all transmission (including some 220 kv) and grids stations that are not part of the transmission network.

The responsibility for T&G now exists with one department in WAPDA and which is structured to perform all of the required functions for successful operation. To go through the exercise of bisecting the T&G section to move the large share to the new Distribution Division when the intended implementation has not started is hard to understand. WAPDA needs to issue the directive for implementing the Institutional Improvement Program and assure the full cooperation of all their employees involved in the new division. This will be such a long task that the General Manager of Distribution does not need the responsibility for T&G as he will have all that he can handle with the reorganization. The idea that implementation of the T&G will be three (3) to five (5) years away should support the idea that the proposal (move T&G to Distribution) will be considered after the Distribution Division is reorganized and functioning for some time.

7.2.5 Observations

The Evaluation Team believes that successful reorganization of the Distribution Wing at all levels requires a closely coordinated effort by WAPDA, USAID and PTAT. The key to a successful implementation is timely input by all participating parties and continual review and pressure from the top level of management.

Tentative approval for the IIP was given by WAPDA on January 28, 1985, however, formal approval and official notification to the Distribution Division has not yet been issued. The WAPDA counterparts of the PTAT representative for Planning and Engineering and Construction Operation and Maintenance have not been informed of their assignments and have neither reviewed, nor seen the IIP paper. It will take 3-6 months for them (and assigned department heads) to study and assimilate all the activities required for a timely implementation.

Another potential problem area is the unavailability of the two PTAT engineers for day-to-day assistance and guidance to their counterparts during the initial phase of implementation. Past experience shows that WAPDA uses their time as general consultants to do various tasks and studies that have no relationship to the IIP. USAID and PTAT will have to establish a procedure to keep this item under review and determine a priority system for the engineers' time.

To expedite project implementation, the USAID project manager should develop a procedure to identify problem areas and methods for correction. The lack of a firm time schedule that is based upon realistic goals (it takes time to accomplish things in third world countries) has caused project slippage. USAID must also face the costs to the project of diverting the efforts of PTAT chief consultants. USAID is in a position to insist on appropriate use of PTAT experts and should do so when necessary.

It is recommended that PTAT stops all actions on the transfer of the T&G function to the Distribution Wing. This stop order will alleviate some of the turmoil and confusion within WAPDA and allow both the T&G and General Manager (Distribution) to continue with their assigned task. The General Manager (Distribution) has more than enough problems for one man to handle with the reorganization of his Wing and the assumption of the additional duties outlined in the IIP.

7.3 PTAT Sub-Contractors

7.3.1 Objectives of Sub-Contractor Involvement

The project was designed to feature heavy involvement of Pakistani sub-contractors. Such involvement was necessary, according to the project paper, in order to (a) draw on local experience and knowhow, (b) extend the services of PTAT to a huge organization like WAPDA distribution cost effectively, and (c) provide on-the-job training to Pakistani professionals to "strengthen local private sector consulting capability."

7.3.2 Nature of Sub-Contractor Participation

The execution of this aspect of the project has been faithful to its design and intent. Pakistani professionals furnish the greater part (about 60%) of the level of effort for technical services financed by the project, totalling 178 person years. The EBASCO-headed joint venture subcontracted to three Pakistani private consulting firms, Associated Consulting Engineers (ACE) Limited, EMMAY Associates Limited and Fikri Associates Consulting Engineers (FACE) Limited. The three sub-contracts total the equivalent of \$2.8 million at the current rate of exchange.

By design or otherwise, sub-contract awards have had the effect of encouraging the growth and development of newer, smaller firms. The smallest of the three, FACE, formed in 1977, drew the largest sub-contract for services in electrical engineering and technology. It has been heavily involved with work on the master plan and the energy loss reduction program, among other tasks. EMMAY, a slightly larger management consulting firm founded in 1979, won the next largest portion of the work. It has provided expertise in the preparation of the institutional development plan as well as specific service in regard to WAPDA financial, management and administrative matters. The smallest subcontract went to ACE, Pakistan's largest and oldest engineering firm, founded in 1958 and operating in several countries in addition to Pakistan. Its work has focused on institutional development, training, and curriculum development activities.

As was intended, the Pakistani sub-contractors have been involved in every aspect of the project. In each of its four components - institutional development, training, energy loss reduction, and master plan preparation sub-contractor staff have been working side by side with expatriates of the joint venture. They have provided most of the manpower involved in the work that has been carried out to date. For the two smaller companies, sub-contractor participation is headed by the firms' managing directors. ACE's project manager is a senior official of the firm and devotes one-third of his professional time to project business, while the FACE senior manager works half-time on the project.

The sub-contractors have performed a number of important functions on the project. These include:

- Providing trained staff to share project implementation tasks.
- Adapting expatriate ideas and work habits to local norms.
- Acquainting the expatriate with WAPDA and the joint venture, especially at senior levels.
- Liaising between WAPDA and the joint venture, especially at senior level.
- Assisting the flow of decisions in WAPDA on PTAT suggested changes.

- Increasingly, developing the means for implementing the suggested reforms at WAPDA.

7.3.3 Assessment of the Experience

The involvement of the subcontractors has been a substantial success and is achieving the goals sought in the Project Paper. Subcontractor participation has been a vital ingredient in PTAT's ability to function effectively in Pakistan, and it is difficult to imagine how the joint venture could have managed to get this far without them. With the project now moving into early implementation, and the consequent increase of day-to-day contact with WAPDA's field offices, the role of the sub-contractors can be expected to increase in importance even further.

The project's objective of increasing private Pakistani consulting capability is being realized, particularly for the two smaller firms. They are using the period of dependable income made possible by the five year sub-contracts (a long period by Pakistani standards) to gain further experience, train and develop their staffs and hunt for new business. FACE and ACE have already won several new contracts as joint venture partners. An appreciable amount of "technology transfer" appears to be taking place as a result of collaboration with the PTAT as well as specific training experience in the U.S. made possible by the project -- e.g. computer software techniques, distribution network analysis, financial planning, personnel administration, etc.

Although the sub-contractors are successfully participating in the project, we believe that there is room for improvement. In particular, sub-contractors should be brought more fully into the planning and implementation strategies. There is a strong perception among the sub-contractors that USAID and PTAT regard them as simply the rank and file implementors of USAID/PTAT decisions. Day-to-day experience tends to confirm this. For example, they are not routinely invited to most PTAT planning meetings. It is believed that bringing senior sub-contractor staff into discussions of project issues and into project planning would be beneficial, and would help avoid some of the institutional development problems that are noted elsewhere in this report.

7.4 Computers/Management Information Services (MIS)

The PTAT effort to assist WAPDA in upgrading its computer services is targeted at two different levels. The first is the large systems level, helping WAPDA to organize and store the voluminous data that a large utility routinely collects. The second is the use of computers, especially small ones, to improve the productivity of line workers. The level of effort devoted to these two tasks appears to be appropriate to WAPDA's current capacity to absorb new techniques and concepts. Indeed, the computer services area is one in which PTAT and WAPDA have enjoyed an outstanding working relationship. The success of the computer planning effort thus far may serve as a model for some other areas.

The computer work started with a detailed examination of the problems. What are computers supposed to do at WAPDA? How will work improve if computers are introduced? An inventory of existing, computing equipment was taken. Then the tasks to be computerized were broken down into component parts.

The requirements definition was a joint effort. Pains were taken to organize the changeover in an evolutionary, rather than revolutionary, way.

A plan for implementing the computerization has been drawn up and implementation commenced in early 1986. The plan gives the following items of information:

- The equipment needed
 - by type
 - by location
 - by function
- A schedule for procurement
- Cost estimates

In the opinion of the Evaluation Team, this task represents one of the best examples of joint PTAT/WAPDA activity. Its progress can be seen graphically in Figures 7-1 and 7-2. The computerization plan can proceed smoothly (with one suitable replacement for Ms. Abdullah) since WAPDA is fully informed about progress and goals and has assisted in the planning and implementation as a full counterpart, not just a recipient of technical assistance.

The big question that remains to be answered in the computer services area is the future direction of the services. Clearly, there is a tremendous short-term payoff to be realized by reducing the delays that WAPDA experiences in its internal system by speeding the entire bill calculation and posting procedure. However, in order to evolve into a truly modern utility in the next decade, WAPDA must avail itself of the benefits of modern data processing in its central management functions in Headquarters. Thus far, such efforts have been among the least rewarding for the PTAT to undertake with WAPDA, as can be graphically seen in the lack of progress in the management information system as shown in Figure 7-2. The evaluation team believes that the full computerization of financial, personnel, inventory, purchasing, and procedural matters will be a long-term necessity for WAPDA, but that it must be integrated with a management information system that allows decision-makers to monitor and control changes as they occur.

7.5 Customer Services

Customer services is perhaps the leading area where WAPDA needs strong and continuous technical assistance if it is going to evolve into a modern utility in the near future. Until now, because of the long waiting periods for connections in most locations and the system-wide shortage of generating capacity, WAPDA has not had to be overly concerned with meeting customer concerns or modifying its procedures to maximize customer satisfaction. It has been the PTAT presence which has led to such innovations as the creation of model customer service centers, where customers can have all of their problems resolved at one place, rather than being forced to travel to a number of different locations and meeting with several WAPDA employees. These changes, and the others which are now being worked out by PTAT and WAPDA staff, will lay the foundation for a mature service utility in the future.

COMPUTER CONSULTING SERVICES

EXPECTED V. ACTUAL ACCOMPLISHMENTS, 5/86

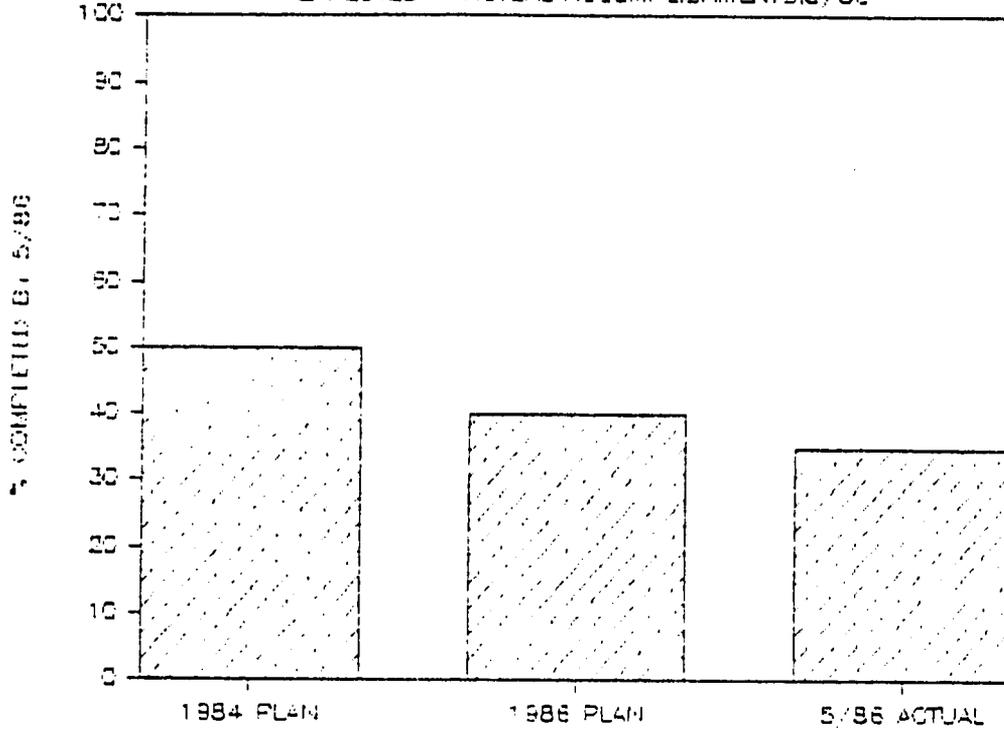


Figure 7-1

COMPUTER CONSULTING SERVICES

SUBTASK ACCOMPLISHMENT, 5/86, V. PLANS

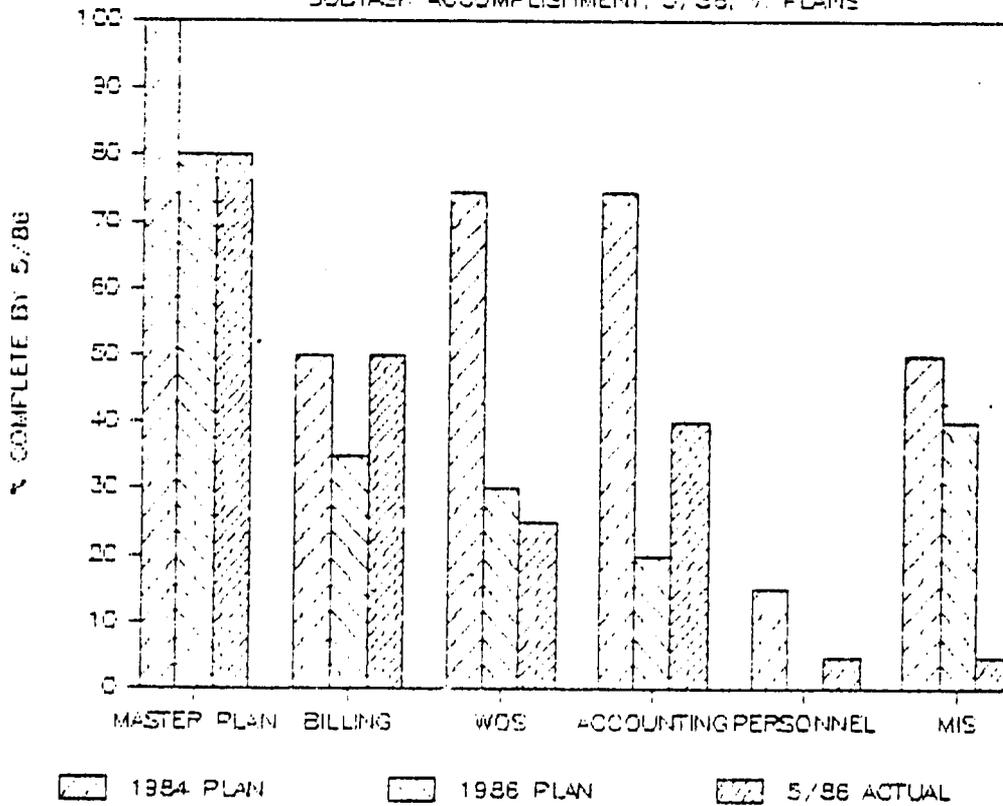


Figure 7-2

7.5.1 PTAT Work Plan

According to the summary listing of PTAT work plan the following assignments were undertaken showing the percentage progress up-to-date:

- Development and implementation of an Energy Conservation and Load Management function for all classes of customers - 30%
- Development and implementation of revised computerized commercial procedures - 40%
- Development and recommendations of an improved customer security deposit system - 85%
- Production of conceptual drawings for a customer service center in cooperation with a local A&E firm - 20%
- Development and implementation of recommendations for a program to monitor customer usage to detect theft of energy - 10%

7.5.2 Cumulative Outputs

In pursuance of the above work plan, the following cumulative outputs were produced. The status of each report is given as follows:

- | | |
|---|-------------------|
| ● Utility commercial management course, outline developed | Submitted |
| ● WAPDA Tariff modification Power Factor clause proposal | Approval required |
| ● Security Deposit Proposal | Approval required |
| ● Commercial Procedures Revision Proposal | Approval required |
| ● Customer System User's Committee Proposal | Implemented |
| ● Electric Furnaces Survey | Submitted |
| ● Energy Conservation/load Management Proposal | Approval required |
| ● Tariff Modifications Power Factor clause alternative | Pending |
| ● Energy Conservation Paper | Implemented |

Some reports are still being developed and have not been mentioned.

7.5.3 Major Problems

The Customer System User's Committee report submitted in Jan 1986 detailed suggestions to WAPDA for the improvement of their customer services procedures with respect to preparation, distribution, and payment of energy bills through designated banks. The report pointed out inefficiencies of the present system and delays caused by banks in transmitting cash received to the WAPDA's account. The inadequacy of WAPDA's system of tracking its accounts receivable was seriously affecting WAPDA's cash flow and resulting in overdue payments of tens of millions of rupees.

A visit paid by Evaluation Team members five months later did not show any signs of improvement.

The procedure of installation of new connections was also far from satisfactory.

7.5.4 Setting up of Model Divisions

The activation of two model Divisions will provide a proving ground for the new customer services procedures beginning July 1986 on a pilot basis. The strengths and weaknesses of the new procedures will be demonstrated and remedial action will be taken well in time before the change over is affected in the entire system.

7.5.5 Conclusion

The introduction of customer services organization on the pattern of American Electric Power will go a long way to redress the grievances of the WAPDA consumers and will provide an efficient and quick service to them. The concept of adopting the new customer services procedures in the two Model Divisions will filter out all shortcomings and deficiencies before adopting them for use in the rest of the system.

The appreciation held by PTAT for the absolute necessity of appropriate transportation, training of personnel, provision of adequate office equipment, is fully endorsed for the solution of present day constraints in the services of the utility for the customer. The need for vehicles equipped with wireless communications cannot be overstressed for the achievement of optimum efficiency and success of new procedures.

7.6 Stores and Inventory Control

7.6.1 PTAT Work Plan

According to contract the PTAT had to carry out the study and improvement of Distribution Function procurement and inventory management systems and facilities. In the PTAT work plan of 1984/85 this assignment was divided into 11 activities. In the work plan of 1985/86 these activities were revised and finalized into eight activities, described as follows, showing their completion status:

1. Purchasing and Stores, including explanation of organization chart, Job Descriptions, and estimate of staffing requirements	70 %
2. Inventory Control and Planning including revision of procedures. Material planning, cataloguing and disposal	0 %
3. Purchasing	0 %
4. Material Inspection	0 %
5. Stores Operation including revision of stores surveillance, implementing and monitoring procedures	60 %
6. Warehouse practices and procedures	0 %
7. USAID materials including policy changes for the purchase of all Donor Funded Project materials	90 %
8. Management of Reclaimed Transformers including recommendations for policy changes for the repair, control and storage of repairable transformers	90 %
9. Improvement of Regional Stores	100 %
10. Model Warehouse	90 %
11. Computerized Inventory Control	60 %

7.6.2 Comments

Warehouses located at Sahiwal, Gujranwala, Shalamar, Multan, Faisalabad, Quetta, Nowshera, Hyderabad and Rawalpindi were visited in March/April 1985. Detailed lists of recommendations for improvements to these regional stores were prepared and passed on to the Director Inventory Control of the concerned region. Many of the recommendations could be carried out by the available labor employed in these stores. For other recommendations financial cost estimates had to be prepared and approved by the competent authority. Most of these recommendations have been carried out while action is pending on some which are under correspondence.

An inventory balance as of September 85 is Rs 571,152,120.00 distributed in 96 Regional, Field and Remote Stores -- a formidable stockpile. In spite of the PTAT's recommendations made in March/April 1985, reduction in stockpile is nowhere in sight.

The report on the procurement and management of Donor Funded Project materials was submitted by PTAT to WAPDA in November 1985. Final action on the recommendations has not yet been taken.

The report on the management of repairable transformers highlighted that the existing organization of Transformer Reclamation under General Manager (T&G) be bifurcated and responsibility for the existing and any new facilities for distribution transformers be transferred to General Manager (Distribution). A staff position of Director of Repair and Test Facilities should be created under the GMD to plan, direct and monitor the repair and testing of damaged transformers. Action is pending on these and other recommendations in the report although these could have been incorporated in the Institutional changes being carried out in Distribution Headquarters.

The development of a computerized stores inventory system was proposed by PTAT to WAPDA as both an institutional improvement and pre-requisite for an automated work order system. The process of computerization of the Stores Inventory Procedures requires active cooperation of all sections within WAPDA, who use or may require information from Stores inventory data base. A "Users Committee" has been established, and has been assisting in the development of reporting procedures and data input forms.

7.6.3 Conclusion

Action on the inventory control activity is off to a late start and it needs to be accelerated. Construction activity on the building of model warehouses has to be expedited so that these can be made operational during the tenure of the contract of PTAT. The investment on inventory control has to be brought within economically acceptable limits.

7.7 Financial Services

The PTAT financial services consultants have sought to improve WAPDA's accounting, financial management practices, fixed asset valuation, and cost of service/rate setting activities. The level of effort approved for the PTAT would be appropriate, if they had received the expected level of WAPDA cooperation. However, due to the external circumstances, the PTAT financial services consultants have had to alter their work plans to only include those items that the PTAT can largely accomplish on its own. The current level of effort is insufficient for the magnitude of the overall task. It is not, however, up to the PTAT to put forth more resources into this area, but rather there is a need for greater counterpart effort.

As the result of the changed environment, the PTAT financial services consultants have shifted focus dramatically, as can be seen graphically in figure 7.7-1. Initially, the PTAT had expected to work closely with WAPDA on electricity rate issues. Indeed, several studies were performed to calculate the optimal rates for various WAPDA goals. However, the necessary day-to-day cooperation was missing at WAPDA. The evaluation team believes that high level GOP cooperation will be necessary to make progress on the tariff issue. In the other financial areas, the team found that the PTAT was working within the confines of WAPDA's current procedures and technologies. The team believes that current WAPDA technology is inadequate, and that the PTAT team should continue to work with WAPDA senior managers to implement a new financial management system using currently available computer technology.

FINANCIAL CONSULTING SERVICES

EXPECTED V. ACTUAL ACCOMPLISHMENTS, 5/86

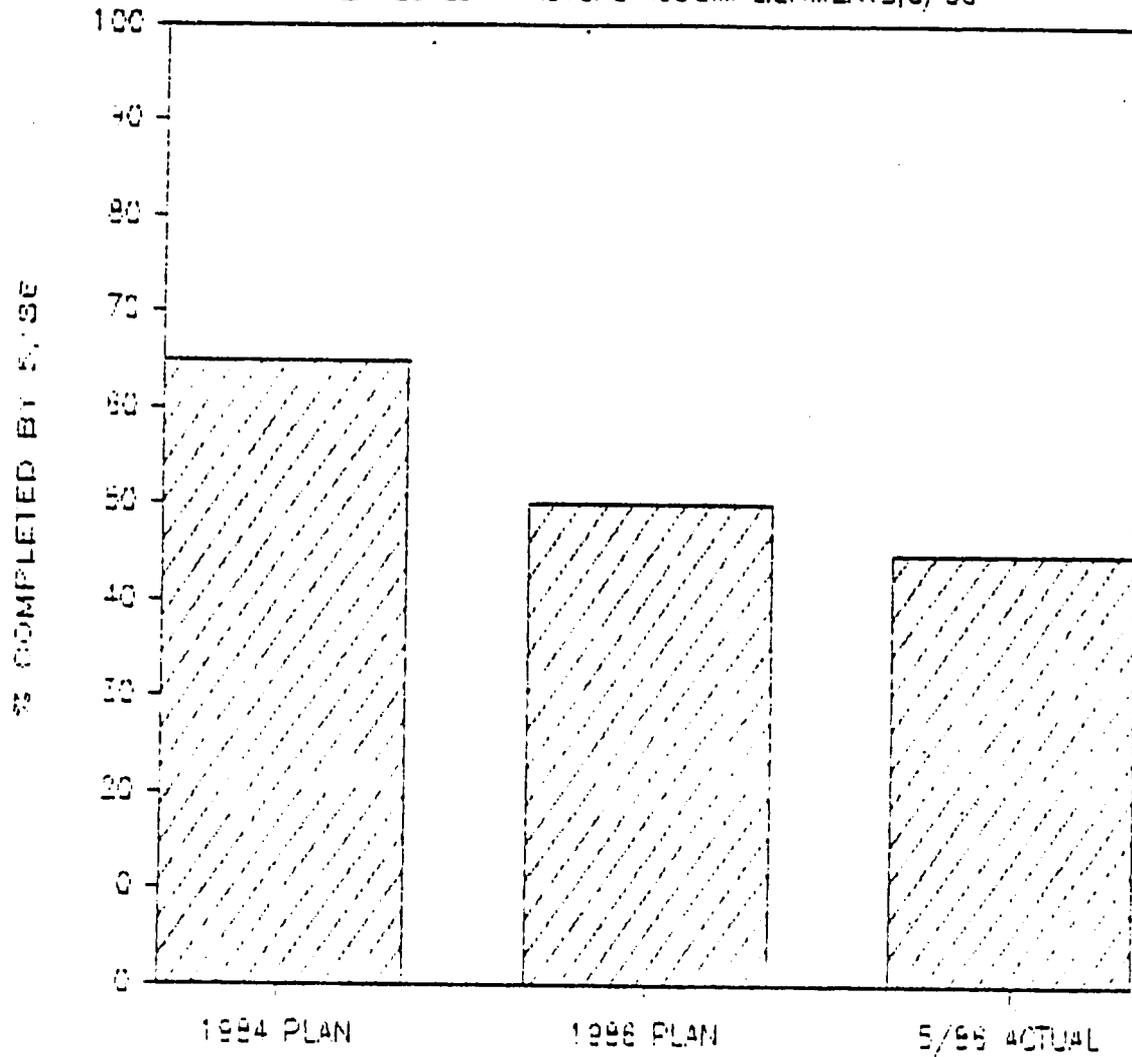


Figure 7.7-1

8.0 DISTRIBUTION TRAINING

8.1 Strength of the Activities

There are six major strengths in the PTAT Training program: the existence of the approved Training Plan (See Section 5 of this report), its staffing, the curriculum development, internal controls, the design of the Distribution Training Institute, and the U.S. short-term training. Each one is described briefly below.

8.1.1 Distribution Training Plan

As was referred to earlier in Section 5.0, the Comprehensive Power Distribution Training Plan was completed on schedule and was accepted by WAPDA and USAID in November 1985.

8.1.2 Staffing

During the first year of this project, the PTAT training consultants selected an excellent staff, consisting of Pakistani educators, past WAPDA employees and personnel from business and industry, to serve on the PTAT team. Over one half of the assembled staff hold Doctor's Degrees in education or engineering. This group of Pakistani and Expatriate Consultants then worked side by side with Pakistani WAPDA Counterparts. Except for promotions and transfers within PTAT, the original training staff has remained virtually intact, thereby further increasing productivity. Well-qualified support staff members including word processors, Urdu typists and curriculum coordinators have also been employed.

A unique accomplishment for training has been the official appointments by WAPDA of the Chief of Training; Department Heads for Technical, Commercial and Management; and the Principal of the DTI. Each position has been officially posted and office orders have been issued assigning WAPDA personnel to the positions. The Chief of Training serves as the WAPDA counterpart to the Chief Consultant of Training for the PTAT.

The PTAT training program has built an organization which places increasing responsibility on WAPDA and other Pakistani personnel. When expatriate consultants are phased out, the WAPDA administrators and trainers will be able to assume the responsibility for the program, and operate it as manpower needs dictate.

8.1.3 Curriculum Development

At this writing, twelve curricula have been approved by various advisory committees, with production averaging one per month. Curriculum development activities are far ahead of schedule as only one curriculum was projected to have been completed by this time. In fact, as may be seen in Figure 8-1, 40 % of the total curriculum portion of the project has been completed.

Several man-months were used in the development and implementation of a slide/tape safety presentation for lineman and assistant lineman, while six additional courses were added under the category of inventory control. Assistance was also given by the training staff for development of the Institutional Improvement Plan and the Rehabilitation and Expansion Plan.

DISTRIBUTION TRAINING SERVICES

EXPECTED V. ACTUAL ACCOMPLISHMENTS, 5/86

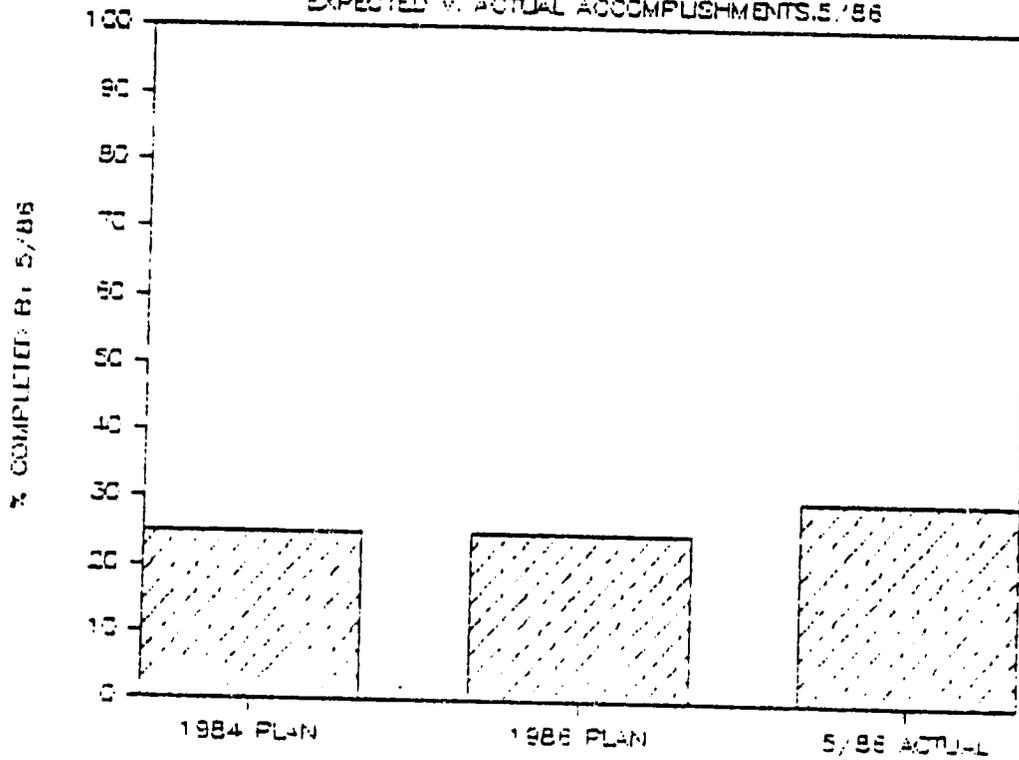


Figure 8-1

DISTRIBUTION TRAINING SERVICES

SUBTASK ACCOMPLISHMENT, 5/86, V. PLANS

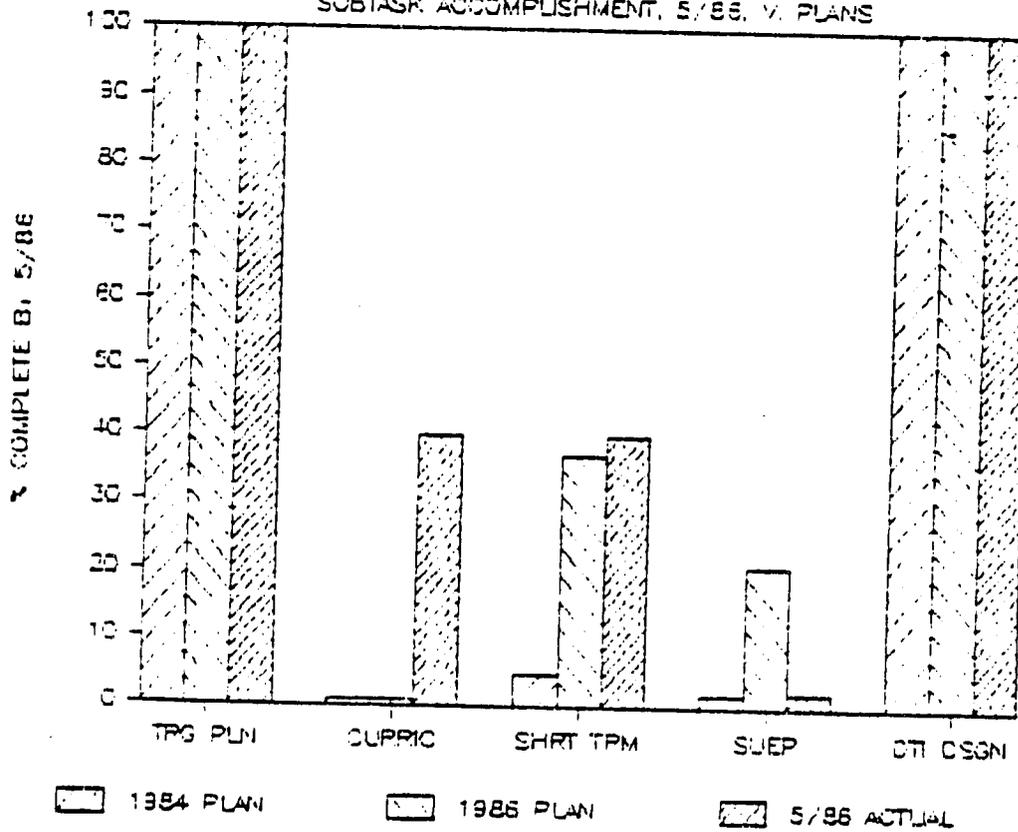


Figure 8-2

Curriculum work began with the submission of the CPDTP in May, 1985. Advisory Committees were formed and job/task analyses were conducted before curricula writing started.

Following advisory committee approval, curriculum materials are field tested to validate content, teaching techniques and timelines. Each curriculum is evaluated in the field by instructors, trainees and PTAT implementation staff. Following this formal report, the curriculum developer revises the course materials based upon the data collected.

8.1.4 Control Factors that have assisted Training Consultants to achieve desired change

In an effort to achieve desired objectives in a limited amount of time, Training Consultants have done the following:

- o Consistently stressed upon WAPDA and USAID the necessity for clearly defined limits of the problem being considered
- o Diplomatically but untiringly pressed WAPDA to assign a Chief of Training, Principal of DTI and department heads while insisting (for several months) that the appointments become effective and stable
- o Conducted incremental reviews of everything that was done with all parties having a vital interest in the project and
- o Maintained a monitoring and evaluation process which is timely, well communicated and effectively stresses problem areas.

8.1.5 Distribution Training Institute Design

The PTAT completed the development of requirements for a Distribution Training Institute (DTI) to be built at Islamabad during the first quarter of 1985. Figure 8-1 shows the 100 % completion of the design. However, due to various delays in procurement of title to land and employment of architects and engineers, the construction phase is far behind schedule. Because it appears that the completion of the DTI will not occur until after the expiration of the PTAT contract, the PTAT has initiated the creation and operation of an interim DTI in Lahore, which will be run by WAPDA beginning July 1, 1986.

8.1.6 Short-Term U.S. Training

As shown in Figure 8-1, the 1986 plan calls for approximately 37 % completion of U.S. based short term training by this time. Actual numbers having completed the training plus those now involved in the U.S. training represent approximately 40 % of the projected total. It should be noted that returnees have expressed concern that the training in this program should provide more hands-on and practical applications than was provided for the first two trainee groups.

8.2 Weaknesses of the Program

8.2.1 Long Term U.S. Training

The Training Plan calls for the identification of training needs, development of candidate selection criteria, and the submission of 20 names for long term academic programs in the U.S. beginning in the fall semester 1986. Although the April 1986 Monthly Report indicated that 25 % of the task has been completed, it appears that this program is behind schedule by at least six months. The main problem has been unrealistic requirements for participation.

Ninety-two persons responded to the first advertisement for long-term academic programs in the U.S., but none of these met the required criteria. Selected employees were recommended following re-advertisement but further delays have been encountered due to the failure to schedule the English language proficiency (TOEFL) examination in a timely manner.

8.2.2 Sister Utility Exchange Program

The Sister Utility Exchange Program (SUEP) has been suspended by order of USAID/Islamabad since mid-February, 1986, pending the resolution of a major dispute over the proper level of funding and Joint venture home office staff time required for successful operation of the program. Before that time, it had been behind its own schedule. Figure 8-1 indicates that the SUEP should have been 20 % completed by this time, but in fact only 2 % completion of the work has occurred. The Evaluation Team feels that it is imperative to get the SUEP back on track before the end of this calendar year, and then to accelerate the dispatch of WAPDA staff in the following 18 months. What is needed is hands-on experience, not a one-to-one tutorial program. The WAPDA personnel have expressed great interest in being able to observe ongoing activities in a modern U.S. utility, not in classroom training. This was the original intent of the SUEP, and it should be reinstated and resuscitated as soon as possible.

8.2.3 Short-Term In-country Training

Short-term in-country training has been a major disappointment to date. Although over 2300 participants are scheduled to have been trained in short courses in Pakistan by the fourth quarter of 1989, virtually no assistance has been requested by the Institutional Improvement and Energy-Loss Reduction programs. Only one request for training services, that for Mapping and Surveys, has been received and that has been met. Apparently, the PTAT and WAPDA staff within the main technical programs do not feel the need or are not yet ready for such short-term training. Although agreements in principle may have been reached, office orders have not yet been issued to WAPDA employees who would be the recipients of such training.

8.2.4 Translation of Curricula

All of the curricula being prepared for trainees in WAPDA basic pay scales 16 and below are being first written in English, and then forwarded to a WAPDA staff member, who in turn assigns a trainer or department head the responsibility for the translation. The result has often been poor or inconsistent translations, which have to be extensively revised.

8.3 Observations and Conclusions

The PTAT Training staff has effectively performed the functions required to produce the Comprehensive Power Distribution Training Plan, three supporting publications, twelve curricula, and a safety slide/tape presentation for Lineman and Assistant Lineman on schedule, all of which are of high quality.

The PTAT Training Consultants have assembled a cohesive, responsive and goal committed team for curriculum development, production and implementation. The organizational manner in which the training project activities have been carried out has placed the optimum amount of responsibility upon WAPDA and Pakistani Consultants and staff. Such staff will be fully prepared to assume responsibility for continued development and operation when expatriate consultants are withdrawn. The physical integration of WAPDA counterpart office functions with PTAT staff has promoted desirable professional relations, allowed for a free flow of information and provided resources for all parties to draw upon for decision-making.

In the past, training in WAPDA has not been considered a prestigious or desirable assignment for either the trainer or the trainee. So often the assignment has resulted in a type of punishment or form of discredit in fact, even if not intended. This condition needs to be reversed. The most competent persons should be selected and posted as trainers. The attitudes of these trainers should be positive toward their assignments which will effect a positive attitude and result on the part of the trainee.

Having evolved within training an effective system of curriculum development from creation to implementation it now can be used as a model for future WAPDA programs.

Delays in the selection of participants for out of country training program have been the result of a complicated and inefficient procedure followed by WAPDA, which has now been partially remedied.

English curricula, which require translation into Urdu, are being translated by WAPDA employees who are not professionally prepared for the task, resulting in extensive editing requirements.

Although the design of the DTI Islamabad was executed by the PTAT on time, the actual construction of the facility is not likely to be completed before the end of the project.

To visualize planned and actual accomplishments see Figure 8-1 and 8-2.

8.4 Recommendations

A concerted effort should be made to enhance the image of training within WAPDA. The best qualified trainers should be posted to training positions, with those assignments to be for not less than three years. Appropriate pay allowances of not less than 50% of basic pay increase should be provided for trainers. Successful completion of training should be a major factor in consideration for promotion and for pay increases for employees.

The successful pattern of operation followed by the PTAT training staff should be continued and used as a model for the other parts of the Rural Electrification project. This has involved the integration of WAPDA, expatriate, and local Pakistani PTAT staff; along with a progressive shifting of administrative and production responsibilities to WAPDA.

A simplified process for the selection of out of country trainees should be implemented by WAPDA, one which will require fewer approvals and will take up less valuable time.

Services of skilled translators should be obtained immediately for the translation of the English curricula into Urdu, rather than relying on WAPDA senior staff employees to perform this task. Their time would be better spent on other matters. However, technically competent WAPDA personnel should review the translation to insure that it is technically accurate and complete.

Since the implementation of the DTI in Islamabad has been delayed, probably beyond the duration of the PTAT contract, high priority should be accorded to the start-up of the interim DTI in Lahore. This will demonstrate effective administrative and instructional procedures, which can later be transferred to the DTI in Islamabad and used as a guide for all Distribution training.

9.0 ENERGY LOSS REDUCTION PROGRAM

9.1 Introduction

The Energy Loss Reduction (ERL) program was designed to establish within the WAPDA Distribution a comprehensive technical energy loss reduction program, to develop the technical knowhow and procedures for system analysis, and to provide the related required equipment. The overall goal was a reduction of technical losses by three (3) percent.

In general, heavily loaded feeders with a poor power factor contribute heavily to the amount of technical losses generated in the WAPDA distribution system. Technical losses can be minimized through proper design, planning, operation and maintenances of the system, but never eliminated. Non-technical losses result from overlapping metering and billing periods, human error and pilferage. Non-technical loss can be eliminated through proper control of the system and continual review of the system data base.

The chief technical causes of the very high losses in the WAPDA system are poor power factors, transformer losses, conductor overloading, secondary losses, and poor connections. Each of these problems can be corrected by initiating action based upon good utility practices. Power factor can be raised by the use of capacitors and load balancing. Transformer losses can be reduced by sizing each unit to match the load and impedance. Excessive conductor loading can be examined by the use of metered data while conductor connections improved with proper connector hardware. All of these corrective actions and related design criteria will be executed in the PTAT recommendation for inclusion in WAPDA's "Standard Distribution Installation".

WAPDA's distribution system is maintained by eight Area Electric Boards (AEB), located in four provinces in Pakistan. The system predominately serves area demand by 11 kv primary feeders through distribution transformers with a low voltage of 400/230 volts. Two winding grid station transformers are typically used to serve distribution area demand from the sub transmission system. Distribution grid station transformer demand, energy and voltage readings, are manually recorded on an hourly basis and typically maintained at the grid station. A review of these grid station logs indicates that the energy loss is high due to poor distribution feeder power factor. In addition, distribution bus voltage at some grid stations drops below 11 kv during peak load periods. WAPDA's overall system load factor is generally in the order of 60 per cent; however, some annual feeder loads show a range of 30 to 80 per cent.

Some of the objectives for the ERL program are as as follows:

- Reduce technical losses in WAPDA distribution system by 3%.
- Develop cost/benefit base for energy loss evaluation.
- Develop work order system for managing energy loss improvements.

- Train WAPDA engineers in planning and design loss improvements to the distribution system.
- Guide, monitor and approve the energy loss reduction work.

The ELR program will be implemented by WAPDA's eight AEBs following the guidelines established by the PTAT team and in accordance with the approved work order system. In the early phase of preparation and installation, the ELR program will be under the direct supervision of a senior PTAT expatriate engineer. He will work with his WAPDA counterpart in the review of the high energy loss area in the AEBs, data collection and analysis, design and preparation of work orders, assistance with construction and inspection of completed work. In the latter phase of the ELR program WAPDA will have the total responsibility for implementation.

9.2 Crash Program

During the early phases of the ELR program, it became evident that the long lead time for procurement was causing a serious delay in feeder correction. To expedite actual distribution feeder correction the General Manager (Distribution) sent a letter to PTAT date February 26, 1985, instructing them to prepare, immediately, ten work orders out of the 54 feeders previously agreed upon to be included in the crash program. The work orders would be designed to use material already in WAPDA's stores, and would focus on improving those feeders showing the best cost benefit ratios.

Upon receipt of the letter from the General Manager the PTAT team began a concentrated effort to comply with the WAPDA directive. After analysis of the distribution energy loss data for 1983-84, six divisions in two AEBs that showed the highest loss levels in the system were selected for intensive review. In turn 54 feeders within these divisions were selected from the grid station records because these feeders showed high total loss coupled with high peak demand.

The crash program sought to reduce both non-technical and technical losses. The non-technical losses were addressed by field investigation of the number of customer connections, loads on the selected feeders and meter security. For technical loss assessment, electrical data on the feeders were collected and one-line diagrams were completed showing the data required for calculation and analysis of the peak feeder electric loss. A computer program was developed to calculate the primary and secondary conductor losses, display these feeder line losses by segments, and indicate those segments of unusual high loss which became candidates for replacement.

Loss analysis was undertaken for the heat loss value of the primary conductors and transformers, using WAPDA's transformer efficiency curves. Secondary losses were estimated, using the analysis of the six test feeders where some secondary network data were collected. Total losses were calculated for the designated feeders which were in turn compared to the grid station loss record. In some cases the two values compared closely, indicating predominant technical loss, while in others there was a wide discrepancy indicating large non-technical losses or theft.

Engineering improvements to the selected feeders were limited, since only the existing WAPDA stock inventory could be used. The available stock consisted of various conductor sizes and low voltage capacitors. To select the size of the conductor needed, future load projections were calculated using a ten per cent growth rate for a three-year period.

The cost estimate for the material was based upon the latest WAPDA inventory of average unit price and labor cost on a percentage of historical WAPDA assignment. Bills of materials were prepared, using the existing WAPDA work order format. Due to the lack of as-built drawings, completion of the work order was extremely difficult. This condition effected the accuracy of the cost estimate and consequently the cost benefit ratio.

The final action of the ELR crash program was to assess the benefit gains against the cost for each work order. Technical losses reduced by feeder improvement were considered a cash benefit as there is a shortage of generation and all available kwh were considered saleable. All ELR investments showed a capital recovery period of less than three years for the forecasted loading conditions.

The crash ELR program as implemented, did not meet the requirements outlined in the project paper. There were several important items of equipment needed for feeder improvement that were not available from WAPDA's stores. However, the crash program provided an opportunity to develop a workable procedure for gathering data, preparing computer programs for feeder analysis, training WAPDA specialists in computer applications at AEP, and developing a cadre of WAPDA staff to continue the ELR program.

9.3 Work Order

The WAPDA distribution work order system prepared by the PTAT team is a comprehensive methodology providing formal procedures for planning, executing, accounting and managing power distribution activities. It also insures that the cost of the work is properly charged to the appropriate asset accounts, and cost reimbursement is approved by the funding agency, if applicable. The planned system will initially be built upon the existing WAPDA work order procedures used by the ELR program. Automation of many burdensome manual functions will begin as soon as the new manual system is implemented and functioning.

The new work order system provides the means of communication and coordination among all the WAPDA functions supplying information to or receiving information from the distribution work process. These major distribution functions include:

- System planning and design
- Regional distribution engineering
- Distribution mapping
- Asset accounting
- Payroll accounting
- Distribution materials purchasing and
- Stores inventory and accounting.

The work order system also provides the basis for increased utilization of automated technology in many distribution functions. It is the first key element in the proposed long-term development of a full WAPDA distribution information and data gathering system.

The work order system as prepared by the PTAT team and presented in an Annex to the Master Plan (MP) appears to be complete and adequately detailed to meet the WAPDA requirements for distribution. While the PTAT prepared the work order program, a WAPDA Work Order System Users Group was active in the development of the implementation procedures and the preparation of the actual forms, based in many cases on existing WAPDA forms.

The implementation plan outlined in the Annex to the MP contains a general plan of action but is missing details of who does what and when. Implementation of the work order system must be integrated into WAPDA's day-to-day routine. WAPDA staff must believe that it will improve their Distribution Wing.

9.4 Load Management

Load management is another tool that may be used to reduce distribution losses. Load management consists of direct control of the customer electric service through load isolation devices or indirect control through use of economic incentives and disincentives in the tariff structure to encourage changes in the consumption patterns. Reducing loads during peak periods of demand can be used to conserve energy and to reduce the capital investment required for electrical production, transmission, and distribution. The procedures involve changes in consumption patterns on the customer side of the meter. The customer may be residential, commercial, industrial or rural.

A PTAT team short term consultant spent four months developing a load management device that could be fabricated by Pakistani Firms, using locally available materials. He made extensive use of the local PTAT staff throughout the design, fabrication and testing of the load management device, but solicited little input or comments from WAPDA personnel. Now that the PTAT consultant has returned to the US, the WAPDA counterpart for ELR program indicates that WAPDA has a representative in Europe visiting firms and organizations to investigate load management devices. Not having been involved, WAPDA did not accept the device developed by the PTAT member. Apparently further review the application of load management will be made after the representative returns from Europe.

9.5 Material Procurement

Procurement of materials for the ELR program was scheduled to be completed during the first two years of the project. The first priority was to be given to identifying the required ELR materials, preparing product descriptions and specifications (starting with the long lead time items). Documents to be prepared by the PTAT staff, with WAPDA assistance, include product descriptions, specifications, Invitation for Bid (IFB), bid review and evaluation and recommendation to WAPDA for issuance of procurement contract.

Noting the need for the speedy selection of the required materials, the product description and specification were prepared by PTAT staff in October 1984 for the long lead time items. The procurement process became incredibly involved and lengthy, due to the inclusion of approval procedures involving several approaches and numerous requirements. There were differences of opinion between USAID, on the one hand, and WAPDA and the PTAT, on the other, over whose regulations or opinion would govern specifications and the bid procedures. As can be seen in Figure 9-3, extended delays resulted. USAID Contracting, Legal and Commodity Procurement staff appear to have been largely responsible for the delays, due both to understaffing and an initial unwillingness to work constructively with the PTAT staff. These problems appear to be largely resolved. Most of the initial material contracts have now been awarded to the suppliers with a one-year delivery period. This will mean that the materials will arrive within 3 years of a five year program. It is the evaluation team's understanding that the procurement delays have been largely solved, but this area should be closely monitored by the USAID/E&E project office.

There is one procurement item still outstanding: "Special Metering Packages". The PTAT monthly report of May 1986 shows it has been an open item for the last six (6) months. Monitoring instrumentation is a necessity in a project that has so many unknowns. Due to the lack of a data base, reductions gained through design are theoretical without measurements. Review of the results the crash ELR program indicates that the data recorded at the grid stations are questionable at best. There is an immediate need to monitor feeders before and after ELR work to create an accurate, selective data base.

9.6 Circuit and Feeder Mapping

The PTAT has developed a mapping system to provide the basic data on the WAPDA distribution system which are needed for planning, engineering, operations and property records. It is designed to be compatible with computer-based graphics operations as planned for WAPDA in the future. In conjunction with this system, a mapping function is to be established within WAPDA to assure a timely implementation and continuation of the program. Sufficient number of crews must be provided along with adequate inspectors to collect plant record data to meet the need of the ELR and rural expansion programs.

The massive effort needed to establish distribution maps can be performed by WAPDA personnel or outside contractors. However, if the work is done by private firms, WAPDA will need to acquire a mapping function capable of maintaining the completed maps. Establishing the function within WAPDA is most important and long overdue as this is the second time that a consultant has assisted WAPDA with map preparation. The US consulting firm of Minor and Minor started a mapping program in the mid 1960s. However, when they departed the mapping function ceased.

PTAT prepared an IFB for WAPDA to hire a private contractor for the mapping of geographical and electrical survey of 190 distribution feeders in all the WAPDA area electric boards. The approved contractor will carry out field surveys and prepare maps for each selected feeder, providing electrical and physical details. WAPDA apparently plans to use the contractor to complete the mapping program.

9.7 Observations

The design work for the ELR crash program for correction and upgrading of 54 feeders has been completed by the PTAT. WAPDA construction crews are working on the last eight feeders of this group. All of the work orders for the crash program were prepared by the PTAT team (including the local sub-contractor staff) with minimal input by WAPDA. A vivid example of the lack of cooperation between WAPDA normal construction activities and PTAT ELR program was noted during a field inspection of some modified feeders. The new ERL feeder ran down one side of the street. On the other side of the same street a new double circuit feeder was going up. They both started at the same grid station and serviced the same area of the city, but neither WAPDA nor PTAT knew what the other was trying to accomplish. PTAT staff felt that this type of confusion was due to a lack of local area maps, but it appears to the evaluation team to be symptomatic of a large problem of a lack of coordination of PTAT activities with WAPDA's system expansion program.

All of the engineering input required for preparation of the work order should be a joint effort to accomplish the project goal of the transfer of technology. It is not sufficient to have WAPDA staff review and approve the finished work order.

The next phase of the ERL program is to be accomplished by the Chief Engineer of the AEBs, who will prepare the work orders in conjunction with the PTAT team. This procedure will be a major improvement on the current practice of using the PTAT as if it were an outside engineering contractor, rather than a group of colleagues. However, there is no concrete plan for accomplishment or time schedule for completion of the work.

All of the items under the ELR program are being seriously slowed by the late start of the reorganization of the Distribution Wing headquarters. The ELR feeder program needs direction from the very top management for a timely implementation. The Load Management must be reviewed immediately, since a decision is needed for application if the limiting devices are to arrive before the end of the project. The Work Order system implementation must begin soon to complete the manual phase in order to avoid a delay with the computer automation phase. Mapping has started under a WAPDA contract, but the development of a WAPDA internal capability to maintain the completed maps is in limbo. Procurement is behind schedule. A decision must be reached soon on the second set of items so that the IFB can be issued.

It is recommended that the USAID take the lead in assisting the GOP and WAPDA in expediting the implementation of the reorganization and staffing of the new Distribution Wing. It is also recommended that the six-month delay in procurement of the ELR "Special Metering Package" be resolved as soon as possible. Without them, measuring the results of the entire program will be theoretical.

To visualize planned and actual accomplishment, see Figure 9.1-1 and 2.

DISTRIBUTION TECHNICAL SERVICES

EXPECTED V. ACTUAL ACCOMPLISHMENTS, 5/86

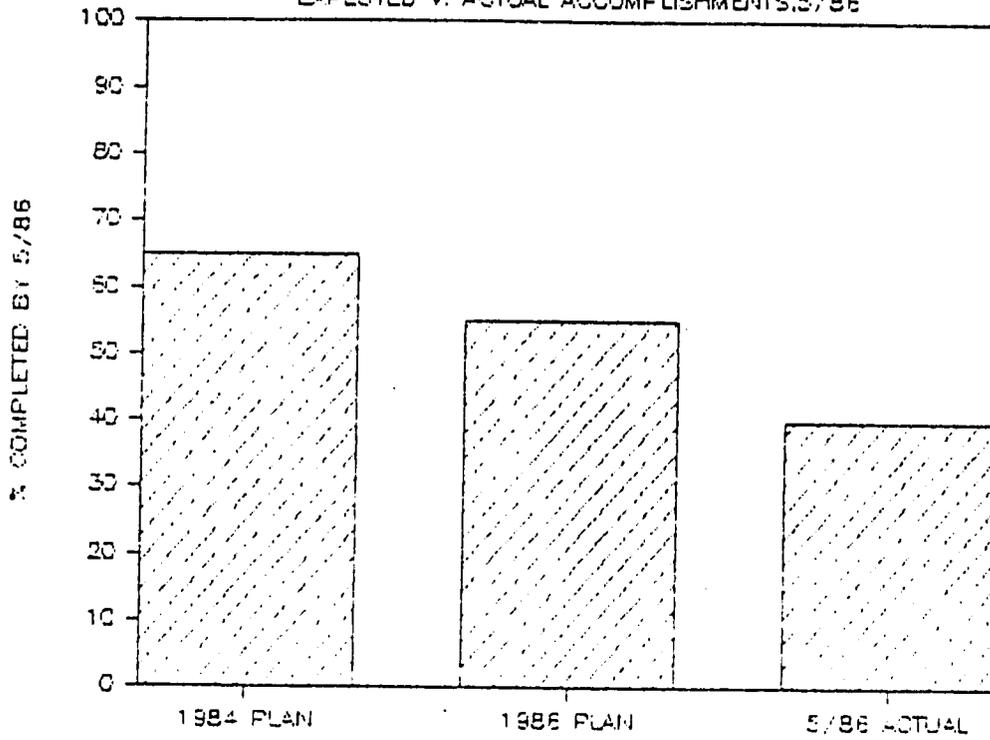


Figure 9.1

DISTRIBUTION TECHNICAL SERVICES

SUBSTANTIAL ACCOMPLISHMENT, 5/86, V. PLANS

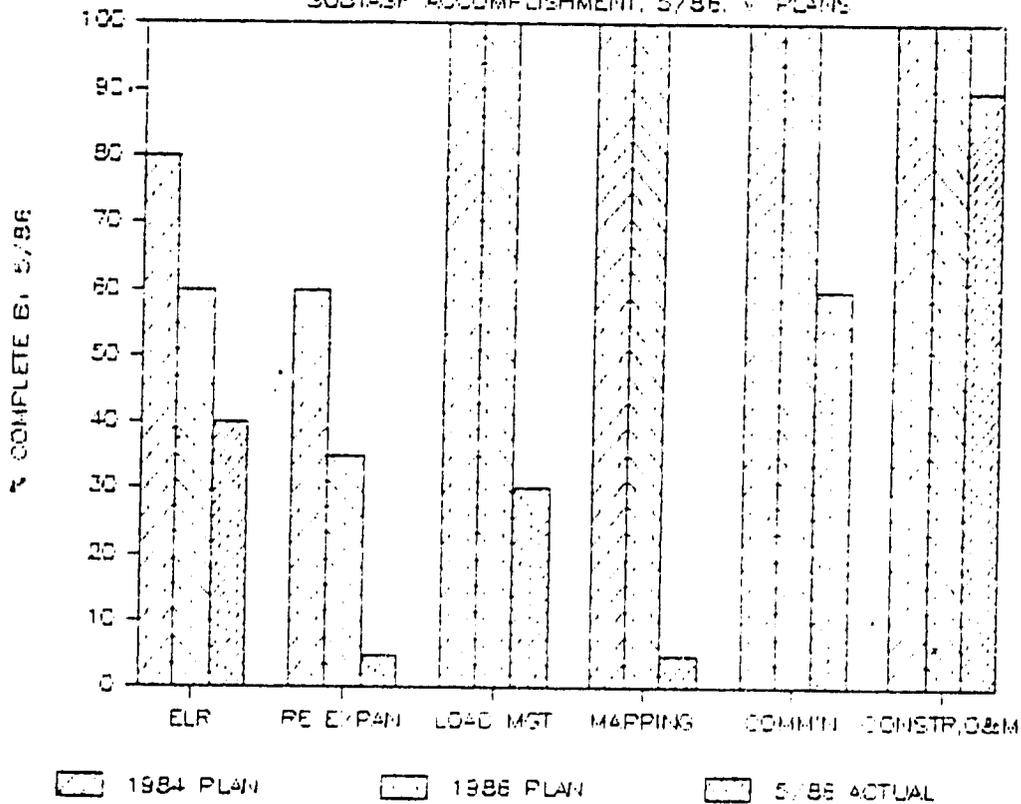


Figure 9.1-2

CHRONOLOGY OF PROCUREMENT
FOR ELR EQUIPMENT

I. Shunt Capacitors Tender No. 391-K-189/1 (Package 1)

29 Apr 1984	WAPDA requested by AID to prepare IFB in accordance with USAID Hand Book for host country procurement.
02 Sep 1984	WAPDA submitted draft IFB to AID for review and approval.
18 Sep 1984	WAPDA informed by AID that the draft IFB was incorrectly based on Hand Book 11 Chapter 2, dealing with host country contracting for construction services and had to be redone.
Oct 1984	Specification packages submitted to WAPDA by PTAT for many ELR components.
08 Jan 1985	IFB documents submitted to USAID and WAPDA for approval.
28 Mar 1985	WAPDA comments on IFB documents received by PTAT.
01 Apr 1985	Revised draft IFB for supply distribution line material and equipment provided by PTAT to USAID.
18 Apr 1985	USAID/E&E issued reminder to USAID/RLA-CC to finalize IFB documents by responding to questions raised by PTAT.
21 Apr 1985	E&E's comments regarding issues raised by PDM sent to ACO/PDM.
24 Apr 1985	E&E reminder to ACO/PDM to finalize subject documents.
29-30 Apr 85	Meeting with USAID and CC(CCC) to resolve issues on taxation of imports.
05 May 1985	Interim response regarding language for "shipment" in IFB provided to PTAT by USAID/E&E.
07 May 1985	AID review of Draft IFB.
12 May 1985	Final draft copy IFB incorporating USAID and WAPDA's comments sent to USAID/PDM/PCO for finalization of IFB.
21 May 1985	USAID pouched to PTAT copies of reference documents and forms for preparation of IFB.
21-26 May 85	USAID review of IFB and CDB publication notices.
07 Jul 1985	PTAT furnished to USAID 4 copies of IFB documents incorporating USAID/RLA and E&E comments.
15 Jul 1985	Released tenders in U.S. and Pakistan - 76 sets of bid documents sold.

CHRONOLOGY OF PROCUREMENT FOR ELR EQUIPMENT, CONTINUED.

- 03 Sep 1985 Bids opened at PTAT/WAPDA offices. (Bid validity 150 days [5 months] after bid opening date viz Feb 3, 1986.)
- 12 Nov 1985 GE's letter to PTAT stating that only Syed Bhais representing GE meet WAPDA's prequalification requirement as published local press.
- 17 Nov 1985 USAID/E&E sends letter to WAPDA/GM (D) stating that only IFB was the legally controlling document regarding eligibility of bidders.
- 17 Nov 1985 USAID sends letter to WAPDA stating that WAPDA's notice published in Pakistani press was not approved by USAID, and that CBD notice and AID financed export opportunity bulletin which were approved by AID did not contain the clause of prequalification that appeared in Pakistani press.
- 08 Dec 1985 Meeting in Islamabad to try to expedite approvals of various commodity procurements.
- 08 Jan 1986 USAID/E&E sends memo to USAID/RLA-CC summarizing the status of all bidders regarding capacitors.
- 13 Jan 1986 E&E's telex to GM (D), WAPDA stating that additional firm bid was eligible for possible USAID funding and should be evaluated along with other bids received.
- 14 Jan 1986 PTAT reminded USAID/EE that the bids would expire 28-30 January 1986.
- 20 Jan 1986 USAID telex to PTAT and WAPDA telling that the review of the 20 bids would not be complete by 28 Jan 86 and asking WAPDA to request extension of bids for 30 days.
- 23 Jan 1986 USAID Commodities Officer questions various charges and surcharges in several of the bids.
- 26 Jan 1986 Complaint to E&E from GE stating that if prequalification requirement was rescinded, unfair advantage would be given to PEL as other suppliers would have bid using their local partners.
- 29 Jan 1986 GM (Distribution)/WAPDA replies to USAID inquiries. AID intends to retender package 1 (capacitors) but has not as of August 86 issued letter/telex regarding retendering.

CHRONOLOGY OF PROCUREMENT FOR ELR EQUIPMENT

II. ACSR Conductor (Package 3)

- 14 Jul 1985 Released tender documents in U.S. and Pakistan.
- 03 Sep 1985 Bids opened at PTAT/WAPDA office.
- 27 Oct 1985 Bid evaluation for conductor forwarded to USAID by PTAT.
- 27 Oct 1985 PTAT request for AID approval for award fo contract received.
- 13 Nov 1985 At the request of AID, PTAT transmitted copies of 3 lowest responsive bidders.
- 19 Nov 1985 USAID/E&E forwarded bid documents ato USAID/RLA-CC for review and approval of contract.
- 08 Dec 1985 PTAT telex to expedite contract approval.
- 18 Dec 1985 PTAT send letter to USAID attaching copy of WAPDA authorities decision for conditional award of contract after CCC has reexamined the evaluation report.
- 24 Dec 1985 PTAT sends letter to USAID attaching copy of GM (D) letter dated Dec. 7, 1985 stating that minutes of recommended quantities by 15 percent.
- 14 Jan 1986 PTAT telex reminding AID of deadline of Jan. 28, 1986 for the award of contract.
- 14 Jan 1986 WAPDA's letter requesting potential bidder for bid bond extension up to march 10, 1986.
- 23 Jan 1986 Telex from USAID/RLA-CC to GMD asking whether IQRA and surcharge were included in the bid price of Atlas Cables.
- 03 Feb 1986 Bid bond expires after 150 days.
- 04 Feb 1986 USAID/RLA-CC telex message with go ahead signal to WAPDA for finalization of contract with Atlas (after expiration of bid bond on Feb. 3, 1986).
- 11 Feb 1986 PTAT informed by USAID/E&E to report financial implication due to refusal by Atlas to extend the validity date and to explore the possibility of awared of contract to the next lowest responsive and responsible bidder (Chaudhry Cables).

10.0 DISTRIBUTION SYSTEM EXPANSION PROGRAM

10.1 Current WAPDA Program

WAPDA distribution function is performed through the office of General Manager (Distribution) (GMD). He is administratively responsible to Member (Power) of the WAPDA Administration. The General Manager (Distribution) is assisted by Chief Engineer, Design, C/Commercial Manager, Deputy General Manager (Inventory Control), Chief Engineer (Training), Chief Engineer (Rural Electrification), Director of Tariffs and Statistics and a Director of Public Works. The GMD is also responsible for the distribution training at the Faisalabad Institute, the eight AEB, as well as for power distribution, construction and operations.

To meet the present demand the distribution system has expanded greatly in the last several years thus following the economic and population growth. The expansion in electric consumption has followed both an intensive and extensive pattern. The intensive pattern comes from additional customers in areas with existing electrical system and existing customers who have increased their consumption. The extensive pattern has come from an increase in the number of new customers. WAPDA distribution has electrified 17,500 villages in the last 24 years and added 2.7 million new customers in the last 10 years. The majority of the new customers resides in urban areas while 23 percent are from rural areas. The decision to serve more urban customer is based upon the fact that it produces more revenue for less cost. The recent growth rate is not just from residential connections. Industry, commerce and agriculture have also grown extensively over the last 10 years. As a result of this large increase in demand there has been a deterioration in the quality of electric service measured, both in frequency and duration of outages, and in voltage instability. Load-shedding has become a necessity and the problem will probably increase in the next few years.

The decision to serve more people reflects recent political objectives of the GOP. These objectives are outlined in the Sixth Five Year Plan (1983-88) and some are as follows:

- Enforce efficient use of energy
- Ensure adjustments for realizing growth target
- Arrange interfuel adjustment
- Ensure coverage by rural electrification of the entire rural population residing in compact villages
- Ensure proper institutionalization of longer-range energy planning, monitoring and evaluation
- Rationalize energy prices

10.2 Distribution System Expansion

WAPDA distribution forces are conducting an extensive expansion program and each AEB has a chart displayed showing the number of villages electrified each

month. The present procedure for implementation allows the Chief Engineer of Construction for each AEB to design and construct the village distribution system as he sees the situation on the resulting design. As a result of this procedure we have seen a different installation at each AEB that we have visited. The new Distribution Wing being organized under the Institution Improvement Program will concentrate the design requirement in the division headquarters; all the AEBs will follow the same design criteria.

There are a number of key issues that influence the design of a comprehensive long term distribution program, covering both rural and urban electrification. Some of these key issues include:

- Impact of the program on energy sector infrastructure
- Long-term goals of minimizing cost, maximizing reliability and efficiency
- Equitable distribution of benefit
- Local participation in village solution
- Customer service and education
- Develop rate structure to assure cost recovery and bad management
- Study alternate source of energy
- Privatization of tubewells

Following these guidelines WAPDA should include in their distribution program an analysis of the shortfall resulting from the generating capabilities and projected demand and energy requirement. These policies should be considered within a comprehensive framework of planning within the energy sector so that electrification needs and benefits are considered along with design concept.

10.3 Project Support of Future Distribution Expansion

The distribution expansion program has been held in abeyance until other project components are in place and functional. The technical members of the PTAT have been occupied with other project items but have given the Rural Distribution System Expansion some consideration and planning. When the decision is made to implement the rural distribution expansion both PTAT and WAPDA will increase their effort in the area. There seem to be no predictable problems with the project component but past experience shows that the road to implementation is full of pitfalls. To assure a hasty start, WAPDA and PTAT should establish a team to prepare village selection procedures, design criteria, service policies, etc., prior to receipts of the notices to proceed with rural distribution expansion.

The work order system outlined in the master plan satisfies the condition precedent (iii) "An economically feasible and administratively sound System Expansion Work Order Design and Management System consistent with the Master Plan based on accurate data has been developed."

11.0 AN ANALYSIS OF THE PROJECT PROGRESS VS. THE ORIGINAL LOGICAL FRAMEWORK

11.1 Introduction

The analysis of the task completion vis-a-vis the Logical Framework (Logframe) will be organized exactly parallel to the Logframe for this project. Where appropriate, the percentage completion of a given item is indicated. The criterion used is the relevant "Objectively Verifiable Indicator" (sec. B). For the "Means of Verification" (sec. C), we will use the data provided by USAID and the PTAT on the nature of their efforts. Where Key Assumptions (the D items) have been invalidated by the implementation of the project, this commentary will so indicate. It is necessary to have a copy of the Logframe for a complete understanding of the organization and rationale of this review (see Appendix G).

In general, the assessment of the degree of completion is qualitative. There are two reasons for this. First, at this stage of the project, there are not many quantitatively measurable results. Second, much of the data for measuring interim results are themselves in process and are thus unavailable.

11.2 Project Goals

B. None of these objectively verifiable indicators has yet been directly analyzed by PTAT. Indeed, the social indicators identified in this section will require analysis by professionals outside the PTAT for both the gathering and the manipulation of data. Only the final indicator, dealing with the quality of service, can be provided by WAPDA to the PTAT.

C, D. None of the items in these two sections was found objectionable. However, a national social and economic census is still an intermittent affair in Pakistan. To properly gauge the effects of rural electrification on consumption and incomes, such a survey will become a necessity. Indeed, the time between gathering the data and releasing the results will need to be shortened in order to use such results for the final project evaluation.

11.3 Project Purpose

B. Status of Objectively Verifiable Indicators:

1. Guddu is on schedule.
2. Master Plan is behind schedule and is holding up implementation of rural electrification activities.
3. Rural System expansion activities not yet begun. Loss reduction activities being institutionalized through training program.
4. Comprehensive training program is on schedule.
5. Procedures for the following are roughly on schedule:
 - procurement, inventory, warehousing.Procedures in this area are significantly behind schedule:
 - customer procedures.
6. On schedule are:
 - warehouses, distribution function training.Behind schedule are:
 - customer service centers.

7. Timeliness of connection with respect to application: no progress.
8. Frequency of load shedding has diminished, no tie to project activities apparent yet. Project is not yet gathering data which could assess the effectiveness of the ELR program.
9. There are not yet any data to support this conclusion since little effort has been made to collect such information. Such data do not, in any event, reside with WAPDA or the PTAT. Rather, they must be obtained from an update of the rural electrification survey of the late 1970s.

C. Means of Verification

PTAT is undertaking a study of the economic impacts of load shedding on industry. This study will furnish much of the data identified but missing for II.B.8&9.

D. Assumptions

1. OK
2. Not clear that this is the case. WAPDA has dragged its feet on several key aspects of the program including appointment of counterparts to PTAT and approval to staff for overseas training.
3. Work order system not yet implemented. Rehabilitation criteria still based on emergency loss reduction idea. No economic criteria yet used.
4. Policy support is not always adequate, especially in terms of operational independence of WAPDA.

11.4 Project Outputs

A & B Narrative Summary and Verification

1. System expansion program has been suspended pending satisfaction of certain USAID requirements. This point is not yet relevant.
2. Guddu is now functioning. Item is 100% complete.
3. Personnel training:
U.S. long-term, short-term, and SUEP are behind schedule due to USAID stop order on AEP expenditures along with WAPDA failure to approve candidates for training.
In-country training slightly behind schedule.
4. Design is complete. Construction far behind schedule. Interim training institute now operating in Lahore.
- 5 & 6. Model Divisions are now in set-up phase.
7. Master Plan not yet completed. Current Draft does present blueprint for implementation.
8. Distribution Training Program ahead of schedule. Curricula now being prepared.

Completion of Components of Training Activity

	Actual	Planned	
		1984	1986
Plan	100%	100%	100%
Short-Term U.S. Training	40%	5%	35%
DTI Design	100%	100%	100%
DTI Construction -	0%	20%	0%
Long-Term U.S. Training -	25%	2%	25%
Short-Term in Country -	10%	40%	45%

- 9 & 10. Work Order System not yet implemented. Rural System Expansion suspended. Most effort in Loss Reduction effort has gone into Crash Program. No measurement of results is possible due to lack of appropriate metering devices.

Completion of Components of Technical Services

	Actual	Planned	
		1984	1986
Loss Reduction	40%	80%	60%
RE Expansion	5%	60%	35%
Load Management	30%	100%	100%
Mapping	5%	100%	100%
Communications/transp.	60%	100%	100%
Construction, O&M	90%	100%	100%

11. Work Order System procedures completed on paper but not yet implemented.
12. New inventory system developed, procurement system not yet developed. Implementation is yet to come.
13. Personnel administration policies not yet revised.
14. Computerized management system being developed. Effort is slightly behind schedule.
15. New communication and transportation systems designed but not yet implemented even in model divisions.
16. New accounting procedures being developed and implemented behind schedule. New commercial procedures and management systems not yet complete.
17. Cost analysis not yet completed. PTAT is working on cleaning up fixed cost schedules.
18. Review of valuation, depreciation, and cost of service policies largely completed.

D. Important Assumptions

1. SUEP is stalled due to USAID-AEP disagreements over costs and nature of effort in U.S.
2. WAPDA procedures for selecting trainees have proved too slow thus far.
3. N/A yet.
4. Construction of DTI well behind schedule due to delays in land acquisition and in contracting.
5. Rural Systems Expansion not yet implemented. RE will not be started until Conditions Precedent are met concerning the completed.

- Technical Master Plan, WAPDA reorganization, loss reduction, and additional Power Generation.
6. WAPDA has been slow to appoint counterparts to PTAT staff. This has often meant that PTAT staff act more as technical advisors than as counterparts.
 7. PTAT consultants seem generally excellent technically. However, they have often been operating in a vacuum with respect to WAPDA counterparts. This has often led to their being used as surrogate WAPDA technical staff instead of as consultants and trainers.
 8. Training programs appear to be effective in design and in initial implementation. Short-term in-country training has thus far received few requests for assistance. As a result, the medium-term implementation is well behind schedule.

11.5 Project Inputs

In most areas, the provision of inputs by both USAID and the GOP have been adequate. USAID has done a good job at getting the expatriate and local PTAT consultants into their positions and functioning. In almost all other areas, USAID has been able to put the resources where they are needed in a reasonably expeditious manner. For USAID, the exceptions to this evaluation lie in the computer hardware area. One of the biggest delays in the entire USAID side was in the procurement of computers. This effort is at least 6 months behind schedule.

The GOP has been responsible for a number of areas falling well behind schedule for lack of resources. These are:

- PTAT counterpart staff (WAPDA salaries);
- Land acquisition for DTI;
- Construction of model warehouses; and
- Provision of trainees for short-term U.S. training -- slow processing of applications, and ill-timed administration of TOEFL.

WAPDA is now putting in the requisite appointments of counterpart staff. This will remedy the most debilitating of the input insufficiencies under the control of the GOP. The efforts in training are almost as serious and should be remedied before the SUEP and other programs get back into full operation. Otherwise, the out-of-country training effort will suffer. In addition, the slow pace of requests to the short-term in-country training reduces the effectiveness of PTAT in appropriately modifying the program after some field experience. It is in WAPDA's interests to take advantage of the training programs as rapidly as possible to make sure that the work of the PTAT has lasting value.

PART FOUR: PROJECT MANAGEMENT AND INSTITUTIONAL RELATIONSHIPS

12.0 QUALITY, TIMELINESS AND CONSISTENCY OF PROJECT MANAGEMENT

12.1 PTAT Project Management

There has been commendable continuity in the senior management of the PTAT for the past two years in the persons of the General Manager, the Deputy General Manager, a number of senior consultants, and the senior managers of the PTAT subcontractors (A.C.E., F.A.C.E. and EMMAY). Moreover, the evaluation team finds that the senior management of the PTAT team has done an excellent job in directing an incredibly diverse technical assistance program, scheduling a bewildering variety of specific tasks, procurements, and personnel actions. They have been responsive to AID mission management, perhaps overly so, even when that direction has been tangential to the project. They have shown ability to respond to changing environmental conditions related to USAID and WAPDA.

However, there have been several problem areas in the PTAT management which deserve immediate attention. The chief among these has been institutional development, an area which is vital for the long-term success of the project.

Within certain parts of USAID and the PTAT team, the problem of managing the institutional development effort has been perceived as being one of poor personnel selection by the PTAT home office management: the individuals were not right for the job. This was compounded, in the case of the initial manager of the institutional development effort, by the decision by the Joint Venture management to have one individual advise WAPDA on an array of services from management information services to personnel. While this division of labor reflected the emphasis in the original Request for Proposals, it created a position that was, in the PTAT's own words, "too big a job for any one individual." USAID and PTAT management rightly pointed this out to be a mistake. While the first manager of institutional development remained in Pakistan for his full two-year assignment, his effectiveness was severely hampered early on by serious differences with the AID project manager. In August 1985, at the time of the expansion of the PTAT staff, his position as supervisor of the other consultants was taken by a senior manager experienced in developing country utility operations, and who had supervised a major developing country utility reorganization. While the evaluation team was in-country, USAID requested that this second institutional development supervisor, Manager Utility Operations, be replaced. The evaluation team understands that a new more appropriate individual has been selected.

The evaluation team does not feel that it is appropriate to comment on the management performance of the chief consultants for institutional development, since one had already left prior to our arrival and the other was already being eased out during our visit. Both individuals appear to have been inappropriate choices for the institutional development effort. However, as is discussed in sections 6 and 7, the management of the institutional development effort suffers from two other types of problems, both of which

have to be addressed directly if the PTAT is to contribute to the long-term institutional development of WAPDA.

The first problem is that AID/E & E senior management, and therefore the PTAT management, appeared to have approached the solution for WAPDA institutional needs primarily as organizational in nature. Creating a new organizational chart, getting it approved by WAPDA senior staff, and getting individuals selected for the new positions, although necessary at the first step, cannot be taken as the required institutional change. In this view, institutions are like electrical circuits: rerouting the flow of decisions and authority will resolve such organizational problems as inefficiency, over-centralized decision-making, and massive underemployment of much of the lower level staff. While reorganization is important over the long-run, it does not address most of the institutional problems of WAPDA's distribution function, nor will it promote professionalism and efficiency, without effective, concentrated consultant contact with WAPDA personnel.

Second, the individuals selected to fill most of the institutional development posts within the PTAT staff have little or no expertise in the management of institutional change. Despite their dedication and excellent professional credentials within their respective fields of expertise, they are drawn for the most part from staff components of American Electric Power, an organization that has been, and remains, institutionally stable. While AEP can serve as a model for what WAPDA may become in 10-20 years, the transition period should be assisted by consultants who are professionals in organizational development and management experience within one and only one electrical utility. Skills such as team-building, personnel selection for change in the corporate culture, the structuring of incentive and promotional programs for technical staff, and the management of decision-making information flows under conditions of extreme uncertainty are those which should be paramount for the institutional development team. Utility experience, while helpful, is far less important.

12.2 USAID Management

12.2.1 Achievements of the Senior Management

The senior management of the Energy and Environment Office of USAID has impressed the evaluation team with its energy and enthusiasm, devotion of duty, willingness to press for its program, and consistent focus on the development of an overall power sectoral strategy. Moreover, the close working ties and program coordination of the E & E senior staff with other major donors are also to be applauded, since they have been directly responsible for creation of a cohesive donor strategy for energy in Pakistan, and have resulted in the mobilization of very substantial resources for WAPDA generation and distribution.

The development of such a large and complex energy portfolio within the E & E office has been accomplished by a very small expatriate staff, which is only now beginning to reach a size commensurate with its responsibilities. Each individual was responsible for a number of different tasks, ranging from project development to policy dialogue and project management. Deadlines were set for the development of a number of crucially important projects for

Pakistan's energy future, albeit at a substantial personal cost for the individuals involved. The evaluation team has been concerned, however, that the number and size of the USAID/E&E staff's responsibilities also has adversely affected the supervision for projects that were developed early, such as the Rural Electrification Project. This will be discussed in Section 12.2.2 below.

On the strategic level, the evaluation team feels that virtually all of the key management decisions made by the head of the E & E office -- such as the acceleration of the scope of work, the requirement for three major planning documents, the stop work order of February 1986 -- were sound. They were required by circumstances that perhaps were foreseen but which, in any event, necessitated decisive action to minimize future problems within the project.

In addition, the head of the E & E Office has provided on numerous occasions sound written and oral policy guidance to the PTAT that represent a sound development approach. These include such matters as: increasing functional and physical integration of the PTAT and WAPDA staff, the need to work through senior WAPDA staff when communicating with lower levels of WAPDA, and the importance of phasing PTAT staff out of task responsibilities and phasing WAPDA staff in as soon as possible.

12.2.2 Problems of Day-to-Day Management

On a day-to-day level, the management by USAID/Islamabad and USAID/Lahore of the Rural Electrification Project has been less successful. There has been the seemingly contradictory problem of too much direct USAID involvement in project outputs and too little management oversight. Early on in the project, there was a great deal of USAID involvement in the technical activities of the PTAT. At times, it appears that the original project manager assumed direct control of the day-to-day contractor decisions, from the selection of personnel to the development of detailed outlines for important reports. The original PTAT General Manager was replaced after only a few months at the request of AID. The current PTAT Manager arrived in July 1984 and had to deal with a large number of AID requests for specific administrative and personnel actions. USAID managers felt that contractor confusion and inactivity in the period June 1984-January 1985 warranted this active participation. Partially as a result, the contractor has developed a habit of passing along all of its internal decisions for USAID inspection. This takes valuable times away from the execution of the PTAT's technical responsibilities. PTAT senior management maintain that this habit of documenting all decisions and requests was prompted by the failure of the AID/Lahore Liaison Office to provide support and equipment specified in the original contract.

On the other hand, as has already been mentioned, the heavy load on the USAID E & E staff for preparing new projects and supervising a number of activities has meant less oversight of the Rural Electrification Project than the evaluation team feels is warranted. Part of the problem is due to design flaws with the project, and in the adequate management system set up by USAID during the start-up phases of the project. The contractor work plan is deficient in that there are no milestones within the separate technical areas which allows the USAID project manager to closely follow project progress. This is true both for long-term and short-term PTAT expatriate staff.

Short-term staff have proved to be a particular problem. While there is a pre-agreed general scope of work for each short-term consultant, there is not a firm agreement among PTAT, USAID, and WAPDA on how his effort is to contribute to the institutional evolution and strengthening of WAPDA and how to measure progress toward those goals. While there has been some recognition of this fact since the new project manager was installed in January, 1986, there is still not adequate USAID operational controls over contractor direction. The current project officer must take a more active role if the project is to be managed successful. He must devote more time to direct contractor supervisor and liaison with other USAID Offices. Weekly oversight meetings and more detailed meetings are required to make certain that contractor activities are working toward the project objectives.

The lines of both formal and informal authority within the USAID E & E office have also complicated the PTAT management tasks, and slowed execution of certain tasks. Formally, there have been a number of project officers for the Rural Electrification Project, and they have sometimes served only for a short period of time before being taken off for other pressing assignments. Informally, the long association of the E & E office chief with the project (he was the head of the project design team and the first project manager) has led to his continual involvement, despite his many other responsibilities. The project officer and program manager defer continuously to the office chief, and await his decision on important issues. They tend not to take initiative for many routine measures without consulting with him.

This has been a particular problem during periods that coincided with home leave or other pressing obligations of key E & E management staff, such as the period June 1985 - January 1986. During this period, when a series of crucial decisions on procurement, staffing, levels of expanded PTAT budgets etc USAID staff in both E & E and the other components of the mission did not provide sufficient assistance and supervision. Information that was sent up to USAID about such important matters as the anticipated expansion in the PTAT budget was not analyzed critically. Responses to many PTAT requests for guidance on crucial policy actions were delayed, and there appeared to be little operational oversight of PTAT reports, activities, and decisions that affected project direction.

There is a perception, within the staff of both the contractor staff and other USAID/Islamabad offices, that decision-making within the E & E office on the Rural Electrification Project is highly centralized. The contractor tends to await USAID/Islamabad clearance on important matters, rather than dealing with the USAID/Lahore office. This is further exacerbated by the current project officer's lack of day-to-day involvement, supervision, and guidance of contractor activities. For their part, other USAID/Islamabad office tend to assume that they have to deal directly with the head of the E & E office, since they assume that most major decisions will be referred to him anyway. This has tended to slow decision-making and to reinforce the existing informal lines of authority.

The evaluation team has examined in Section 9 above the tortured process of the procurement of materials for the energy loss reduction program. While blame can be placed on all parties -- the PTAT for not having staff who were familiar with USAID commodity bidding procedures, WAPDA for taking some time

to review the specifications and for negotiating with bidders after the process was closed -- the delays within USAID/Regional Legal Affairs, Contracts, and Commodities appear to have been highly detrimental to the overall project progress. It is hoped, with the addition of several commodity specialists in USAID/RLA/CC, and the implementation of closer coordination within USAID/ Islamabad through the project committees, that these problems can be avoided in the forthcoming major procurements for the System Expansion components recommended in this report.

12.2.3 Changes in Project Management

As has already been mentioned, the large and shifting portfolio of the E & E Office, combined with the small size of the staff of the E & E Office, has led to rapid shifts in responsibility for an oversight of the Rural Electrification Project. While there has been a measure of continuity provided by the presence of the senior E & E Office foreign service national as program manager on this project throughout its history, a number of U.S. nationals have been involved in management and direction of the project. In the past year, at least three individuals have been in charge of the project for varying periods of time, until they are reassigned to work on some item that is considered more pressing (generally project design and development work). Project management is not a subsidiary function. The Rural Electrification Project should have one individual that is assigned to the project full time for the next several years, with the autonomy required to make and enforce operational decisions. Moreover, that individual should probably be assigned in Lahore because of the large number of U.S. and subcontractor personnel that should be receiving constant programmatic oversight. The evaluation team fully appreciates the difficulty of getting coordination from other USAID offices, when the project office is located in Lahore and not Islamabad, but the increased level of project direction and the rapidity of response from USAID will make this price worthwhile. This project officer would in turn report to the head of E & E, who would be concerned primarily with overall policy questions, level of funding, and coordination of activities with other donors, etc.

13.0 KEY INSTITUTIONAL RELATIONSHIPS

13.1 PTAT/WAPDA Relations

Throughout this report, we have noted that senior WAPDA managers of grade 19 or above are almost invariably overwhelmed with required paperwork and meetings. Most routine decisions are passed upward through the organization for resolution by senior management.

Sixty or more hours a week of skimming and settling "files" is the norm in many grade 19 and 20 positions. Keeping up with the paperflow is a full-time occupation. The handling of these tasks is a main criterion for judging performance and promotion.

Given this workload and with WAPDA's top-down style of management, those individuals designated as PTAT counterparts normally have very little time to devote to the questions that have occupied PTAT and USAID attention. These questions include:

- Future management structures
- The creation of new operational procedures
- The creation of new structures within the AEBs or divisions

Important changes in the system are determined at the highest levels of WAPDA management. They are not currently the concerns of middle managers with major line responsibilities.

Learning new technical skills is accorded even lower priority by WAPDA middle managers than new structures, procedures and management routines. Such specialized skills as computerized mapping, the writing of procurement specifications, or the preparation of detailed new procedures are left entirely to the PTAT. The inability to have free time to learn new technical skills has meant that many WAPDA managers have been only tangentially involved in executing the specialized engineering activities that comprise energy loss reduction calculations, work order designs, data base construction, among others.

Normally, the PTAT staff have consulted their WAPDA counterparts to obtain their agreements in principle to tasks that are to be done largely by the PTAT itself. The WAPDA counterparts must also authorize the final reports. However, few of the WAPDA senior managers have become heavily involved in the day-to-day execution of tasks. This means that they and their junior staff will be scarcely better off in their abilities to plan and execute activities than they were prior to the start of the program.

The evaluation team does not want these comments to be taken as a blanket criticism of the individual PTAT chief consultants, the Pakistani subcontractors, or their WAPDA counterparts. In most cases, the problem is institutional, and is beyond their control. The tight deadlines facing senior PTAT staff and the lack of time, interest, or incentives for senior WAPDA

decision-makers has made full integration of the project activities a distant goal.

We would like to point out that there have been notable exceptions to these generalizations. In fact, there are several good models of successful collaborations between the PTAT chief consultants and the WAPDA counterparts. These three areas, training, computer services and finance, are discussed below. Each demonstrates a slightly different means of successfully promoting WAPDA institution-building and PTAT/WAPDA staff integration.

In other areas, however, the cooperation and integration needed in this project have been lacking -- for example, the proposed reorganization has been approved in theory since January 1985. The final PTAT draft institutional report was only readied for WAPDA and USAID approval in mid-April 1986. For their part, WAPDA senior management have only put forth and had approved by the GOP the individuals to be posted or promoted to the WAPDA middle-manager positions which were designated as the counterpart slots. Until now, there have not been full-time counterparts for such key components of the PTAT program as:

- Electric tariffs and rates; and
- Inventory control.

Lacking these key full-time counterparts, there has not been any real opportunity for PTAT/WAPDA staff integration. In other cases, particularly several of the engineering areas, counterparts have been named but have not received sufficient freedom from their current responsibilities to allow them to fully participate in PTAT tasks. The remodeling currently underway of the 8th floor of LDA building is designed specifically to allow the physical integration of PTAT and WAPDA counterpart staff into adjoining offices. While this will accelerate the staff integration, the formation of joint PTAT/WAPDA working teams will be totally dependent on major changes in the work loads levied on the WAPDA staff.

Real functional PTAT/WAPDA integration may also require USAID and PTAT senior management to adjust their expectations for the pace, volume, and quality of the output of the team. While the WAPDA personnel is learning new skills and techniques, they will make mistakes, and will operate at a slower speed than their more experienced PTAT counterparts. This is one of the prices that the institutional strengthening of WAPDA will levy, and both WAPDA and USAID personnel must be willing to accept the slipped deadlines and deliverables that may result.

Training

This area has been singled out by USAID, WAPDA, and PTAT staff alike as the discipline in which there has been the most successful WAPDA/PTAT cooperation and staff integration. Due in large measure to the persistence of the former PTAT training director (now the assistant general manager) and his replacement, a chief of training for the distribution function was designated relatively early in the project. The office of that counterpart and those of his staff have been located together with those of the PTAT team. The staffs

are now fully integrated. Training programs which have been developed jointly by the PTAT and WAPDA staff, are now being executed by WAPDA staff. Curricula are now being developed which will serve as the basis for additional field training by WAPDA staff.

Management Service/Computers

Another potential model is in the management services area. The recently deceased Director General of the WAPDA computer center had worked closely with her PTAT counterparts in the following key areas:

- System inventories, including software
- Requirements definitions for tasks to be computerized
- Selection of WAPDA personnel to receive computer training
- Determination of system configurations
- Design of software and training requirements and
- System installation.

From the start, the WAPDA personnel were actively involved in all phases of the activity. It is ironic to note that most of the slippages in this area have been due largely to difficulties in the procurement of equipment (an AID/PTAT problem), not to any lack of interest desire or commitment on the part of the WAPDA staff.

In the absence of cooperation from other WAPDA counterparts for the Management Information System (MIS), the computer team has designed the outlines of such a system. The requirements have also been estimated along with the work necessary to meet them. Such anticipatory effort will sharply reduce the delays in implementing the MIS once the other WAPDA divisions name their counterparts.

Finance

The finance area shows how much functional integration can be undertaken, even in the absence of a full-time WAPDA counterpart. The PTAT chief consultant made great efforts to involve lower-level WAPDA and Pakistani subcontractor staff fully in the development of new programs and procedures.

The results of this effort have been steady progress in a number of important, if mundane, areas. These include:

- Asset Valuation
- Cost of service calculations
- Financial management

Further progress in the important area of tariff rationalization and in requirements definition for the management information system await senior counterpart appointments by WAPDA. In the interim, the PTAT and WAPDA have been preparing the ground for rapid progress. As in the computer area, the team has been working in advance of executive direction from WAPDA. Yet at the same time, the work represents a joint WAPDA/PTAT effort.

13.2 USAID/WAPDA Relationships

The evaluation team was favorably impressed by the close working relationships between senior USAID E & E staff and WAPDA decision-makers. This was particularly true for the chief and deputy chief of E & E and the Member (Power), but there is obviously a cordial relationship as well with other members of the top rank of WAPDA managers [WAPDA chairman, Member (Water), and Member (Finance)]. It is obvious that USAID E & E staff have engaged in extensive policy dialogue with WAPDA senior managers, and this discussion has resulted in major changes in WAPDA and GOP attitudes in areas considered important by USAID/Washington and USAID/Islamabad such as privatization of governmental and state enterprise activities, reduction of subsidies, and encouragement of joint U.S.-Pakistani joint ventures. However, there appears to have been less discussion so far on other policy issues that the evaluation team considered central to WAPDA's future institutional solvency and reform, such as reduction of subsidies and elimination of cross-subsidies within the electrical sector, as well as a movement to cost-based tariff setting. Focusing on these areas will require that the USAID staff work jointly with the WAPDA personnel to gain support for these controversial changes for key decision-makers within the Ministries of Finance and Planning, as well as within the ministerial-level Economic Coordinating Committee.

13.3 POLICY DIALOGUE: PTAT, USAID, GOP

There are two major items in the policy dialogue between USAID and the GOP which involve the activities of the PTAT. These are reform of the WAPDA electricity tariff structure and institutional improvements.

13.3.1 Electricity Tariff Reform

The two elements of electricity tariffs that concern USAID and others in the donor community are efficient use of resources by consumers and revenue sufficiency. The current tariff structure is essentially an ad hoc construction formulated annually to meet certain revenue targets of the GOP. Cost of service considerations do not dominate the rate setting process as in a U.S. utility. Moreover, there are apparently large cross subsidies. The beneficiaries are domestic and agricultural consumers while the industrial and commercial (general services) consumers are the benefactors.

Aside from efficient resource allocation, the other issue that dominates the tariff-setting domain is equity. The general argument is that those other customers who subsidize domestic and agricultural users can afford to do so. The tradeoff made by WAPDA is also made worldwide. The secret is to know how much the tradeoff costs and who benefits/who loses.

WAPDA and the Ministry of Water and Power have been concerned at the highest levels with initiating some reform in the tariff structure. This concern has been reinforced by the requirements from donors that WAPDA generate at least 40% of its investment funds from revenues.

The high-level interest of WAPDA has not been matched by the operational level of the organization. There has been no Director of the Rates and Tariffs Division since November, 1985. Accordingly, there is no counterpart organization in WAPDA for which PTAT can provide technical support. PTAT is the Rates and Tariffs Division.

PTAT has had continuous dialogue with Member (Power) on the tariff issue and recommendation for changes have been forwarded by WAPDA to the Ministry of Water and Power. The Ministry overruled WAPDA's suggestions, so no results of this dialogue have been forwarded formally to the Economic Coordinating Committee (ECC) or the Ministry of Finance. These two agencies, with major responsibilities for WAPDA finances, must be convinced of the need to rationalize tariffs and end cross subsidies.

In addition to the personal dialogue with Member (Power), PTAT has provided a number of suggested methods of revising the current tariff structure. These suggestions, contained in a series of documents written by the Chief Consultant, Financial, show WAPDA a number of operational alternatives for tariff reform.

What is needed at the present, however, is a set of policy oriented staff papers on the options in the rates and tariffs area. The GOP agencies with final control over the WAPDA rates do not have significant staff capabilities in the utility area. This argues for background papers on a number of subjects including the following:

- Nature and extent of cross subsidies in WAPDA tariffs
- Estimates of resource misallocation due to cross subsidization
- The economic and financial rationales for tariff reform
- Implications of alternative tariff structures with regard to:

Resource allocation and the level of electricity demand

WAPDA long range investments

Financial viability of various organizational options such as a Distribution Authority, power cooperatives, reorganized AEBs (economic regions concept)

The absence of such activities in the PTAT dialogue with WAPDA is by no means the fault of PTAT. Rather, such assignments must be sanctioned by USAID.

Until now, USAID has been unwilling to do. In addition, the mix of skills of the PTAT is not appropriate to such a task.

The Evaluation Team recommends that USAID authorize an increased emphasis on the economic and policy aspects of its work with WAPDA, only if they are willing to provide the staff capabilities for the needed backup materials. With appropriate resources, such a staff function could provide a significant "soft" technology transfer to WAPDA in the policy analysis area.

A related concern is the money owed to WAPDA by consumers in the Federal Government. The Evaluation Team suggests that AID initiate a dialogue with the GOP over payment of the arrears or about a scheme to put the payment burden outside WAPDA. Clearing up such governmental non-payment could net WAPDA up to \$50 million annually.

The Policy Dialogue on the institutional side involves three distinct pieces: the separation of WAPDA Distribution, improved functioning of WAPDA in distribution, and privatization of certain WAPDA functions.

13.3.2 Institutional Improvement

13.3.2.1 WAPDA Reorganization

USAID/PTAT/WAPDA policy dialogue on this subject has already resulted in agreement in principle on substantial changes in WAPDA's distribution function. Implementation may require further encouragement and discussions. A major step was taken in May 1986 with the signing by USAID and WAPDA of an aide memoire in which WAPDA agreed to establish the senior positions for heading up the new "Unified Power Distribution Wing" and to appoint appropriate persons to those positions by June 30, 1986. USAID and PTAT will need to monitor WAPDA's progress in taking these actions and in setting up the organizational arrangements at headquarters for the reorganized distribution function.

The other major changes contemplated in the summary Institutional Development Plan will need to be reviewed and approved by WAPDA (possibly with the concurrence of the Ministry of Water and Power). These include the revamping of the organization, staffing and functions of the Districts/Circles, the similar changes contemplated for the Area Development Boards, and a schedule for implementation of each. Accomplishment of these actions may require further "dialogue" with WAPDA by PTAT/USAID.

13.3.2.2 Institutional Strengthening of WAPDA

The Evaluation Team believes that additional policy dialogue would be desirable on the institutional development topics noted in section 6.4. It believes that forward movement on these issues is essential if distribution is to remain a WAPDA function and if WAPDA is to handle the increasingly large and complex program the GOP has planned for it. The probability that AID will be providing additional investments for power generation and distribution in Pakistan makes dialogue on such issues quite appropriate.

As indicated in section 14.2.3 below, the evaluation team recommends a major new dimension of technical assistance to WAPDA for institutional development.

It suggests that a high level US/Pakistani group specializing in institutional change work with senior GOP leaders to develop a strategy for addressing WAPDA's underlying institutional problems. Agreement on such a strategy would be followed up by a US/Pakistani team of management, personnel and implementation experts to install the reforms in WAPDA and to monitor their implementation.

Such an approach would have to be preceded by considerable policy dialogue on USAID's part with senior GOP leadership to: (a) reach a common understanding on the nature of WAPDA's underlying institutional problems, and (b) agreement on the recommended approach including a commitment by the GOP leaders to devote the time necessary for their participation.

Assuming such dialogue resulted in an agreement, the following topics might form the agenda of the discussions which the high-level team would hold with the GOP leaders.

13.3.2.2.1 Strengthening WAPDA's legal, regulatory and financial authority to manage its own affairs.

This would include the measures necessary to increase WAPDA's autonomy and authority to cope with an ever-expanding workload under conditions that are increasingly complex. It would include increasing WAPDA's capability to be a constructive participant in energy and power planning, not simply an executing agency. It would involve not only measures necessary to recover ground that has been lost during WAPDA's evolution but mandates necessary to meet future tasks and responsibilities.

13.3.2.2.2 Improving WAPDA's system of management and management functions.

Discussions would focus on measures and incentives to encourage delegation of authority to the lowest responsible unit. It would include changes in regulations and procedures affecting levels of decision making, budgetary autonomy, and deployment of staff.

13.3.2.2.3 Reforming WAPDA's personnel and compensation system.

This topic would be concerned with such matters as WAPDA's compensation and benefits structure, incentives for initiative, cost reductions and innovation, relationships with the labor union, and changes in policies and incentives to reduce "unauthorized compensation" or illegal gratuities.

12.3.2.3 Decentralized/Privatized Distribution

Looking further ahead, an overarching issue is whether a central government agency, WAPDA, is the best instrument for constructing and managing Pakistan's power distribution network or whether alternative forms of enterprise would be more efficient, less costly, and more responsive to local needs and conditions. A closely related issue is whether a decentralized system should be owned and operated by a separate Distribution Authority (the solution being pressed by USAID and PTAT), by provincial authorities, by private commercial entities or by rural cooperatives. A further issue is whether such decentralized entities should also have the authority to establish local

generating facilities for communities or localities interested in electrification but too remote to be economically served by the national grid.

These issues are extremely complex for they involve such policy questions as the degree of centralized control, and public vs. private ownership. They also involve questions relating to the reallocation or sale of capital assets and facilities and the establishment of rates for the bulk purchase of power from WAPDA and its retail price to the consumer.

The Evaluation Team believes that power distribution in Pakistan is rapidly approaching a volume and pattern of service at which even the decentralized approach within WAPDA currently being pursued by it and PTAT will be inadequate and inappropriate. USAID should begin now to analyze and consult with the GOP on alternative approaches.

Much thought and study has been given to the whole subject of power distribution and rural electrification in the developing countries. There are a number of examples in Asia and elsewhere that can be studied at first hand. The immediate task will be to assemble and review the relevant information, identify particular topics that may require special attention, and prepare a series of position papers on the issues involved. If practical results are to be achieved, USAID should involve key Pakistani agencies in the process. These might include, in addition to WAPDA, representatives of ENERPLAN, the Ministry of Finance, the Economic Coordinating Committee, and possibly the Agricultural Development Bank (if rural cooperatives are to be pursued). In that way, policy dialogue can proceed on the basis of a common understanding of the background, relevant experience and the issues involved.

14.0 THE DIVERGENCE OF THE PTAT WORK PLAN FROM THE ORIGINAL SET OF PROJECT OBJECTIVES

The redrafting of individual work items and deliverables has substantially changed the overall direction of the project. The evaluation team is struck by the number of key work items that are tangential or irrelevant to the basic objectives of the project. At the same time, there are a number of key items that have been not included in the current work plan.

The real danger in a program as multi-faceted as the Rural Electrification Project is that the USAID and PTAT management will lose sight of the original objective of the technical assistance effort. The objective of this Project is to increase WAPDA's competence in planning and implementing its own system expansion and operation. Other issues, such as reorganization, privatization, linkage to other energy projects, and technical assistance to other donors are secondary to the primary goal of institution-building.

The Evaluation Team feels that this problem has manifested itself in two major ways in the Rural Electrification project. The first is that PTAT consultants serve as adjunct WAPDA staff. The second is that PTAT staff have served WAPDA in a general engineering consulting capacity.

14.1 PTAT Consultants as Adjunct WAPDA Staff

PTAT senior staff has been asked by WAPDA senior management and USAID to undertake a number of activities that are outside the spirit of their Technical Assistance mandate. Even if such activities are within their very broadly worded scope of work, PTAT's efforts should not be dissipated in catering to passing interests of WAPDA or USAID managers. Only if such assignments are directly relevant to their program should they undertake additional assignments. Even now they are over-burdened with several assignments, many of them behind schedule.

Recent examples of such tangential activities include the following items:

- Study of the financial and economic impact of power interruptions and loadshedding
- Preparation of WAPDA's prefeasibility submissions to the Asian Development Bank
- Developing demand projections as inputs to the WASP-III computer runs for the Lakhra coal project.

The PTAT senior management and USAID E & E Office noted, in response to an earlier draft of this evaluation, that the evaluation team was harsh in pointing out these activities, particularly the preparation of the WAPDA prefeasibility submissions to the Asian Development Bank. The PTAT stated that much of this work was prepared on non-official time (evenings, weekends and lunchbreaks) and did not detract from normal PTAT work. Yet the evaluation team noted that the scope of work for the Joint Venture was amended to add considerable additional funding for this effort. USAID argued that this work "was in line with item 34 of the EBASCO contract scope" and was part

of the "projectization effort" that the evaluation team said was needed for the Technical Master Plan. We feel that these activities, while useful to WAPDA, are not central to the transfer of skills and knowledge that is supposed to be central to the Rural Electrification Project. By acting as consultants to WAPDA (or USAID), the PTAT team members were not able to devote their time to being counterparts and technical advisors.

We recommend that these activities be completed only if they can be integrated into broader policy dialogue with the GOP on such issues as tariffs, energy sector subsidies, privatization, or broader WAPDA management issues. PTAT specialists in these areas should work jointly with USAID staff in these policy discussions.

14.2 PTAT Staff as Free Engineering Consultants to WAPDA

In addition to their staff work for WAPDA, senior PTAT staff have been providing direct engineering services to WAPDA. The PTAT engineers function much like an outside contract consulting firm which happens to be free. For example, an examination of the plans and outputs of the distribution planning and engineering functions of PTAT (technical area 23) shows 15 tasks that are to be undertaken. Many of these tasks can easily be undertaken by WAPDA staff. However, the PTAT can accomplish the task more quickly and more efficiently by doing the work directly, rather than assisting the WAPDA staff and reviewing their work.

Until the WAPDA staff gain considerable expertise, PTAT will produce higher quality, more timely results. Reliance on PTAT engineers does not give WAPDA any capability to do such work in the future after the departure of the PTAT. Examples of the type of consulting engineering work that PTAT is undertaking include:

- The preparation of specifications for the procurement of materials, tools and equipment (21 items)
- The development of specifications, procurement, and installation standards for special revenue meters
- Studies on standard WAPDA pole designs and recommendations for less costly designs
- Studies on aluminum connectors

In the past, the PTAT has even provided WAPDA with specifications for the procurement of fiberglass ladders. USAID E&E staff explained to the evaluation team, in response to an earlier draft, that some of the activities had been foreseen at the time of the project paper preparation, and were even inserted into the PTAT Scope of Work. While this certainly makes them legitimate tasks for PTAT to undertake, they don't assist in technology transfer. Such activities doubtless lead to higher quality tools, materials, and poles for WAPDA. They will not give WAPDA the internal capability to design and select such tools and materials in the future.

The Evaluation Team is well aware that the PTAT is under great pressure from USAID to stay on their schedules, and to submit their deliverables on time.

It is invariably easier to have the PTAT staff (both the expatriate and Pakistani subcontractors) do the work and then pass the finished product along to WAPDA for approval or use. This is particularly true in those areas where the WAPDA counterpart has not been selected until recently, or has been generally unavailable for participation in the work. To bring WAPDA into full participation will surely slow the pace of the work considerably. However, the primary purpose of this project is to improve the long term performance of WAPDA. It is imperative that every deliverable be assessed by its technical merit, its date of completion, and by the relative contributions from WAPDA's staff.

15.0 THE CURRENT WAPDA EXPANSION PROGRAM

15.1 The Historical Record

From the formation of WAPDA in 1959 through 1970, a total of 1,575 villages were electrified. By 1980 an additional 7081 received power. In that year, WAPDA's twentieth, ten times as many villages had power as did in 1959.

The average number of villages electrified fell from over 300 annually from 1959-1960 to under 100 per year by the mid 1960's. The rate of village electrification, quite rapid in the early 1960's, slacked off in the early 1970's.

In 1972, the pace of electrification picked up dramatically. By 1975, over 750 villages/year were receiving power. Finally, in 1977, the pace doubled again, with an average of 1,500 villages receiving electricity every year since then.

Currently, 19,000 villages have power, just 43% of the national total. At the same time, the saturation level of customers within electrified villages is quite low. In fact, rural customers are losing ground relative to urban customers as a proportion of total consumption. (If current trends continue, the rural domestic sector will increase the number of customers 500,000 annually, without a proportionate rise in demand).

A continuation of the current rates of growth will leave more than 60% of rural consumers without power by 1990, while about half the nation's villages will be electrified by then.

15.2 The Prime Minister's Mandate for 1990.

The PTAT had drawn up a series of scenarios for its Master Plan based on a 1992-3 completion of three alternative WAPDA development programs. The accelerated plan ("B") showed an increase of almost 4 million domestic consumers in the period 1986-1992. The new Mandated Plan compresses that schedule into just four years. Furthermore, the rate of village electrification must be raised from 1,500-2,000/year to 5,000 annually. In addition to the new domestic consumers, the mandated plan calls for a speedup in connections of tubewells and industrial consumers.

Achieving the targets of the Prime Minister's plan was a tall order with a 1992-3 due date. With the new compressed schedule, there appears to be a contradiction between the desire to eliminate load shedding by 1990 and the desire to electrify 4 million additional households.

The Mandated Plan causes four types of difficulties for WAPDA. These are:

- A "peakier" demand structure with lower load factors;
- Concentration of investment into money-losing customer categories;
- Increased length of distribution lines relative to total demand; and
- A vast increase in the administrative complexity of WAPDA itself.

With falling load factors, the cost of needed new generation facilities will be spread over relatively fewer units sold per unit of installed capacity. This means that WAPDA will need to raise rates simply to pay for the lower load factors as long as it must meet self-financing targets.

In addition, the new investment, concentrated as it is on the domestic side, will exacerbate the financial woes of the utility. Marginal costs can be expected to rise rapidly with the extensions of service to ever more remote areas. However, with average cost pricing (and below actual costs at that), the more successful the village electrification program, the more severe the strains on WAPDA.

At the same time, the doubling of customers will require either a doubling of employment in the Distribution Wing, or the speedy adoption of new, more efficient management procedures and technology. In essence, there will be no "running in period" for the proposed organizational and management changes at WAPDA.

Finally, the line lengths required to electrify 90% of the nation's villages will likely lead to increases in some types of technical line losses. This means that WAPDA will need to put even more work into loss reduction than has been the case thus far.

On the distribution side, the Plan will require financial investment of Rs 50 billion over a period of 4 years, about three times the current level of effort in WAPDA distribution.

The implications of the Mandated Plan for the generation side are ominous. Load management will doubtless have an important role in reducing peak demands for some classes of consumers. At the same time, however, meeting the peak from 4 million new domestic consumers alone will require more generation capacity than is likely to be built until 1993 or later. In all, successful implementation would require at least 4,500 MW of additional firm capacity and a 200% increase in energy output. Luckily, we feel certain that WAPDA will be unable to achieve anything close to the Mandated Level of connections even by the late 1990s.

The easiest and quickest additions to generation, new units at the Tarbela and Mangla dams, will not provide peak power. These units are vulnerable to fluctuations in precipitation and can worsen load shedding rather than reducing it under drought conditions.

In order for Tarbela and Mangla to be more useful for meeting peak demands, the management priorities of WAPDA would need to change. Water use would need to be more closely regulated. These changes include:

- Incentives for improved efficiency in irrigation - e.g. flow control, higher water charges
- Incentives to shift pumping out of peak load times

- Increased power costs for tubewell operators
- Elimination of the subsidy for converting tubewells from diesel to electricity.

A significant shift in the current strategy of power development would be required to meet the demands of the Prime Minister's plan. In particular, the nation would need to quickly develop its coal and gas reserves to feed new baseload plants. This implies a number of policy and implementation details including:

- More combined cycle power plants
- Imported coal facilities
- Increased emphasis on turnkey projects and a shortening of the project cycle within the GOP
- Cogeneration of power by large industrial electricity users

Even with such policies and efforts, the generation needs of the 90:90 targets are not feasible. At least six thermal stations in the 400-700 MW range would need to enter design phase immediately. Feasibility study and materials acquisition take two years. Actual construction takes 3-4 years (except for gas turbines). Offsites and financing could add one year. Finally, WAPDA has not demonstrated the ability to manage this number of large projects simultaneously; nor is any bank likely to finance such parallel efforts. At best the country can start one or two projects each year, achieving supply-demand equilibrium in the mid 1990's.

On the demand side, the actions necessary to effect some semblance of the Mandated Plan include new tariffs, load management, and diligent maintenance and loss reduction.

The targets set by the Prime Minister will require substantially more resources than had been budgeted for the 1986-1990 period previously. The physical targets can probably be met, given enough money. But it is not clear that WAPDA yet possesses the organizational and administrative abilities to implement the Plan. Accordingly, such a Plan may need to rely more on the international community for both resources and skills than has been previously envisioned

16.0 THE DISPOSITION OF THE FUNDS ALLOCATED FOR RURAL SYSTEM EXPANSION (COMPONENT FIVE) WITH THE RURAL ELECTRIFICATION PROJECTION

When the Rural Electrification Project was being designed in 1982, there was already a mounting concern within USAID and the GOP over the rapid growth of electrical demand. Demand was rapidly outstripping supply, leading to growing shortfall that had to be met by systemic loadshedding. Initial rough calculation in 1982 estimated that the gap between demand and supply would be 912 MW(e) by 1984/5, and then drop as new generation capacity was brought on line. In order not to exacerbate the growing amount of loadshedding, the project design team suggested, and USAID/ WAPDA concurred, that the rural system expansion portion of the project be deferred until the first phase of the Guddu Combined Cycle Power Plant could be built under component four. With this additional capacity online, together with energy savings resulting from the loss reduction component, WAPDA could then proceed to extend lines to additional rural areas.

In the intervening four years, the problem of loadshedding has become an overwhelming problem for WAPDA and the government of Pakistan. During the spring and summer of 1985, WAPDA's electrical output from hydro sources dropped sharply, due to lower than expected rains. At the same time, water impounded behind the major dams (Tarbela and Mangla) was being diverted at higher than normal rates to meet the higher than expected demand for irrigation (again due to the lack of rainfall). The result was a drop in hydel output of 577 million KWh or 4.5%, despite the addition of 350 MW(e) of hydroelectric generating capacity. Despite a herculean effort to make up this loss through increased utilization of the existing thermal power plant capacity, there was massive loadshedding, with the supply-demand gap hitting 1500 MW(e) in January, 1985. Some areas experienced loadshedding of more than eight hours each day, disrupting industrial and commercial work schedules and threatening agricultural output. As a result of the very negative public reaction, the Prime Minister issued an order to WAPDA to eliminate all loadshedding by the year 1990 (see section 3.2.2 above for additional details).

As part of its review, the Evaluation Team has been asked to recommend to USAID/Islamabad what disposition should be made of the Component 5 funds (\$55 million), which to date remain uncommitted. An additional \$17 million from the Agricultural Commodity and Equipment Import Program would also be used for Component 5 for financing tubewell connections. On the one hand, the completion of the Guddu Combined Cycle Power Station had provided 400 MW of new generation capacity, and this was to be enhanced by an additional 200 MW when the steam turbines are operational in late 1987. This certainly fulfills the requirement that project design team had had in mind when they inserted the condition precedent that the "execution of plans for additional power generation capacity is proceeding satisfactorily." But the demand side of the equation may be much greater in the future, if the Prime Minister's program of electrification of 90% of the villages is enacted by 1990 (or even 1995), resulting is a continuing shortfall. With these considerations in mind, the Evaluation Team has examined PTAT and WAPDA projections of future demand, as well as WAPDA's current plans for the addition of generating capacity between 1985 and 1990. In addition, we have tried to factor what fraction of rural system expansion is organizationally feasible, the Prime Minister's mandate for reaching 90% of the villages by 1990 notwithstanding.

In approaching this complex issue, the evaluation team has found it useful to review the full slate of options that have been put forth by WAPDA, GOP, PTAT, and USAID officials for the use of these funds. While there are as many options as there are interested individuals, four options are being given serious consideration and will be reviewed here. They are:

- Rural system expansion
- Rehabilitation and refurbishing of existing thermal power plants
- Rehabilitation and upgrading of existing Distribution infrastructure
- The provision of high level plus follow on management services to WAPDA.

Each of these options will be briefly described below followed by the evaluation team's recommendations for an optimal mix of actions.

16.1 Current Plan from 1982 Project Paper

The Project Paper (PP) calls for USAID to finance 10% of a major rural electrification program, once the additional 450 MW(e) generating capacity from the partially USAID-financed gas turbine installation at Guddu is operational and the energy loss reduction program is underway. The USAID contribution will provide funding for 215,385 connections, at a total cost of \$470 per connection. The initial PP estimate was that these connections would be broken down approximately as follows:

● residential	184,364
● community	4,539
● commercial	17,158
● industrial	1,583
● tubewell	7,741

The PP indicates that the Master Plan, when completed, would assign a high priority to tubewell connections and to the connection of existing customers within existing villages. As it notes, "if that happens, it should be possible to make even more connections under this component at a lower average cost per connection because distribution lines are already in place and the only additional cost to connect new customers would be the cost of meters and very short line and service drop connections."

16.2 Other Options

16.2.1 The Thermal Power Plan Rehabilitation Program

One alternative that has been widely discussed is to increase the operating efficiency and reliability of existing fossil-fuel-fired power plants. A power rehabilitation program would consist primarily of letting a number of turn-key contracts to bring the older powerplants back up their nameplate ratings. Activities that are often undertaken in such programs include:

- Cleaning out the boiler combustion chambers -- removing slag, etc
- Upgrading all aspects of the steam production cycle operating pressures, etc

- Refurbishing the turbines -- replacing worn blades with new and overhaul of the governors, etc.
- Insuring maximum output from the generator -- drying out the windings, etc.

This approach's main advantage is that it is the fastest way to add generating capacity and reduce load-shedding within the WAPDA system. It is estimated that much of the retrofit work could be completed within one year of the signing of the service contracts. Moreover, the power produced will be relatively inexpensive, costing \$200,000-400,000 for each MW(e) of regained capacity.

However, it is our understanding that substantial funds have already been set aside for this activity. A \$100-120 million project is being developed, using \$28 million from the USAID Energy Commodity loan fund and the remainder from the World Bank. The result will be a 3-4 year project which will rehabilitate WAPDA's existing thermal power plants, and provide funding for the addition of combined cycle units to two of the thermal plants. A preliminary estimate by Stone and Webster indicated that this program will raise the output of WAPDA's thermal plants by 281 MW(e), at a total cost of \$166 million (including local currency costs). Therefore, the evaluation team feels that there is no need to reallocate the Component Five funds for thermal power plant rehabilitation.

16.2.2 Distribution Line Rehabilitation

One option that has been widely discussed for all or some use of the \$55 million dollars would be to accelerate the Energy Loss Reduction program, applying it to the high loss feeders in descending order of priority until all the cost-effective uses for the money are exhausted. Included in this would be the acceleration of such PTAT activities as computerized mapping of circuits, the CADPAD computerized circuit redesign and optimization program, and the accelerated procurement of items such as capacitor banks and remote industrial load management systems.

This approach emphasizes the urgent need to completely overhaul and upgrade the WAPDA distribution network between the grid station and the step-down transformers that serve the final customer distribution networks and service drops before adding additional consumers. Given the current state of disrepair of most of the 2000 distribution feeders, WAPDA and PTAT would find little difficulty in spending all of the allocated money on just a small fraction of the feeder system.

However, it should be remembered that the Asian Development Bank has already provided \$800,000 from the remainder of its RE loan for this purpose. In addition, the Asian Development Bank has already agreed in principle to provide an initial \$50 million to WAPDA for energy loss reduction investments, and to consider additional loans of up to \$200 million in the future, based on information prepared by the PTAT for the ADB. Given this level of funding, there does not seem to be a pressing need for additional funds in this area from the amount set aside for Component 5. The only issue is whether or not the ADB funds will be available in a timely fashion to avoid a slowing of the ELR Work Orders.

16.2.3 Provision of Management Services to WAPDA

As emphasized in Section 6, there has been a clear shortage to date of experienced senior specialists in organizational change within WAPDA and the USAID-sponsored technical assistance program. Thus far, the approach has been virtually exclusively focussed on reorganization and procedures, without any diagnosis of major WAPDA problems (overstaffing, bureaucratization of functions, lack of incentives, lack of WAPDA autonomy, etc.) and potential solutions.

One way to resolve this TA deficiency would be to bring in a group of management change specialists, who have a proven track record of assisting private and parastatal organizations in renovating their procedures and policies to meet new operating environments. The group should include persons with professional experience with public and/or private companies in South Asia and senior Pakistanis with such experience.

This would probably have to be a two step process, as follows:

a. Institutional Strategy:

This first function would be undertaken by a major corporate reorganization and strategy firm. The leadership of this team would be very high-level management consultants, working directly with the highest levels of the GOP (Ministers of Finance, Planning, Water and Power) to resolve issues such as WAPDA autonomy, budget latitude, grade and salary structure, optimal electricity pricing procedures, internal promotion controls, management by objectives, critical path analysis, etc. This would probably take a 3 person team for six months. At least one member would be a Pakistani. The PTAT feels that institutional issues, such as WAPDA lack of autonomy, should be best handled by USAID and other major lending institutions..

b. Operational Procedures and Processes:

Once the high-level decisions have been made, there is then a need for a group of highly technical specialists to assist in the redrafting and rewriting of follow-up and implementation procedures and processes. These would cover such items as promotion policies, organizational and procedural steps to force decisions further down in the organization, decentralization of Operations and Maintenance, etc. This would be best undertaken by organizations such as the consulting arms of big-8 accounting firms or groups specializing in the guidance and direction of corporate change. There are also groups that specialize in utility operations and procedures that might be helpful. There may well be an expanded role for the 3 PTAT Pakistani subcontractors in this phase as well, particularly because they are intimately familiar with current WAPDA procedures and the inherent flaws. This would require 2-3 long-term individuals (18 months each), as well as 4-5 people on 3 month assignments. The PTAT feels that this level of additional Technical Assistance is not required. Instead, they advocate the addition of a single organizational development specialist during the reorganization of the model division. The evaluation team feels that this would not begin to address the magnitude of the problem.

For the above approach to work would require high-level agreement in advance between USAID and the GOP. The Evaluation Team believes discussions aimed at such an agreement are prime candidates for USAID's policy dialogue with the GOP. The Evaluation Team's report might be used as a basis for raising the issue with the GOP. USAID should also seek the agreement of other donors to support such an approach.

16.3 Evaluation Team Recommendations for the Disposition of the Component Five Funds

The disposition of the 55 million dollars set aside for rural electrification was perhaps the most perplexing choice facing the Evaluation Team. On the one hand, there is a clear need for electrical services in rural areas, particularly where it is not available in sufficient supply and provided with sufficient reliability to encourage tubewell installations, small-scale industries, and other productive uses. Rural electrification is also a very high-level priority for the GOP, and a number of senior officials expressed to the Evaluation Team their interest in having the RE expansion program continue to be supported technically and financially by USAID. The rate of rural electrification will also be accelerating in the next four years, to better than 3,000 villages per year, if WAPDA is to meet the Prime Minister's goal of providing power to 90% of the villages by the year 1990.

On the other hand, WAPDA is currently extending only minimal service to each village that it connects, primarily for domestic lighting, television, etc. For a village of 80-100 families, the planning figure is a peak load of only 500-750 watt hour/family. Because of a current shortage of peak generating capacity within the system and a weak distribution network, each additional increment of load increases loadshedding problems and decreases power reliability.

Given this quandary, we have opted to recommend a mix of ranked expenditures, with some approximate monetary figures and preconditions for each. Further detail will be provided in section 17, recommendations.

16.3.1 Institutional Diagnosis and Strengthening

- A high-level institutional strategy team
manpower resources -- 3 senior consultants in organizational change and management for six months each
financial resources: \$350,000
- A follow-up operational procedures and processes team
manpower resources -- 3 long-term individuals for 18 months each plus 5 persons for three months each
financial resources -- \$850,000

16.3.2 Selection of 200 Rural Feeders

Having sufficient supply and having minimal technical losses to support additional tubewell and village connections

manpower resources -- 12 month of WAPDA engineering time

financial resources -- minimal

16.3.3 Provide support for the installation of 10,000 tubewell connections at approximately \$1,500/connection.

manpower resources -- to be provided by Agricultural Development Bank and WAPDA staff

financial resources: \$15 million

(Preferably provided to the Pakistan Agricultural Bank to be lent out to the interested farmers for tubewell loans [rather than as grants], with the repayments being put back into a tubewell loan revolving fund.)

The Evaluation Team feels strongly that this money should be earmarked only for the sites that are currently without any type of water pumping systems, not for replacing existing diesels with electric systems. Replacing diesel engines does not produce any additional water but only saves on diesel bills, a benefit primarily to the local farmer, not to the country. In addition, USAID should fund the installation (at each tubewell) of a time of day meter and/or a load management device, which would insure that either tubewells are shut off during peak periods or farmers are charged a stiff surcharge during this period.

16.3.4 Provide funding for the total electrification of the 500 largest villages that currently fall outside the WAPDA connection criteria and that are accessible to the 200 selected feeders. USAID would reimburse WAPDA for the total cost of the connections, including service drops, service masts, and meters, for each home in the village. It is estimated that this would require \$75,000 per village, plus \$25,000 for additional transmission and distribution requirements per village.

manpower requirements: to be provided by WAPDA

financial requirements: \$50 million

16.4 Implications for the PTAT Level of Effort and for Staffing, USAID Oversight, and for the WAPDA Program

16.4.1 Institutional Strategy Team

The PTAT consortium does not currently include a firm of the type required for this effort. This work should be obtained under a PTAT subcontract based on a bid process that would be reviewed by an ad hoc board comprised of organizational change specialists from the World Bank, ENERPLAN, WAPDA, the Ministry of Planning, and USAID. In keeping with USAID/Islamabad policy of not increasing the number of expatriate personnel in-country, this level of

effort would have to be subtracted from the consultants scheduled under the institutional development program.

USAID will need to evaluate whether the E & E Office staffing require change to handle the above task since there does not appear to be in-house expertise in institutional charge. A specialist in that field, perhaps attached to the Lahore Office under a personal service contract, might be warranted.

16.4.2 The Operational Procedures and Processes Team

The PTAT team, particularly within AEP and ITECO, may have some of the skills required for this effort. The final analysis of their internal capabilities would have to await the recommendations of the institutional strategy team on what areas should receive immediate attention. It is expected that the PTAT may have to go outside their companies to contract two additional individuals with the remaining individual being drawn from their existing staff. Another option is to increase the PTAT level of effort in the final 18 months of the contract, when it has been envisioned that there would be a reduction of in-country PTAT staff.

16.4.3 Selection of 100 Rural Feeders for Additional Tubewell and Village Connections

The Evaluation Team feels quite strongly that the PTAT engineering staff has already been overburdened with frequent additions to their scopes of work. Also, it is the purpose of the project to pass additional responsibilities to the senior technical staffs in the AEBs and Divisions. Therefore, it is recommended that this task be given to the AEBs to develop as a series of work orders, with the PTAT team only providing technical oversight and review.

This task will not require any USAID oversight, but will require active WAPDA participation at both the headquarters and AEB level to insure that this feeder selection program operates in harmony with the ongoing rural electrification program and the ADB rural electrification effort.

16.4.4 Tubewell Installations

It is anticipated that the PTAT will have to provide assistance to WAPDA for the preparation of the bid documents for the tubewell electrification program. In addition, it is strongly urged that PTAT assist WAPDA in the purchase and installation of time of day meters and/or load management devices for all 10,000 of the USAID-sponsored tubewells, in order to not further burden the local feeders during peak periods.

USAID would be involved primarily in the procurement of the materials for the extension of service to the 10,000 tubewells, as well as the purchase of the required time of day meters and load management devices. The largest burden would fall on the WAPDA engineers at the Division and Sub-Division level, who would have to provide the required support for all of these installations.

16.4.5 The total Electrification of 500 Large Villages

The PTAT might be asked by WAPDA to help formulate "scientifically correct" selection criteria for picking the villages to be connected, but the actual

development of the work plans, the site engineering and required mapping, and the installation work will be executed by the existing WAPDA staff. The major burden will be on the technical staffs, but this should be seen as part of the effort that WAPDA has already agreed to undertake, and will lead to a far faster and more efficient connection of customers than the concentration of smaller villages that happen to be within 0.5 miles of a 11 kv feeder.

A program of this size will require substantial support from USAID/Islamabad, primarily for the supervision of the procurement of more than \$39 million in commodities by local and international tender. While the problems of coordination and backlog of work that plagued the commodity procurement in the Rural Electrification Project earlier appear to have been solved, procurement of this scale should be carefully coordinated in advance with the USAID/Islamabad staff.

17.0 RECOMMENDATIONS

17.1 Introduce a Major Institutional Strategy Team

Much of the progress that is expected from the reorganization of the WAPDA distribution function and from the policy dialogue between USAID and WAPDA will not be realized unless a number of other fundamental institutional problems within WAPDA are attacked simultaneously. As has been noted throughout the evaluation report, modernization of the WAPDA Distribution function depends as much on issues such as WAPDA's institutional autonomy, its manner of making decisions, the pervasive informal payments systems, and the rationalization of staffing as on such technical additions as better communications, computerization of billings, better inventory control, and the creation of an energy loss reduction work order system. To have a lasting impact on WAPDA/Distribution, the USAID-sponsored TA effort must diagnose its major institutional problems and develop solutions that are politically acceptable to the highest levels of the government of Pakistan, technically feasible, and financially affordable.

Therefore, the evaluation team recommends that USAID reprogram a portion of the funds allocated for component 5 of this project to bring in a three-person high-level institutional strategy team to work with USAID/Islamabad senior management, and Cabinet-rank GOP officials. The need is immediate, since the success of the reorganization this fall will depend on the success of such a parallel program. Their task would be to diagnose the existing practices and internal structures that will slow the process of change to a modern, independent and efficient utility. While familiarization with the operation of electrical utilities would be helpful, the chief skills that are required of these individuals is the mediation of institutional change and guidance of structural reform.

The individuals selected must be extremely senior specialists who have sufficient international stature to work directly with GOP ministers, the head of WAPDA, the U.S. ambassador, and the USAID mission director. These individuals will probably be drawn from leading management consulting firms or corporate reorganization companies, although recently retired chief executives from U.S. regional power networks would also be good candidates. These individuals must be considered equals by the highest levels of GOP decision-makers. Examples would include: the former head of the Tennessee Valley Authority or the Bonneville Power Authority; a senior vice-president in charge of corporate restructuring for a major U.S. merchant bank or management consulting firm; or a leading independent management consultant to the Fortune 500 firms. Their stature will also indicate to the GOP the importance that the United States government places on the early resolution of these institutional problems. The evaluation team recognizes that such individuals will command a consulting fee which is far above that normally paid by USAID, but we feel that this level of expertise and stature will be required to win ministerial-level approval on fundamental issues such as WAPDA autonomy, decentralization of decision-making, a restructured electrical tariff system, and a rationalization of WAPDA employment and promotion practices.

It is our estimate that this team should contain three senior individuals, one of which should be a senior Pakistani management consultant or seconded GOP

minister. They would be supported by several short-term consultants intimately familiar with WAPDA and with Pakistan's electric tariff system. The senior management team will be required for six months, consisting of three month-long working trips in Islamabad and Lahore and additional time in the United States. Their work should be coordinated constantly with the USAID mission director, deputy mission director, and the chief of the E & E office.

17.2 Provide a Follow-up Institutional Procedures and Process Team

Once the GOP and WAPDA senior management, USAID, and the institutional strategy team have agreed upon strategies for bringing about rapid institutional and procedural change, a group of technical specialists should be brought in to assist in the preparation and implementation of the major changes developed by the high-level working groups. Once again, the key skills required will be the management of institutional change and reorganization, although the team will also have to include utility operations specialists. This team will work closely with the PTAT chief consultants, but will work on items such as: the institutionalization of the changed relationships of WAPDA with other institutions; the expansion of WAPDA's planning capability; alternation of promotion and personnel procedures; and introduction of expanded auditing procedures. Candidates for running such a program include some of the major accounting firms or management consulting firms specializing in corporate restructuring and reorganization. Pakistani experts, perhaps including individuals drawn from the senior staff of the three PTAT sub-contractors, should play a prominent role in this work.

This is expected to be a lengthy but rewarding process, which will reinforce the work of the PTAT specialists. Our best estimate is that 2-3 U.S. based consultants will be required for 18 months each, plus short-term consultants as needed. The PTAT Joint Venture feels that this level of additional Technical Assistance is unnecessary, and have advocated the addition of a single organizational development specialist. In order not to increase the number of long-term expatriates working on the institutional development of WAPDA Distribution, it is proposed that several of the long-term PTAT positions be terminated early, and that several of the proposed short-term positions be reprogrammed to this effort. Possible candidates for a elimination or shortening within the PTAT long-term expatriate and Pakistani staff include: the Coordinator for Transmission and Generation, the proposed junior advisor for purchases and stores, the manager of utility operations, and one of the proposed advisors on internal auditing. There are a great many proposed short-term positions within the PTAT work plan that are also candidates for reprogramming. These include: several of the forthcoming training specialists, a number of the grids station specialists within the distribution planning and engineering effort, and one of the planned purchasing specialists.

It is anticipated that much of the services outlined above could be provided by the Joint Venture through a subcontract to an appropriate firm. Some, but probably not the majority of the positions required, could be found within the existing personnel of the joint Venture firms.

17.3 Rework the Energy Master Plan

Because it does not yet reflect the recent GOP mandate for electrification of 90% of the villages and an end to load-shedding by 1990, the Energy Master Plan will have to be revised in the near future. This would be an opportune time to provide information that can be used by GOP and WAPDA senior managers for the allocation of financial and manpower resources. To do this, the activities envisioned in the Master Plan must be reorganized into projects, each with a detailed implementation plan containing the required resources, required coordination with other GOP and provincial organizations, and optimal strategies recommended by WAPDA for activities such as the selection of villages, the rehabilitation of lines, and the development of the national distribution system. Each component should be broken out into annual plans, with allocations and resource requirements by geographical region clearly shown.

17.4 Accelerate the Implementation of the Reorganization Contained in the Institutional Improvement Plan

It is understood by the Evaluation Team that WAPDA has initiated the process of issuing office orders for the general manager positions within the new Distribution Headquarters Organization. This will hopefully mean that these individuals will be posted and in place by the end of June. They will then have to assemble and have assigned the key individuals who will work directly below them in the new Headquarters Organization. Getting this entire team assembled is crucial to the implementation of all of the technical changes and new procedures that the PTAT hopes to introduce. Therefore, the evaluation team recommends that the USAID project manager and the PTAT manager take an active role in insuring that these appointments occur as quickly as is humanly and organizationally possible. Individuals who have already been identified as counterparts to the PTAT within the new organization should be freed of their other responsibilities within WAPDA, and assigned full-time to mobilizing the resources required to getting their new units staffed and working. It is recommended that USAID stress the importance of having all these key individuals within the Headquarters appointed, posted, and working within 90 days.

17.5 Accelerate the Integration of the PTAT and WAPDA Staff

For the past year, USAID has pressed for the physical integration of the PTAT and WAPDA staff. Now that the new senior WAPDA Distribution staff are at last being appointed, the evaluation team recommends that the emphasis be shifted to a functional as well as physical integration of the two staffs. If necessary, USAID should make its continued financial support of the Rural Electrification Project contingent on the total melding of the technical assistance and the WAPDA management functions. WAPDA senior managers should be expected to begin taking over major responsibility for the tasks currently being performed almost exclusively by the PTAT specialists, with PTAT providing advice, training, and quality control supervision. Within one year, USAID should send a team to examine the progress toward this functional integration, and to make recommendations that will insure a steady movement of authority and technical expertise to the WAPDA managers and staff.

17.6 Allocate the Component 5 Funds to a Mixture of Institutional Development, Tubewell Electrification, and Electrification of a Geographically Concentrated Group of Villages

One of the major mandates of the evaluation team was to make recommendations on the disposition of the funds originally allocated for rural electrification in the project paper. This consists of a \$55 million fund for village electrification, as well as \$17 million which was set aside from the Agricultural Commodities and Equipment Program for the electrification of tubewells. The evaluation team recommends that these funds be released for the following purposes, with the order of priority as given.

Funds should be set aside for the institutional strategy team, as well as the follow-up institutional procedures and processes effort. While the level of long-term and short-term effort can be taken by reducing the PTAT effort in the areas mentioned, additional funding will be required because of salaries and expenses of the senior individuals to be employed. The Evaluation Team considers the maximum amount of funding for the two institutional tasks to be \$2.5 million but probably much less after the funds from the reduced PTAT level of effort are calculated and subtracted.

The Evaluation Team further recommends that the \$17 million allocated for the installation of electric tubewell be spent as planned. This money, however, should not be spent on the substitution of electric motors for existing diesel engines, since this does not produce any additional water benefits for the country but only some foreign exchange savings. The benefits that do accrue are financial savings for the farmer, in the form of lower energy expenses, and here the savings are substantial enough that he should be able to finance it directly, if given access to credit.

When the tubewells are installed, each should be equipped with a pole-mounted and well-protected load management device, that shuts off the power to the tubewell during peak periods (normally 5-10 P.M.). This would eliminate the need for adding more peak capacity to power these units. It is our best estimate that the installation of the tubewells, complete with load limiting devices, poles, transformers, etc., would cost \$1500 - \$2000 each. This would mean that 8,000 - 10,000 tubewells could be installed, hopefully in an integrated fashion in one or two large geographical areas where the installations, their impacts, and problems can be closely monitored.

Lastly, the evaluation team recommends that the remainder of the funds, some \$52.5-\$55 million, be spent on the electrification of a number of villages in one or two geographical areas. We are well aware that loadshedding has not yet been eliminated, nor is it likely to be abolished in the near future until considerable new capacity can be added. Therefore, we are also recommending that several thousand load management devices be retrofitted onto existing tubewells in the areas adjoining or including the new village installations, so that no additional peak capacity will be required to service the new villages.

The Evaluation Team specifically recommends that in the selected geographical region(s), power be provided to 400-500 of the largest villages that do not qualify for electrification under current WAPDA criteria. Picking the largest villages would simplify the task of providing power to a large number of rural

consumers quickly, and would also reach commercial and industrial customers who will in turn provide employment and rural income. These villages, and indeed the whole region in which they are developed, will serve as models for WAPDA Distribution as to how rural electrification should be done. All of the practices recommended by the PTAT staff and all the procedures for minimizing line losses, carefully matching transformers to loads, and instituting load management procedures could be implemented during the establishment of service. The Evaluation Team recommends that power be provided to all potential customers within each village to include the service drops, service masts, and meters. The consumer can provide the internal wiring of their house or place of business.

Once the model area has been selected, the Evaluation Team recommends that the existing feeders be immediately mapped, so that those that are capable of carrying additional load can be identified and used. The local AEB will conduct, with the assistance of the PTAT as needed, the required site investigations, prepare the circuit maps, complete the system design, prepare work orders for review, and construct the system.

17.7 Expand the Scope of Work and Level of Effort of the Contractor Gibbs and Hill to Reflect Its Additional Responsibilities during the final 18 Months of Construction of the Guddu Combined Cycle Power Plant

USAID's consultant James Stephenson has recommended that the scope of the revised work plan, submitted by Gibbs and Hill January 1, 1986 be accepted with minor revisions. This would mean the addition to the Gibbs and Hill contract of 350 person months of home office and field personnel above the currently authorized level of 782 person months approved in 1985. He had also recommended that a monthly process be instituted for comparing the projected home office and field office requirements, drawn from the revised Work Plan, with the expenditures submitted by the contractor.

17.8 Accelerate the Implementation of the Sister Utility Exchange Program and the Short-Term In-Country Training

The Evaluation Team feels that the Sister Utility Exchange program is one of the most important parts of the PTAT/WAPDA relationship. It has been behind schedule throughout the project. Since February, 1986, there has been a stop order on any work on this component, pending the resolution of a number of items in the revised budget that the Joint Venture had submitted as part of the acceleration of effort of the PTAT staff. The Evaluation Team recommends that USAID move immediately to resolve this dispute, and to restart the Sister Utility Exchange Program within 90 days. In addition, we recommend that proposed program be accelerated using the principle of the Pakistani participants as observers and counterparts in actual working conditions rather than in classrooms, so that the program is back on schedule by September 1987.

The Evaluation Team further recommends that the PTAT and USAID senior management insist that PTAT senior consultants and the newly appointed WAPDA counterparts make use of the short-term in-country training capability being offered by the PTAT/WAPDA Distribution training program. As numerical targets, we suggest that at least 300 WAPDA personnel should be provided short term in-country training through this mechanism by the end of 1986, and that the program be expanded in 1987 to train additional WAPDA staff. The USAID

project manager should closely monitor compliance with this effort, to see that the program is being fully used to enhance WAPDA's resources of trained manpower.

17.9 Institute a Major Program of Monitoring and Data Collection

It is currently difficult to assess the impacts or benefits of a number of the activities of the PTAT program, because virtually no monitoring or data collection is being undertaken. The Evaluation Team recommends that this deficiency be rectified as rapidly as equipment can be purchased and baseline data collection systems installed. One example to which we would like to draw attention is the need for monitoring of the feeders being rehabilitated under the ELR program. Because no meters were installed on the circuits to be upgraded, it is impossible to measure the savings of electricity that resulted. Records are currently kept only at the grid station, which means that the records are questionable due to manual record noting and faulty meters. The loss or addition of a major industrial customer from another part of the feeder, for example, would skew the data so that it would be virtually useless. A \$700,000 package of instrumentation for monitoring of the ELR program has been identified by the PTAT team, but has not yet been cleared by USAID procurement. The Evaluation Team recommends that the execution of this procurement be considered a very high priority by the project manager and by the USAID Evaluation Officer. Without such data, it will be very difficult to measure the line loss reductions and financial benefits produced by one of the major components of the Rural Electrification Project.

There is also a need for baseline studies of activities within WAPDA or affected by WAPDA before recommended changes are introduced by the joint WAPDA/PTAT effort. For example, a large number of activities are planned in the two model divisions that will increase operational efficiency, reduce the time to process bills, reduce errors, and improve WAPDA management. If a number of studies of the model utilities are instituted now, it will be possible to judge later (to show to WAPDA senior management) what positive changes have resulted. We recommend that \$400,000, in addition to the \$700,000 set aside for special meters, or \$1.1 million total, be programmed for baseline data collection and project monitoring. Without it, it will be virtually impossible to measure project progress in the summative evaluation schedule for the end of the technical assistance effort.

APPENDIX A: USAID MISSION TO PAKISTAN
RURAL ELECTRIFICATION PROJECT (391-0473)
EVALUATION SCOPE OF WORK

I. Activity to be Evaluated

The Mission requests an evaluation of the Rural Electrification Project (391-0473) from project authorization on 22 September 1982 to the present. Life of project funding is \$170,000,000, including approximately \$2 million in Mondale Rupees. The Project Assistance Completion Date (PACD) is 30 September 1989.

II. Purpose of the Evaluation

To evaluate progress in implementing the Project, the degree to which the original objectives are being achieved and the soundness of changes in the project that have been made to date. Also, to help Mission management by identifying possible areas of change, including desirable adjustments in objectives and implementation methodology, strategy, schedule, technical assistance, and institutional support.

III. Background

This Project was designed to assist the Government of Pakistan (GOP) to expand reliable electric service to a greater number of Pakistan's rural population for productive and social uses, to improve the rural poor's access to that service, and to assist the GOP in overcoming a shortfall in electric power generating capacity.

Initially, the Project was to focus on the development of a National Rural Electrification Master Plan, institutional and technological improvement, and power generation capacity shortfall problems. Once the National Rural Electrification Master Plan was developed and approved and effective steps taken to resolve the more serious of the above-mentioned problems, funds were to be provided to expand the rural electric distribution system and connect irrigation pumps, agro-industries, and other rural customers. Conditions precedent limits use of funds for system expansion until:

- (i) A comprehensive National Rural Electrification Master Plan has been developed and is being implemented according to schedule;
- (ii) Execution of plans for additional power generation capacity is proceeding satisfactorily; and
- (iii) An economically feasible and administratively sound System Expansion Work Order Design and Management System consistent with the Master Plan based on accurate data has been developed.

A.I.D. agreed to finance a wide range of activities, including the following:

1. Institutional strengthening of the distribution function within the Water and Power Development Authority (WAPDA), including development of a National Rural Electrification Master Plan (component 1).

2. The design and implementation of a comprehensive distribution function training program (component 2).

3. The design and implementation of a comprehensive distribution system energy loss reduction program (component 3).

4. Partial funding of the Guddu Combined Cycle Gas Turbine Facility to assist Pakistan to narrow the existing power supply-demand gap (component 4).

5. The design and implementation of a rural electrification system expansion program (component 5).

More detailed information is found in the Project Paper and in other project-related documents.

IV. Statement of Work

The evaluation team will review the efforts made and the progress achieved under the first four components of the project, with a view to identifying major successes in accomplishing project objectives and key factors contributing to these successes. The evaluators will also identify major difficulties in accomplishing project objectives and, based on key factors for success, develop a recommendation for remedial measures.

The evaluators shall also review the design strategy, the implementation plan, the funding requirement, the time schedules and the technical and institutional support of all activities listed in the Project Paper and other relevant documents with a view to determining their adequacy to best accomplish the project's objectives (as originally stated, as modified, and as may be recommended for modification by this evaluation).

The evaluation will include but shall not be limited to:

A. Power Distribution Program (Components 1, 2, 3 and 5)

1. Identify project outputs to date and compare actual accomplishments against original plans as indicated in the logical framework matrix in Appendix:C of the Project Paper.

2. Based on the findings in (1) above, recommend modifications to the project design strategy and assess the effects on the project in terms of Mission management resources contractors' levels of effort, scope of work, and achievement of project goals.

3. Identify and analyze key factors contributing to or inhibiting the achievement of the project's objectives and make recommendations as to future directions, strategy, etc. which will enhance the project.

4. Review the design and implementation strategy for WAPDA institutional improvement as documented and comment upon the feasibility of its implementation.

5. Review the design and proposed implementation strategy of the Comprehensive Distribution Training Program and its adequacy in meeting the institutional and training objectives of the project.

6. Review the design and implementation strategy of the comprehensive Rehabilitation and Rural Expansion Master Plan and comment on the technical and economic feasibility of the program, taking into account the current and projected supply-demand gap.

7. Review the design, operability and applicability to institutional improvement within WAPDA of the Work Order System for energy loss reduction and expansion program.

8. Assess the institutional relationships that exist among and between the various project entities (WAPDA, USAID, EBASCO, EBASCO sub-contractors, etc.) and evaluate the effect these relationships have on project implementation.

9. Evaluate the nature and effectiveness of technical assistance being provided and determine whether the scope of services supports the requirements of components 1, 2, 3, and 5 of the project.

10. Assess the extent to which soft technology transfer has taken place to develop in-country professional engineering capabilities (in WAPDA and sub-contracted consulting firms) to enable Pakistan to continue to implement the technical improvements on which the project is based.

11. Review policy dialogue issues and options surrounding electricity rates and the institutional framework within which electricity is distributed, including an assessment of progress made by WAPDA to rationalize and reduce subsidies.

12. Make specific recommendations as to the use of AID resources allocated for the Rural Electrification Expansion Program, Component 5.

B. Guddu Power Plant (Component 4)

Assess project achievements to date, particularly:

1. Assess the reduction in the supply-demand gap and reduction in load shedding during the time the plant has operated.

2. Identify factors impacting on project plan, project cost and completion time.

3. Review adequacy of the training program for the component as designed and its proposed implementation strategy.

4. Evaluate the nature and effectiveness of technical assistance being provided and determine whether the scope of services supports this component's requirements.

5. Assess the achievement, in quantifiable terms, of technology transfer, including development of in-country professional engineering capabilities.

C. Other Considerations

Members of the team will meet in Washington prior to leaving for Pakistan. The evaluation shall be completed in not more than six to eight weeks, including two weeks in-country completing the final report. Individual members of the team will make every effort to coordinate simultaneous arrival and departure times, to ensure that all members are involved in conducting the evaluation, preparing the final report, and presenting evaluation findings to the Mission and the GOP. The final evaluation document shall consist of the final report, including an executive summary and the completed evaluation summary format in accordance with instructions provided by AID/Washington and USAID/Islamabad. The team leader and at least one other team member will provide a debriefing in AID/Washington following completion of the evaluation.

GUDDU 450 MW COMBINED CYCLE POWER PLANT

STATUS OF PLANT CONSTRUCTION

AND EXAMINATION OF

GIBBS AND HILL ENGINEERING SERVICES CONTRACT

WORK PLAN REVISION 3, JANUARY 1986

Prepared For
United States Agency for International Development
Mission to Pakistan

James E. Stephenson
Engineering Consultant

Contract No. 391-0473-C-00-6094-00

March 1986

In December 1985 Gibbs & Hill Inc. (G&H) notified the USAID Mission that Work Plan Revision 3 was under preparation; that although dollar expenditures through 1985 under the engineering services contract were within 8% of the then current work plan budget, a need for an additional \$3,800,000 life-of-project was projected by Work Plan Revision 3.

The G&H Work Plan is clear and detailed. For each discrete project element (Bid Packages -- eleven) work effort is broken into tasks (six) and technical disciplines within each task. Home Office backstopping is a separate category broken into five divisions of work. Field Staff assignments are specific in position and duration related to the construction schedule. The work plan is revised annually and the manning to accomplish each task is projected month-by-month and then quarterly and half yearly as the time line extends.

My examination of project activities during the past year and status of engineering/procurement/construction enabled a good fix on the work done and remaining to be done.

The increase in Home Office professional work and back-stopping is attributed primarily (87%) to developments during 1985 in three activities.

- Civil works and structures (Lot 3) where G&H had to take over much detailed work from the local engineering firm (NESPAC) rather than give broad supervision as originally expected.
- As a consequence of intensive bidding for the steam cycle end of the plant (Lots 4A and 4B) the bid evaluation period for this complex plant stretched from a scheduled six months to 13 1/2 months before contract award involving nine short-listed bidders. Unallocated effort went into the extended evaluation cycle while initiation of post-award activities planned for 1985 receded well back into 1986 (contract signed March 16, 1986).
- What had been planned as a modest involvement in Gas Pipeline Material and Mixing Plant (Lot 6A) and virtually no involvement in Gas Pipeline Construction (Lot 6B) became a procurement nightmare with coordination, expediting and shipping equipment from multiple suppliers and subsuppliers on three continents. Further G&H had to take over from the turnkey construction contractor engineering and procurement of materials for the Indus River crossing; and then bring in a Pipeline Engineer to get everything hooked up in time to provide gas for firing the combustion turbines as they began coming on line in November 1985.

The substantial increase in the level of Field Staff for life-of-project is in the main, an outgrowth of 1 1/2 years experience by G&H on the construction site. It was expected that much support in the construction management/supervision task would come from NESPAK or direct local hire. This has just not occurred at the supervisory level and G&H has extended the terms of some expatriate positions that were expected to be terminated and added five new positions to the field staff.

In sum, G&H has projected 220 man months for increased home office professional and back-stopping effort and about 130 man-months of additional field staff effort. The financial result is an estimated increase in contract cost of about \$3,900,000.

Three items considered critical to the long-term operation of the project should be added to the contract: Preparation of (1) a Plant Operations and Maintenance Plan, (2) a Plant Staffing Plan and (3) a Training Plan for operation and maintenance staff. In conjunction with these, WAPDA should be urged to accept a Plant Superintendent Advisor at the shoulder of their own Superintendent for the first twelve months of Plant Operation (already budgeted in Contract Revision 5).

The bottom line is that the Guddu Project is going well. The first phase of the project is essentially complete and on-time with four 100 MW combustion turbines feeding power into the WAPDA grid. The last major contract has been awarded: the steam cycle plant with completion scheduled December 1987. It appears that the project will come in some \$50-60 million under original budget. G&H is performing well under its total responsibility charge.

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GUDDU 450 MW COMBINED CYCLE POWER PLANT

Status of Plant Construction

and Examination of

The Gibbs & Hill Engineering Services Contract

Work Plan Revision 3, January 1986

1. Background

This examination of Gibbs & Hill's (G&H) role in construction of the Guddu Combined Cycle Power Plant and performance under its engineering services contract is a follow-on to a similar analysis completed a little more than a year ago. (Reference: Evaluation of Gibbs & Hill Engineering Services Contract, Findings and Recommendations---Stephenson, February 1985).

Following that study, the G&H contract was transformed from a level-of-effort technical assistance type contract to a cost reimbursement, project completion type contract wherein G&H was given overall responsibility and technical supervision of the project including design, procurement and construction management. This entailed a substantial boost in estimated contract cost from the initial \$3,065,773 to \$9,470,424, based on G&H's life-of-project Work Plan Revision 2, January 1985.

After a year of intensive activity under its overall responsibility role for project engineering and management of procurement and construction, G&H has as required submitted Work Plan Revision 3, January 1, 1986 for USAID approval. The revised Plan estimates life-of-project level of effort and cost of the engineering services contract. Review of this latest Work Plan together with G&H performance and construction progress over the past year is the subject of my present examination.

2. Project Content

The Guddu 450 MW Power Plant is the first "combined cycle" electric power generating station to be built and operated in Pakistan. It is in effect two power plants in tandem: (i) a conventional gas-fired combustion turbine-generator plant consisting of 4-100 MW units interfaced with (ii) a conventional steam turbine electric generating plant consisting of four boilers utilizing waste heat from the gas turbine exhausts to generate steam to operate 2-100 MW turbine generator units. While the nominal plant capacity is 600 MW at optimum operating conditions, the capacity is "de-rated" to 450 MW corresponding to summertime high-temperature conditions. The owner and operator of the plant will be Pakistan's Water and Power Development Authority (WAPDA).

Project financing is provided by contributions from AID, Asian Development Bank (ADB) and Government of Pakistan (WAPDA). The project work has been broken down into discrete packages for contracting:

- Lot 1A Two Combustion Turbine Generators (AID)
- 1B Two Combustion Turbine Generations (ADB)
- 1B-A Fuel Oil Treatment Plant (ADB)

- Lot 2 Transformers and Switchyard (ADB)

- Lot 3 Civil Works and Structures including Central Control Building (GOP)

- Lot 4A Heat Recovery Boilers (ADB)
- 4B Steam Turbine Generators and balance of plant (ADB)

- Lot 5A Data Logger System (AID)
- 5C Chiller Plant (AID)

- Lot 6A Gas Pipe Line Material and Mixing Plant (ADB)
- 6B Gas Pipe Line Construction (GOP)

For summary of the capital cost of the entire plant -- about \$180 million -- see Appendix 6.

3. Status of the Project Works

Examination of Progress Reports and a visit to Guddu Site March 18, 1986 confirmed the status of work on each of the project features to be as follows:

Lots 1A and 1B

Combustion Turbines - The four units are in various stages of operation and testing though all four units have already been operated simultaneously on two occasions. Unit No.1 has completed its 14-day reliability run operating at base load conditions with output of 106 MW - 115 MW. The 14-day reliability run of Unit No.2 was interrupted due to a clutch malfunction. The fault has been identified, replacement parts received and the reliability run will re-start shortly. Unit No.3 was about two thirds into its 14-day reliability run at time of site visit with in excess of 100 MW being fed into the WAPDA grid. Unit No.4 was under system and efficiency checks with the reliability run expected to begin in two or three days.

Lot 1A-B

Fuel Oil Treatment Plant - Invitation For Bid (IFB) documents were issued in December with a bid due date of March 10, 1986. Fourteen prospective bidders purchased tender documents and three bids were received. Bids evaluation is in process and award is expected by June 1, 1986. This plant is required to treat distillate fuel oil which is an alternative fuel for firing the combustion turbines in the event gas field supply is interrupted. Completion is scheduled for March 1, 1987.

Lot 2

Transformers and Switchyard

This feature of the project is physically complete with various operational checks being made. Equipment take-over by WAPDA will commence following successful completion of all combustion turbine reliability runs.

Lot 3

Civil Works and Central Control Building

Progress by the construction contractor on civil works and structures, in particular the Central Control Building, has been abysmal with continuing shortages of material, construction equipment and manpower. Though the contract was awarded February 1985 the building was hardly out-of-the-ground at the end of the year: some 10% of construction completed with more than 70% of initially envisaged construction time elapsed. The construction completion schedule slipped from November 15, 1985 to June 30, 1987.

The work on the Building has accelerated however and at the time of my site visit structural framing had reached roof level (a concrete frame, three-story building) and exterior masonry walls were being laid up. Inside work, including ducting and hangars, must be virtually complete before sensitive plant control and monitoring equipment can begin to be installed. The most optimistic current estimate is that initial equipment might begin moving into the building by the end of the year (1986).

Delay in completion of the Central Control Building is a serious matter that complicates the mechanical/electrical interface with the combustion turbines which are now operating from a unit control set-up. It is essential for operation of the steam cycle units of Lot 4 soon to be under construction.

Another civil works feature that is critically behind schedule, and continuing to wobble, is construction of Fuel Oil Storage Tanks and Unloading System. (These tanks are required to store the distillate fuel oil for alternative firing of the combustion turbines in the event of interruption of gas supply). At the time of my site visit no tanks were near completion and no work was in progress. No work had been started on two receiving tanks. The contractor was given a warning by WAPDA January 27, 1986 that the contract might be cancelled unless performance substantially improved. This may not be a practical alternative. In any event, the scheduled respective tank completion dates of May 15, July 10 and October 30, 1986 will hardly be met.

Lots 4A and 4B

Heat Recovery Steam Generators, Steam Turbines and Balance of Plant

Bids were opened for this major project component January 29, 1985. Against a programmed time of about six months for bid evaluation and award to successful bidder, the Letter of Award was finally issued effective March 16, 1986 -- about 13 1/2 months required for bids evaluation, clarifications, bidder meetings and satisfying ADB and WAPDA requirements.

Initial Commercial Operation (ICO) of Unit 1 is scheduled 20 months and 10 days after Contract Award with Unit No.2 following one month later. The project schedule shows Unit 1 in commercial operation November 26, 1987 and Unit 2 on December 26, 1987. This represents a slippage of about two months in the schedule for Lot 4 operation -- not bad if indeed GE makes its contractual ICO commitment which is very tight.

Lot 5A

Data Logger

This equipment is for installation in the Central Control Building. Evaluation of bids completed in January. This item has been absorbed into Lot 4 and equipment will be furnished and installed under the GE contract for combined cycle plant.

Lot 5C

Chiller Plant

This plant will provide air conditioning for the Central Control and Administration Buildings. NESPAK's Lot 5C bid evaluation report of January 25, 1986 found not in compliance with AID guidelines and was re-worked by G&H, New York. Three bids received of which two found unresponsive. GE selected for award and contract should be signed shortly with a 7 months 10 days completion time; estimated mid-November 1986.

Lots 6A and 6B

Gas Pipe Line

By dint of extraordinary purchasing and expediting efforts (plus on-site scrounging), the 60 kilometer, 20-inch pipeline was available for provisional operation mid-February 1986. The Dehydration Plant, Mixing Station (for Mari, Sui and future Kandhkot gas), and the permanent 16-inch tie-in from Sui gas line to mixing station remain to be completed with full commercial operation expected by June 30, 1986.

4. Gibbs & Hill's Modus Operandi

In the performance of its tasks G&H operates from three locations:

- Headquarters in New York for overall project direction, engineering design, specifications and procurement documents, vender document review, surveillance and expediting
- Project office in Lahore from where the Project Manager directs in-country operations and coordinates the activities of G&H headquarters and construction staff while maintaining liaison with USAID and WAPDA.
- Construction site at Guddu where resident G&H engineers oversee and reinforce the activities of WAPDA's local consultant for civil engineering services National Engineering Services (Pakistan) Limited (NESPEAK), provide overall construction management services and coordinate the work of all site contractors while maintaining liaison with WAPDA on-site project management.

5. Gibbs & Hill Work Plans

Under the terms of the Contract, G&H is required to submit annually Work Plans which set forth explicitly the work effort expended, and expected to be expended in completing the project. It was such a Work Plan and subsequent revisions, in particular WORK PLAN REVISION 2, January 1, 1985, which was the genesis of my involvement in the Project. My examination and findings with respect to the Contract and Work Plans was set forth in my report of February 1985 cited in 1. above.

On February 4, 1986, G&H submitted for USAID approval WORK PLAN REVISION 3, January 1, 1986 which covered work effort expended through 1985 and estimated work effort required to complete the project.

6. G&H Work Plan Revision 3

The latest life-of-project Work Plan delineates a need for 220 additional man-months of New York home office effort and 134 additional man-months, of field staff. On the face of it this appears a shocking increase from the life-of-project plan submitted one year previously. It equates to a G&H estimated contract budget increase from \$9,470,424 to \$13,268,980: \$3,798,556. How did this come about?

a. Structure of the Plan

The Work Plan presentation is clear and detailed. Home Office professional effort is broken down by Bid Package (Lots), Divisions of Work within Lots, and technical discipline effort within divisions of work. Non-professional home office support is shown as a separate category and broken down into five divisions of work. Field staff is shown as a separate category broken down by position and period of assignment.

In sum, the work envisaged for each bid package, backstopping, and field staff can easily be tracked in detail. Projections are made month-by-month through the first half of 1986, then quarterly and half yearly progressing into 1988 for final wrap-up.

b. Principal Increase in Projected Work Effort From Previous Plan

(1) Home Office Professional

The increase in this category which amounted to 112.9 man-months is attributed primarily (87%) to developments during 1985 in three activities: (i) civil works and structures (Lot 3); (ii) the heat recovery steam generators and steam turbines (Lots 4A and 4B); and the gas pipe line and mixing plant (Lots 6A and 6B).

- With respect to Lot 3, the original estimate of effort was based in the main on G&H reviewing work performed and drawings and documents prepared by NESPAK -- a kind of "looking over the shoulder" and fine tuning operation. In the event, G&H spent an inordinate amount of unscheduled time -- about 23 man months -- making analyses, preparing studies, drawings and documents (detailed in the Work Plan Variance Analysis), seeing to the various, mechanical and electrical interfaces between Lot 3 and the other Lots, and making alternate arrangements (including provision of an unplanned switchyard control room necessary to operate the gas turbines), due to failure of the contractor to complete the Central Control Building (still months away from completion). G&H estimates an additional 27.5 man-months for Lot 3 work.
- With respect to Lots 4A and 4B, the problem basically lay in the protracted bid evaluation process -- 13 1/2 months from receipt of bids to contract award (instead of six months) -- involving a continuum of clarification and equalization meetings with nine bidders and presentations to WAPDA and to ADB. The long process absorbed man-months in the bid evaluation/contract award cycle in late 1985 - early 1986 when the work effort should have been focussed on post award activities such as vendor document review and coordination, vendor surveillance and expediting, which still have to be done. G&H estimates an additional 31.4 man-months for Lot 4 work.
- What G&H expected to be simple one-package task for design and procurement of Lot 6A pipeline material and associated terminal plant equipment became a design coordination and procurement nightmare that ballooned to seven bid packages with some 18 companies involved in supply contracts and subcontracts. Such dispersion required a major effort to interface components and expedite shipment from the U.S., Europe and Asia to meet combustion turbine start-up schedule and be ready to receive Mari Gas under a take-or-pay contract. In addition to the planned mixing station at the plant terminal, pressure control components for both Sui and Mari pipelines were needed and

temporary hook-ups for Sui gas was required to provide fuel for initial start up of the Lot 1 combustion turbines in November 1985. The Mari gas pipeline reached the site February 23, 1986 and is in operation through a temporary hook-up while run-in of the combustion turbines proceeds. In the process, the work effort ballooned from an allotted 22.5 man-months to 52.7 man-months.

The G&H home-office input with respect to WAPDA's turn-key pipe line construction contract was expected to be minimal -- only two man-months allotted. However the turn-key contractor did not accept responsibility for the Guddu barrage crossing and this rather complex engineering, design and associated procurement task fell to G&H, at an expenditure of some 11 man-months of effort.

(2) Home Office Non-Professional Back-stopping

Work Plan Revision 3 estimates an increase in home office non-professional back-stopping of 107.3 man-months distributed through Five Divisions of Work: Project Management and Secretarial; Cost Engineering and Reports; Word Processing, Technical Secretarial and Telex; Vender Document and Design Print File; Planning and Scheduling. The largest rate of increase (147%) is projected in the Vender Document and Design Print file category associated with the large increase of documents experienced in Lot 6A activities and the many vendors and sub-suppliers anticipated under the Lots 4A and 4B contracts. The other categories increased primarily in support of greater activities of home office professional staff described in (1) above.

(3) Field Staff

There has been a very large increase in the need experienced in 1985 and anticipated for field staff at site to oversee construction: 134 man-months. This envisaged extensions of some present staff on account of slippage of about 3.5 months in the construction completion schedule (now about two months on basis contract recently signed with GE); retention of some field staff beyond the period of service expected earlier, and addition of five new field staff positions because the construction staff support originally planned from NESPAK or other local source has not and is not expected to materialize.

In summary, G&H Work Plan Revision 3 anticipates an increase in Work effort over that projected in Work Plan Revision 2, January 1985 (aggregating 782.1 man months) of:

Home Office Technical	112.9 man-months
Home Office Non-Technical	
Back stopping	107.3 "
Field Staff	134.0 "
Total Increase:	<u>354.2 man-months</u>

A detailed breakdown of G&H work effort by bid package, home office back-stopping, and field staff assignments which compare Work Plan Revision 2, January 1985 with Work Plan Revision 3, January 1, 1986 is shown as Appendix 1.

7. Analysis of G&H Work Plan, Revision 3

Following a review of G&H's performance since my report of February 1985, and a visit to Guddu site to observe construction operations and progress, I made a task-by-task review of the life-of-project work effort required for G&H to discharge its project responsibilities. This exercise was in effect an update and extension of a similar projection made a year ago but now reinforced by a year's record of G&H, WAPDA, NESPAK and construction contractors' performance.

a. Project Progress Summary

Overall project progress is something of which the Mission can be proud. Despite notable shortcomings by NESPAK, WAPDA and the contractors in getting on with Lot 3 civil works, particularly the Central Control Building and the Fuel Oil Storage Facility, the fact is that the first combustion turbine was fired up almost on schedule in November 1985 with the three others following in turn at approximate one-month intervals. Various tests and reliability runs are continuing but starting in December 1985 a not inconsiderable amount of power has been fed into the WAPDA grid thru the essentially completed switchyard (Lot 2). Also the 60-kilometre pipeline from the Mari Gas Field has been completed for provisional operation with necessary temporary terminal facilities to permit Mari gas to fire the turbines under a take-or-pay contract for 100 million cubic meters per day. Lot 3 civil works is still lagging -- particularly utilities, fire protection system, construction of buildings (the Central Control Building is critical) and the fuel oil storage facility

After an onerous bid evaluation and contract award exercise that consumed 13 1/2 months (rather than the planned six) an award was made to GE March 16, 1986 for both Lots 4A and 4B, the steam generator/turbine plant complete. Important to G&H's work effort is the very favorable completion schedule given by GE -- 21 months 10 days from contract award to initial commercial operation of the combined cycle plant.

GE has also been selected to provide the Data Logger (Lot 5A) for the Central Control Room and the Chiller Unit (Lot 5C) to provide air conditioning for the Central Control and Administration Buildings. This will simplify coordination of work at the site.

All of the above is important to consideration of G&H's further work effort. My analysis is predicated on what has been done to date and a project final completion date of December 26, 1987 -- initial commercial operation of the steam turbine plant complete.

b. G&H Work Effort Remaining to be Done -- My Projection

- (1) Home Office Professional
- (2) Home Office Non-Professional Back-stopping

- (3) Field Staff

I found a shocking situation here at first glance. When I made my analysis a year ago it was on the basis that the then-onboard field staff plus a Controls Engineer and Start-up Engineer to come later would give the necessary project coverage, perhaps with some extensions if project completion slipped. Now I find that it was found necessary in 1985 to bring out a Gas Pipeline Engineer (who gave yeoman service) and a Piping Engineer to see to Lot 3 interfaces with other Lots and existing installations. Further G&H now perceives a need for three new positions: a Civil/Structural Engineer and a Steam Plant engineer when combined cycle plant erection is at its busiest, and an Engineer Assistant to the Project Manager in Lahore. G&H has scrapped an earlier plan to shift the Project Manager from Lahore to Guddu for the last 14 months of project activity, while substantially extending the assignments of the Construction Manager, the long-term Civil/Structural Engineer, the Electrical Engineer, and the Cost/Scheduling Engineer.

G&H's rationale for the above additions and extensions is to provide necessary technical and supervisory coverage during the critical erection stage of the combined cycle plant as experience has shown that NESPAK or locally-procured staff to perform the required functions are not available.

Given G&H's one-and-a-half years experience on the job, daily association with the local engineering firm on site (NESPAK) and efforts to recruit local engineers for its staff, it is difficult to take a strong position against G&H's considered needs. The tasks are certainly there to be accomplished and G&H has contractual responsibility to see that they are done right.

The retention of the Project Manager's Office in Lahore rather than moving it to Guddu in 1987 (as previously planned) is linked with the now-demonstrated need to retain a hard-charging Construction Manager on-site up to completion of the steam cycle plant. Effective coverage at the construction site will be maintained while inter-communication of the Project Manager with New York home office, WAPDA, USAID, and the many vendors involved in supply of Lot 4 equipment can be more expeditiously handled from Lahore facilities.

Prior to Mission approval, I recommend that the Staffing Plan be reviewed in joint session between the Project Managers representing G&H, USAID, and WAPDA where a meeting of minds may be attained and fine tuning of assignments accomplished.

A detailed breakdown of my estimate of G&H required life-of-project work effort by bid package, home-office back stopping and field staff assignments compared with a similar breakdown previously prepared for Work Plan Revision 2, January 1985 is shown as Appendix 2.

8. G&H Proposed Cost of Work Plan Revision 3

The estimated life-of-project cost submitted by G&H alongwith Work Plan Revision 3, January 1, 1986 is shown below:

	<u>ITEM</u>	<u>COST</u>
1.	Salaries	4,468,300
2.	Fringe Benefits	1,765,400
3.	Overhead	3,904,300
4.	Travel & Transportation	526,500
5.	Allowance	669,810
6.	Other Direct Costs	1,203,100*
7.	Vehicle Maintenance	129,900
8.	Participant Training	95,480
	Total Estimated Cost:	<u>12,762,790</u>
9.	Fixed Fee	<u>506,190**</u>
	Total Estimated Cost and Fixed Fee	13,268,980

*Includes cost of Commissioning Engineer under contract from Dravo

**Included in Contract Amendment 5, effective date 19 March 1985
With Contract Amendment 5 of May 1985 signed in the amount of
\$9,470,424, the proposed increase amounts to \$3,798,556.

9. Stephenson Estimate Life-of-Project Contract Cost

10. Cost Considerations in Future

The tasks of most uncertainty are:

- (1) Coordination of thousands of Lot 4 vendor drawings and vendor surveillance/quality assurance/expediting at manufacturer's plants in the U.S. Europe and Japan, and
- (2) The matching of field technical staff assignments by specialty and time schedule to match Lot 4 and balance of plant construction activity. A comparison of G&H's Work Plan, Revision 3 costs with expenditures through December 1985 indicated about \$6,400,000 to be spent in 1986 and 1987.

b. Effect of Delays

c. Additions to the G&H Scope of Work

There are certain elements not specifically covered in the contract Scope of Work which in my judgement are critical to the long-term success of the project. These are:

- (1) Preparation of a Combined Cycle Plant Operations and Maintenance Manual.
- (2) Preparation of a Plant Staffing Plan.
- (3) Preparation of a detailed Training Plan for plant operation and maintenance staff.
- (4) The funds for a Plant Superintendent Advisor (Technical) from beginning of combined cycle plant commercial operation recommended in my earlier report have been provided for a twelve-months period in Revision 5 of the Contract.

I cannot stress too strongly the importance of the above items although some resistance may come from WAPDA. They are low-cost items which will not guarantee but will certainly help to assure well-integrated management and operation of this first-of-a-kind plant in Pakistan. The other side of coin: AID and ADB would in my view be remiss in handing over a gem of a plant to the Owner at the end of the construction cycle without taking steps to assure an orderly transition into a smoothly operating and well-maintained installation. The cost of this item will be of the order of \$225,000. See Appendix 5 for detailed estimates of cost.

11. Findings

- a. Construction at the site is progressing very well with a couple of notable exceptions that are not yet critical to operations -- Central Control Building which can afford no more slippage, and the fuel oil storage facility. More importantly, from a virtually bare site in January 1985, the four combustion turbines have been installed and beginning with the first unit in December 1985 have been feeding electricity into the WAPDA power grid. Two units are in commercial operation status and it is expected that all four units will have been turned over to WAPDA in April 1986.
- b. The contract for the remaining major component of the plant -- Lot 4, Heat Recovery Boilers and Steam Turbine Generators -- was awarded March 16, 1986. This marks a watershed in G&H's work effort as henceforth the thrust of their effort will be in post contract award activities with supplier's in the New York headquarters and management of construction activities at the site. Barring unforeseen events, the entire combined cycle plant should be in commercial operation by the end of December 1987.

- c. The total plant is coming in considerably under original project estimates. On the basis of actual contract awards made for equipment and construction the savings are of the order of \$65 million. See Appendix 6, Guddu Combined Cycle Power Plant - Cost Summary.
- d. After a shaky contractual arrangement at the beginning, G&H is now operating under a full responsibility engineering services contract covering design, procurement and construction management to project completion (commercial operation of the entire plant).
- e. G&H's performance has been professional and effective in carrying out many diverse tasks. They have shown that they care. Their activities to assure a gas supply in time to fire the combustion turbines as they were ready to come on-stream were outstanding. Further, they have picked up slack from NESPAK's handling of Lot 3 work in the spirit of their responsibility for the whole project.
- f.
 - A most laborious evaluation of bids for the Lot 4 heat recovery boilers/steam turbine generator plant which involved nine tenders on the short list and required 13-1/2 months from opening of bids to contract award.
 - Extraordinary effort to procure and expedite material for the gas pipeline and terminal facilities and to make temporary hook-ups to supply fuel from the Sui and Mari Gas Field for combustion turbine run-in and operation. Note: WAPDA has a take-or pay contract for Mari gas at some \$60,000 per day.
 - G&H assumption of a number of responsibilities originally projected to fall within the purview of NESPAK's work under Lot 3, civil works and Structures.
 - The necessity for reinforced Field Staff -- positions and length of assignment -- for management and technical supervision of construction/erection/installation activities as expected availability of qualified local personnel has not materialized.
- g. To keep things in perspective as to the impact of effective engineering/construction management to assure earliest completion of the project, one must bear in mind that the potential revenue loss from just one day's full commercial operation of the Guddu Plant is \$300,000 - \$400,000.
- h.
- i. A probable maximum exposure to engineering services contract cost is postulated as follows:

11. Recommendations

- a.
- b. That the G&H proposed Field Staff assignments (shown on bar chart, Fig. No.2, Volume 3, Work Plan Revision 3, January 1986) be the subject of a joint meeting between the USAID, G&H and WAPDA Project Managers for fine tuning of positions and lengths of assignments. The "Engineering Assistant to the Project Manager" 5/1/86-3/31/87 position proposed is not considered as justified in the absence of detailed description of specific tasks necessary to reinforce the work of the Project Manager in Lahore. Revisions flowing from the joint review exercise would form the basis for field staff salary component to be included in the increased contract budget.
- c. Amend the contract scope of work to include explicitly preparation by G&H of (1) a comprehensive Combined Cycle Plant Operations and Maintenance Manual, (2) a Plant Staffing Plan, and (3) A Staff Training Plan. (For details of estimated cost -- about \$200,000 -- of this additional work, see Appendix 5).
- e. Upon receipt of each Monthly Expenditure Report from Gibbs and Hill the Project Manager should compare home office hours of work shown in detail in that Report against the projections shown in Work Plan Revision 3. Similarly, the field staff on-board assignments should be compared with the work plan projection. Substantial variation between activities and projections, or indication of an adverse trend should be called to the attention of the G&H Project Manager.
3. In conjunction with e. above, similar attention should be given monthly to comparison between the "current" three-month projection of salary costs shown in the Monthly Financial Report and the three-month projection based on the Revision 3 work plan. Any anomaly should be investigated without delay with the G&H Project Manager.

13. The Bottom Line

The Guddu Project is in good shape. The front end of the power plant is already in operation with 4-100 MW combustion turbines, fired primarily from a new Mari Field pipeline, feeding electricity into the hungry WAPDA grid. The last major contract has been awarded: the back-end steam cycle plant which is expected on line December 1987. The project is expected to come in \$50-60 million under the original estimate. Gibbs & Hill is performing well under a full-responsibility completion contract.

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GUDDU 450 MW COMBINED CYCLE PROJECT
GIBBS & HILL ENGINEERING SERVICES CONTRACT

LEVEL OF EFFORT SUMMARY & COMPARISON

G&H WORK PLAN REVISION 2, JANUARY, 1985
G&H WORK PLAN REVISION 3, JANUARY, 1986

<u>Home Office Professional:</u>		<u>Rev. 2</u>	<u>Rev. 3</u>
		<u>1985</u>	<u>1986</u>
<u>Activity</u>		<u>Man Months</u>	
Lot 1A	Gas Turbines (2) - AID	25.4	28.7
1B	Gas Turbines (2) - ADB	19.1	20.5
1B-A	Oil Treatment Plant	5.3	13.0
Lot 2	Transformers and Switchyard	20.2	25.0
Lot 3	Civil Works and Structure	23.3	50.8
Lot 4A	Heat Recovery Steam Generators (4)	63.2	74.8
4B	Steam Turbines (2) and Balance of Plant	120.7	110.5
Lot 5A	Data Logger for Central Control Facility	24.8	20.6
5C	Central Chilling Plant	6.9	8.6
Lot 6A	Gas Pipe Line and Mixing Plant	22.5	52.7
6B		2.0	11.2
Initial	Consultancy (G&H)	<u>19.8</u>	<u>19.8</u>
Total		353.2	466.2

Home Office Back-up Non-Professional:

Project Manager	109.0	119.3
Cost Engineering and Reports	53.3	54.3
Word Processing and Technical Secretarial	43.3	67.9
Vendor Document and Design Drawing File	22.0	54.3
Planning and Scheduling	<u>18.3</u>	<u>27.4</u>
Total	245.9	353.2

(Continued Sheet 2)

<u>Field Staff: (Revision 2, January 1985)</u>	<u>Rev. 2 1985</u>
Project Manager/Mechanical Engineer 9/1/84 - 11/15/87	38.5
Site Manager 1/1/84 - 3/31/87	39.0
Civil Engineer 2/15/84 - 7/31/86	30.5
Electrical Engineer 8/24/84 - 8/31/86	24.0
Instrumentation & Controls Engineer 6/1/85 - 2/28/87	21.0
Planning & Scheduling Engineer 2/1/85 - 7/31/86	18.0
Start-up Engineer 9/1/85 - 3/30/86 & 6/15/87 - 11/15/87	12.0
Total	<u>183.0</u>

<u>Field Staff: (Revision 3, January 1986)</u>	<u>Rev. 3 1986</u>
Project Manager/Mechanical Engineer 9/1/84 - 3/31/88	43.0
Site Manager 1/1/84 - 12/31/87	48.0
Civil Engineer 2/1/84 - 9/30/87	44.0
Electrical Engineer 8/24/84 - 1/31/88	41.0
Instrumentation & Controls Engineer 6/1/85 - 5/31/86 & 3/1/87 - 11/30/87	21.0
Cost & Scheduling Engineer 2/1/85 - 3/31/88	39.0
Start-up Engineer 9/1/85 - 3/31/86 & 10/1/87 - 1/31/88	11.0
Gas Pipe Line Engineer 9/15/85 - 6/30/86	9.5
Piping Engineer 9/15/85 - 3/31/86 & 10/1/86 - 8/31/87	17.5
Civil/Structural Engineer 12/1/86 - 9/30/87	10.0
Mechanical Engineer Steam Plant 3/1/87 - 1/31/88	11.0
Engineering Asst to Project Manager 5/1/86 - 3/31/87	11.0
Plant Superintendent Advisor 2/1/88 - 2/1/89	<u>12.0</u>
Total	317.0
Grand Total - Revision 2 January, 1985	<u>782.1</u>
Grand Total - Revision 3 January, 1986	<u>1136.4</u>

GUDDU 450 MW COMBINED CYCLE PROJECT
ENGINEERING SERVICES CONTRACT

COST OF RECOMMENDED ADDITIONAL ITEMS

1. Preparation of Plant Operations and Maintenance Manual

Mechanical Engineer	2 man-months	
Electrical Engineer	2 man-months	
Instruments & Controls	2 man-months	
Home Office Backstopping	<u>2 man-months</u>	
	8 man-months @ \$3,837 x 2.32*	= \$ 71,215
Travel (2 trips); Printing, Binding, Shipping		= <u>15,000</u>
		= 86,215
	Fee 7%	= <u>6,035</u>
*Payroll Costs 42%; Overhead 90%		= \$92,250
	Say	= \$90,000

2. Preparation of Plant Staffing Plan (O&M)

Mechanical Engineer	1 man-month	
Electrical Engineer	1 man-month	
Instruments & Controls	1 man-month	
O&M Specialist	1 man-month	
Home Office Backstopping	<u>1-1/2 man-months</u>	
	5-1/2 man-months @ \$3,837 x 2.32	= \$ 48,960
Travel (2 trips to Pakistan), Printing, Binding, etc.		= <u>12,000</u>
		= 60,960
	Fee 7%	= <u>4,267</u>
		= \$65,227
	Say	= \$65,000

(Continued Sheet 2)

3. Preparation of Staff Training Plan (O&M)

Mechanical Engineer	1 man-month		
Electrical Engineer	1 man-month		
Instruments & Controls	1 man-month		
O&M Specialist	1 man-month		
Home Office Backstopping	<u>1-1/2 man-months</u>		
	5-1/2 man-months @ \$3,837 x 2.32	=	\$48,960
Travel (2 trips to Pakistan), Printing, Binding, etc.		=	<u>15,000</u>
		=	63,960
	Fee 7%	=	<u>4,477</u>
		=	68,437
	Say	=	<u>70,000</u>

Summary: Out-of-Scope Activities

Plant Operations and Maintenance Manual	= \$ 90,000
Plant Staffing Plan	= \$ 65,000
Staff Training Plan	= <u>\$ 70,000</u>
total	= \$225,000*

* Includes fee of 7% \$14,750

GUDDU COMBINED CYCLE POWER PLANT - COST SUMMARY

24-Mar-86

LOT	DESCRIPTION	USAID US \$	ADB US \$	GOP Rupees	REFERENCE
1A	Two Gas Turbine Generators & Accessory Equipment	39,503,200		24,607,540	Contract amount (G.E.)
1B	Two Gas Turbine Generators & Accessory Equipment		39,071,900	21,514,340	Contract amount (G.E.)
1B-A	Fuel Oil Treatment Plant		977,931	1,326,000	Lowest bid (G.E.)
2	Main Step-Up Transformers Switchyard Extension		4,410,218	29,038,778	Contract amount (ICC) including variation orders to date
3	Civil & Structures			125,000,000	5% estimate (contracts to date total 78,087,129 Rs)
4	Steam Turbines, HRSG's & Balance of Plant		65,410,496	145,551,614	Contract amount (G.E.)
5A	Data Logger				Supply included in Lot 4
5C	Chillers	652,300		1,545,293	Lowest bid for steam absorption system (G.E.)
6A	Gas Pipeline Materials		4,030,694	2,517,156	Contract amount (various suppliers) including variation orders to date
6B	Gas Pipeline Construction			49,680,460	Contract amount (Petrocon) includ- ing variation orders to date
6A-A	Standby Sul Gas Pressure Reducing Station Equipment	172,614			Purchase order amounts (Davalco & Keller Supply)
TOTAL		40,528,114	111,901,233	400,781,291	
S&W MARCH 1983 ESTIMATE TOTAL		48,270,400	140,372,500	825,323,227	

Source: Gibbs & Hill, Inc - Lahore

GUDDU COMBINED CYCLE POWER PLANT - STONE & WEBSTER MARCH 1983 COST ESTIMATE

24-Mar-86

LOT	DESCRIPTION	USAID US \$	ADB US \$	GOP Rupees	REMARKS
1A	Two Gas Turbine Generators & Accessory Equipment	45,505,000		32,218,676	
1B	Two Gas Turbine Generators & Accessory Equipment		45,420,200	32,218,676	
1B-A	Fuel Oil Treatment Plant				Not considered in S&W estimate
2	Main Step-Up Transformers Switchyard Extension		12,121,000	21,281,388	
3	Civil & Structures			334,751,370	S&W estimate includes structures subsequently included in other lots
4	Steam Turbines, HRSG's & Balance of Plant		76,426,500	264,301,200	S&W estimate excluded civil works
5A	Data Logger	2,765,400		6,433,568	S&W estimate included equipo- ment other than data logger
5C	Chillers				Not considered in S&W estimate
6A	Gas Pipeline Materials		7,004,800		
6B	Gas Pipeline Construction			83,571,749	
6A-A	Standby Sui Gas Pressure Reducing Station & Piping				Not considered in S&W estimate
TOTAL		48,270,400	140,972,500	835,323,227	

Source: Gibbs & Hill, Inc - Lahore

APPENDIX C: ECONOMIC AND FINANCIAL ISSUES THE MASTER PLAN SHOULD ADDRESS

The technical and economic evaluation must address the following general questions:

1. What is the least cost path to each of the final objectives identified in the four scenarios/plans?
2. What tradeoffs are involved in following each of the scenarios?
3. What alternatives exist which might expand or reduce the costs and benefits identified in each scenario?
4. Does the Plan identify targets and milestones against which progress can be assessed?
5. Does each scenario relate logically with the means identified to finance that scenario?
6. How do the costs and benefits of each of the scenarios relate to the issues of training, institutional reform, and generation projects?
7. Are sound economic and financial analysis techniques being used?
8. Will WAPDA be able to replicate the efforts of the MP with changed data in two or three years?

Detailed Discussion of Each Question

These issues are discussed item-by-item in the following paragraphs.

1. Least Cost Paths

The activities in the district MP's, from which the current MP was assembled, were put together in some semblance of cost effectiveness ranking. Thus there is clearly a degree of least cost consideration in the MP. What is needed for a Master Plan, is to assemble individual activities into projects, for projects are the unit of account to planners and to such funders as the World Bank and ADB. Such an effort is obviously impossible given the lack of accurate maps and other data. However, this limitation should be addressed head on and made a priority of future planning efforts. Without a project oriented method, it is impossible to determine the sequence of activities or the critical path that must change as resource commitments change. The WOS shows the local planners how to rank a number of alternative investments, indicating, perhaps, the appropriate scheduling. However, large scale projects in generation and regional development may require compromises between what is best for the short run interests of a given local and the priorities of a region. The WOS cannot assist in assembling activities into such projects. As a result, the WOS must eventually be supplemented with a project-oriented planning system that will assemble the activities into projects.

2. Tradeoff among Scenarios

The absence of least cost methodology accentuates the lack of clearly defined tradeoffs among the alternative scenarios. The reader is told, in a gross sense, how the various scenarios differ from one another; e.g. number of customers, electricity sold, total line losses, cost. However, the important questions of just where these volumes are located or how much effort in one area will replace another effort elsewhere are not posed. One clear way to improve this part of the report is to identify the projects that form each scenario, their implementation schedules, and the resource requirements for each project. In this way the GOP and WAPDA can see the impacts of resource allocation decisions on the achievement of project objectives. In addition to funding tradeoffs, policy tradeoffs need to be made more explicit. How many urban consumers for a given number of village customers? How do loss reduction investments compare with generation expenditures? The evaluation team believes that USAID has devoted insufficient resources to the activities (mapping and data base construction) that would enable a more rational plan to be formulated.

3. Alternatives for Changing Costs/Benefits of Scenarios

The evaluation of the MP selection of alternatives is hampered as are the first two issues by the lack of complete and consistent (WAPDA) system planning methodology. In the current system, it is difficult to identify specific alternatives to current projects. Not surprisingly, the MP is unable to examine the implications of changes in specific policies or implementation schedules on the achievement of the objectives of each Plan. In particular, it is the job of a Master Plan to show how changes outside the control of WAPDA will influence the success of its efforts. Such changes may occur in urbanization, industrial activity, or national income. The WAPDA data base does not now permit such analysis.

4. Targets and Milestones

The technical implementation outlined in the Master Plan fails to include procedures and specific tasks showing how all the aspects of the various programs, Institutional, Training and Power Distribution will work together to accomplish the mandated goals. There should be a scenario of who will do what and when for implementation to proceed in a successful and timely fashion. The Master Plan lists a series of objectives and contains a schedule showing a time frame for accomplishment (c.f. MP Section 6.00 Load Management, 6.05 Implementation - 3 years) but fails to include a discussion of how any specific task will be accomplished. The evaluation section outlines a series of evaluations to be conducted throughout the life of the project but does not contain goals or targets that should have been reached at the time of evaluation. Project management needs the tools of targets and milestones to follow implementation, identify problems such as slippage, and initiate corrective action in a timely fashion.

5. Clarity of Relationship of Scenarios to Means Available

The relationship of the Plan implementation to the financial means at hand is a necessary component of a good plan. For WAPDA, financing their expansion and rehabilitation has two main components, internally generated funds and

those provided by foreign lenders or donors. The funds provided from foreign sources can never be known for sure until the agreements are signed. Internally generated funds, however, can be predicted with some accuracy by estimating power sales and prices. The evaluation team has little quarrel with the short term forecasts of power sales by WAPDA. (Longer term power forecasts do appear problematic, though.) Prices appear in the scenario as a dependent variable - that is, what power prices are required to maintain the 40% internal capital generation ratio demanded by the World Bank and others. Such a construct overlooks two important issues. First, power prices cannot be raised by whim to support the investment needs of a given year. Second, radical increases in electric rates can reduce the level of demand, especially by large consumers, the very ones needed to maintain steady demand and revenues. Electric prices cannot be treated as a simple dependent variable to investment needs. Rather, the MP must consider the effects on scenario implementation of varying levels of electricity prices. The plan also needs to focus on other GOP financing (Federal or Provincial) elements so that foreign funding components which complement such indigenous funds can be better identified.

6. Relationship of Scenario Cost/Benefits with Training, Institutional Reform and Generation

The costs and benefits of each of the technical implementation scenarios will relate intimately to the training and institutional improvement aspects of the project. The MP shows clear awareness in its Introduction that such a relationship is vital. In the plans themselves, the training element appears to play a role in the implementation. The PTAT acknowledges that changes in WAPDA's institutional structure will need to be made as elements of implementation. The evaluation team thinks that the dependence of implementation of the technical plans on institutional reform should be stressed in the discussion of the relevant alternative projects and policies. The treatment of generation appears adequate in general. However, the MP scenarios should be tested for the impacts on program costs, benefits, and implementation of setbacks and delays in the generation program.

7. Soundness of Economic and Financial Analysis Methods

The team found the techniques of economic and financial analysis generally sound, if occasionally sloppy. There are some questionable items, though. First, it is not clear that shadow prices for foreign exchange should be used for grant components since these do not need to be repaid. Second, little use is made of sensitivity analysis. This is tied to a third finding: namely, the team's belief that insufficient use was made of computer modeling techniques for the demand scenarios and for the financial and rate analyses in the MP. The result is that changes are often cumbersome, involving far more hand calculation than seems reasonable. (In all fairness it should be noted that this is not true of the tariff work done subsequent to the MP and that some of the labor intensity of the work stems directly from requests by WAPDA and from USAID-caused delays in procuring computers.

For example, an analysis of rural electrification using full cost electricity rates or world prices for kerosene would give considerably more pessimistic results than are shown in Annex P (See Annex D). All of the demand forecasting and economic analysis could stand more sensitivity testing. Load

forecasts which are done without regard for extant social and economic data will work in the short run but will founder in the medium run. One of the reasons for stressing this point is that only by attempting a proper long-term load forecast can the items needed for the data base be identified and obtained. The team also felt that the rural electrification and urban electrification components needed to be separated for rate of return calculations. Finally, any discussion of rural electrification under conditions of generation insufficiency must be examined for cost-increasing impacts on the overall system - i.e. increasing marginal system costs from new customers.

8. Regular Use by WAPDA of Financial and Economic Analysis Tools.

Improved financial analysis is one component of the overall training program. In order for the instruction to "take," it must be used immediately and regularly. Already, the PTAT has plans to train WAPDA staff in the use of the AEP cost of service model. At a more elementary level, the HP-110 spreadsheet used for the initial reestimates of tariffs can be used by a number of the Pakistani consultants. The real question is not one of ability. Rather, it is one of attitude. Can this project convince WAPDA and GOP officials that detailed scenario planning is both desirable and useful? The answer will depend in part on the quality of this initial attempt.

APPENDIX D: TECHNICAL AND ECONOMIC FEASIBILITY OF THE MASTER PLAN

1. Technical Feasibility

The Master Plan contains the technical procedures and inputs needed by WAPDA and the PTAT team during implementation of the Institutional Improvement Program, Power Distribution Training Program and Power Distribution System Rehabilitation and Expansion Program. Qualified members of the PTAT team will assist WAPDA during the implementation of the various phases of the project. There will be a mutually coordinated effort by the GOP, WAPDA and PTAT team to accomplish project goals.

WAPDA is in the process of identifying the new officials to complete the new Directorate of Distribution personnel roster, resulting from the Institutional Program, and are in the process of preparing a new office area for the Division. Upon completion of these tasks the PTAT team members will assist their counterparts with organization of position functions and assure compliance with the technical objectives outlined in the Master Plan.

The technical goals of Plan C or CG2 are all achievable by 1990 so long as sufficient resources are available. A second prerequisite is swift absorption of PTAT knowledge into the new directorate. The primary obstacles to meeting the goals are organizational and human, not technical.

2. Economic Feasibility

Rehabilitation and Line Loss Reduction:

The information presented in the Annexes to the MP shows that the rehabilitation and line loss reduction components are economically feasible in general. The rates of return that are calculated appear adequate to repay the financing for such projects. Two problems appear, however. The first is that there is no technical data to back up the contention of achieving a given line loss reduction target. The second is that individual rehabilitation activities are listed in order of electricity saved/rupee.

While there may be simulation studies to back up the claims of savings, there is no substitute for a data base. The way that the activities are organized, one cannot be sure of achieving savings without such measurements. That is, where only a section of a feeder is being rehabilitated, the only way to assess the purported savings is to measure that section of line before and after the work.

Second, the listing of activities rather than projects breaks investment decisions into units that are too small for national plans. In this way, the schedule of individual investments would appear to have very high returns while the rehabilitated lines will still connect to other leaky lines. The problem here is the assumption that the activities can be linearly aggregated without changing the economic results. This is doubtful. A component is likely to have higher returns if entire regions are rehabilitated rather than just individual lines.

Rural Electrification:

The RE component does not appear to be economically feasible from the data presented in the MP and its Annexes. Going over the data, the evaluation team found that village electrification was justified on the basis of current distorted prices and not national economic prices. Using current border prices for petroleum products cuts the present worth of both the village electrification and the tubewell electrification considerably from their current values.

An economic evaluation of RE must proceed from costs to the country as a whole. The PTAT used shadow prices obtained from the World Bank. The evaluation team feels that petroleum products must be priced at border prices, not internal market prices. Similarly, electricity should be priced at its cost to deliver, not its subsidized price.

We can correct the results given in Table 4.2.1 (Annex P) by making the following changes:

- change the economic price of kerosene to Rs 2.1/liter (Bahrain + 7% for local distribution)

annual fuel cost falls to Rs 256/yr, a reduction of Rs 163 from the current estimates.

- raise electricity price to Rs 1.2/kWh, its LPMC

annual electricity cost goes up to Rs 210/yr

- > Cost savings benefits fall to Rs 295, project costs rise to Rs 324/yr including fixed and variable household costs.

- > Net project benefits are minus Rs 29/yr/household. For a village of 100 households, the Present Worth of electrification just for lighting is minus Rs 16,386. (12% discount factor over 10 years)

Studies of electrification in other countries have shown that there may be substantial improvements in the quality of life in the village and in output from crafts and small manufacturers. Data on such activities may be available in Pakistan. These data are necessary to show sufficient benefits to justify RE investments economically.

For tubewells, there is a substantial effect on the economic feasibility if one adjusts prices to their economic values rather than their financial ones. In the standard economic scenario, Table 4.3.1, fuel costs fall by 51% from Rs 34,148 to Rs 16,731. This will reduce the total annual economic benefits of the project by Rs 17,275, to Rs 5,507. The Present Worth of the Project falls from Rs 128,723 to 31,115 for a 10 year project lifetime at 12% discount.

The initial Internal Rate of Return for tubewells exceeded 500% based on a 10 year lifetime. With Adjustment of fuel costs to appropriate border prices, the IRR falls to 27%.

On such a basis, electrification of tubewells as an assumed goal is clearly advantageous even at today's lower fuel costs. However, the GOP should also examine such other alternatives as improved efficiency in irrigation water use and in diesel engines. (An efficiency gain in diesel use of 40% would still probably leave the rate of return from conversion above the cost of capital since such an improvement would require substantial investment.) The important gain to the country is the output gain from irrigation itself, regardless of the power source.

APPENDIX E: SUPPORTING PUBLICATIONS

Various supporting publications have been or are in the process of being produced to further the training function.

1. Distribution Training Organization Curriculum Style Book

Component II staff members wrote and produced this book to establish a unified system of curriculum development and presentations. The use is intended for all PTAT curriculum development staff and all future WAPDA curriculum personnel. It will be valuable as a guide to other chief consultants or Sister Utility Exchange (SUE) personnel as future training needs are identified and developed.

All curriculum materials are being produced in conformity with the standards prescribed in the style book and all previously prepared materials are being revised to meet these standards.

2. Distribution Training Organization Position Description Manual

This manual, developed and produced by WAPDA and Component II PTAT personnel reflects the total Distribution Training organization prior to and after operation of the Distribution Training Institute (DTI) Islamabad. It describes the personnel positions and their administrative relationships required for the DTI. It also provides information about the major training facilities currently being used by WAPDA for training Distribution employees.

3. Distribution Training Procedure Manual

Through the efforts of two SUE volunteers, their WAPDA Counterparts and the PTAT training staff the rough draft of this manual has been completed. The manual covers procedures for general administration, curriculum, trainee, staff, facilities and information management. Present time lines project final approval by July 1, 1986 for the opening of the Interim DTI facility in Lahore.

APPENDIX F: ECONOMIC AND FINANCIAL ANALYSIS USED IN THE INSTITUTIONAL PLAN

1. Overall Observations

The economic analysis, like the rest of the Plan, stresses the technological over the organizational. For example, the major improvements in productivity are all given as results of technological improvements, radios, computers, trucks. However, the greatest improvements can come from changes in the way the vast preponderance of WAPDA employees who are not going to use the new technology will function. If the quantification of the improved performance has not been estimated, then there is little value in the detailed information on the impacts of the technological innovations. There is little baseline data on which to evaluate the impacts of the suggested changes.

2. Specific Points

- The number of employees has been projected in a simplistic and misleading way. There should be a reference to function. Without knowing what the various groups of employees do and how the functions of WAPDA (Dist) will change, it is impossible to judge just how the existing functions will change or improve.
- The improvement in collection time is a one time increase in working capital. Other things equal, if the time between billing and collection remains the same over years then a one time reduction in the interval will provide a one time increase in working capital, not a continuous increase in working capital.
- The present worth of the project should be computed for all project costs and benefits from the viewpoints of both WAPDA and USAID. This means that the provided grant funds should be included in a present worth calculation for USAID.
- The title of the third col in 5.4 should read "Present Value benefits" and the sum is missing from the bottom of the second col.
- Many of the technological improvements, especially the computers, will require more facilities costs; better power supply, cleanliness, staff training, security, service. These costs should be included in the facilities costs.

PROJECT DESIGN SUMMARY

LOGICAL FRAMEWORK

Project Title Number : Rural Electrification (391-0473)
 Life of Project : From FY 1982 to FY 1988
 Level of Funding : \$155,000,000 and Rs 176,000,000
 Date Prepared : 7/12/82

GOAL

A. GENERAL PURPOSE

Program or Sector Goal:

- To improve the quality of life of the rural poor

The broader objectives to which the project contributes:

(Not stated)

B. OBJECTIVELY VERIFIABLE INDICATORS

Measures of Goal Achievement:

Extent of increases in the following:

- Agricultural production and productivity, especially in tubewell - irrigated areas
- Quality of service provided by health education and other public service facilities
- Employment opportunities
- Output of commercial enterprises
- Use of electrical appliances and
- Participation in social and cultural activities
- Quality of electric service as evidenced by the frequency of load shedding and black-outs and the degree of voltage regulation

C. MEANS OF VERIFICATION

- GOP, IBRD, ADB and other donor records of Agricultural production and agro-industrial activity
- Employment Statistics
- Consumer purchases of electrical appliances
- GOP/WAPDA's distribution function records
- Special surveys and studies including project evaluations

D. IMPORTANT ASSUMPTIONS

Assumptions for achieving goal targets:

- GOP will continue to accord high priority to the energy and power sectors, in particular the distribution function within the power sector, as evidenced by adequate budgetary support
- Other sectoral inputs such as water and fertilizer, health and educational facilities and capital for commercial enterprises will be available
- Continued progress will be made in narrowing the power demand - supply gap

II. PROJECT PURPOSE

A. NARRATIVE SUMMARY

- To assist the GOP to expand reliable electric service to Pakistan's rural population for productive and social uses
- To improve the rural poor's access to that service and
- To assist the GOP to overcome a shortfall in electric generating capacity

B. OBJECTIVELY VERIFIABLE INDICATORS

Conditions that will indicate purpose has been achieved :
End of project status

- Phase I of the Guddu Combined Cycle Power Generation Facility is operational
- A comprehensive National Rural Electrification Master Plan has been developed and is being implemented on schedule
- Activities under the Rural System Expansion and the System Energy Loss Reduction Programs financed by the project have been completed and procedures have been institutionalized by WAPDA to continue these programs
- A comprehensive Distribution Function Training Program has been developed and partially implemented and new training procedures have been institutionalized
- New procedures and systems for procurement, inventory control, statistics, customer service, warehousing, transportation, and communications have been institutionalized
- New warehouses, customer service centers, and a Distribution Function Training Facility have been constructed
- Reduction in the time between the date of application and the date of actual connection for new customers
- Reduction in the frequency of load shedding and black-outs
- Reduction of kerosene and diesel (fuel) consumption in electrified areas

C. MEANS OF VERIFICATION

- Site inspection at Guddu and WAPDA's generation records on Guddu
- AID FAR records
- WAPDA's personnel, management, customer service, and generation/distribution records
- Site inspection of warehouses, customer service centers and training facility
- Special studies and studies including project evaluations
- Consultant reports

D. IMPORTANT ASSUMPTIONS

Assumptions for achieving purpose:

- Financing for Guddu IV and both Phases I and II of the Guddu Combined Cycle Gas Turbine facility has been secured by the GOP
- WAPDA personnel at all organization levels are receptive and responsive to the policy and operational reforms required to improve the distribution function
- Connections to be made and lines to be rehabilitated are selected on basis of sound economic and technical criteria
- WAPDA receives adequate policy and budgetary support from the GOP to implement the National Rural Electrification Master Plan

III. OUTPUTS

A. NARRATIVE SUMMARY

Outputs:

- New Customers connected consisting of
 - Residential
 - Commercial
 - Tubewell
 - Community
 - Industrial
- New power generating capacity at Guddu
- Personnel Training consisting of
 - US Long-term
 - US Short-term
 - Sister Utility Exchange Program Internships
 - In-country Training courses
- Distribution function training facility constructed and operational
- Model warehouses constructed and operational
- Model customer service centers constructed and operational
- Energy losses reduced
- National Rural Electrification Master Plan developed and partially implemented
- Comprehensive Distribution Function Training Program developed and partially implemented
- Work Orders Executed for Energy Loss Reduction Program
- Work Orders Executed for Rural System Expansion Program
- Work Order Management System established for Energy Loss Reduction and Rural Electrification System Expansion
- New procurement and inventory management system developed and institutionalized
- Revised personnel administration policies and practices developed and institutionalized

- New computerized management system installed and operational
- New communication and transportation systems developed and institutionalized
- New customer services accounting, education, and management system developed and institutionalized
- Analysis of recurrent costs completed
- Review of valuation and depreciation practices (inventory, fixed assets, etc.) and WAPDA's cost-price (cost of service/tariffs) policies completed

B. OBJECTIVELY VERIFIABLE INDICATORS

Magnitude of Outputs:

- New Customers	=	215,700
Residential	=	185,000
Commercial	=	17,000
Tubewells	=	7,700
Community	=	4,500
Industrial	=	1,500
- New generating capacity	=	400 MW
- Personnel Trained	=	28,798
US Long-term	=	14
US Short-term	=	314
Sister Utility	=	160
In-country	=	28,310
- Distribution Training facility	=	1
- Model Warehouses	=	2-5
- Model Customer Service Center	=	2-5
- Energy losses reduced	=	3 percent
- National RE Master Plan	=	1
- Distribution Function Training Program	=	1
- Work Orders for ELR	=	Approx 130
- Work Orders for RSE	=	Approx 159
- Work Order Management Systems for ELR and RSE	=	2
- New procurement and inventory Management System	=	1
- Revised personnel administration policies and practices	=	1
- New computerized Management System	=	1

- New communication and transportation systems	=	2
- New customer services accounting and Management System	=	1
- Review of recurrent costs	=	1
- Review of asset accounting, cost-price policies	=	1

C. MEANS OF VERIFICATION

- Site inspection at Guddu
- Site inspection Distribution Training Center
- Site inspection warehouses
- Site inspection customer service centers
- Site inspections locations where work orders were implemented
- GOP and A.I.D. program and financial records
- Special surveys and studies including project evaluations
- Consultant reports

D. IMPORTANT ASSUMPTIONS

Assumptions for achieving outputs:

- JS electric utilities are willing to participate in a Sister Utility Exchange Program
- Qualified participants are selected for training
- The FAR (Fixed Amount Reimbursement) Work Order System is a feasible implementation procedure for local works
- Adequate sites can be identified for facilities and construction proceeds on schedule and within budget
- Opium poppies are not grown in the project areas during the life of the project
- New management systems and procedures are approved and adopted by WAPDA personnel at all levels of the organization
- Technical consultants are effective in working with WAPDA personnel
- Training programs effectively transfer skills and technology

IV. INPUTS

A. NARRATIVE SUMMARY

1. A.I.D.

- Short and long-term expatriate and Pakistani technical assistance
- Short and long-term US and in-country training and sister utility exchange internships
- Vehicles, gas turbines, computers, training materials, and other commodities
- Construction of a training facility
- Local Works (FAR System)

2. GOP

- Staff salaries and operating expenses
- Land royalty (DTI, customer service centers, etc.)
- Construction of model warehouses and customer service centers
- In-country training and travel costs of US long term training
- Locally procured commodities

B. OBJECTIVELY VERIFIABLE INDICATORS

Implementation Target, Type and Quality
(Level of Effort/Expenditure for each activity)

- See financial analysis (Annex Q, Pages 1-6), implementation schedule (Pages 77-83) and commodity (Pages 86 & 87), technical assistance (Pages 91-94) and training (Pages 97-99) plans in the project paper

C. MEANS OF VERIFICATION

- A.I.D. and GOP project records and financial documents
- Project evaluations

D. IMPORTANT ASSUMPTIONS

- A.I.D. and GOP proposed funding levels are approved by their respective governments and disbursements are made on a timely basis
- Appropriate overseas training programs can be identified
- Local works are undertaken according to agreed upon standards and procedures and are certified for reimbursement under the FAR system
- The GOP meets the conditions precedent for power generation, training, system energy loss reduction, and system training components
- Appropriate consultants can be recruited to provide the required technical assistance

APPENDIX H: CONTACTS

EVALUATION TEAM CONTACTS AT LAHORE

PTAT Staff

Mr. Don W. Ruotolo	General Manager
Dr. John E. Andrews	Deputy General Manager/Program Manager
Mr. A. William Huseby	Utility Operations
Mr. John Womack	Purchasing & Stores
Mr. Allen Stuhlmann	Finance
Mr. R. W. Ernsting	Customer Services
Mr. Ralph Snyder	Energy Loss Reduction
Mr. John Whitmyer	Management Information System
Dr. Sterling Hayden	Training
Mr. L. Clay	Training
Mr. J. Ford	Training
Mr. B. Grass	Training
Mr. Shaukat Shafi	Local Commercial Consultant
Training Component II:	
Mr. Gul Mohammad Gulzar	Distribution Training Advisor
Dr. Mohammad Khushi	Training Specialist
Dr. Zulfiqar Ali Khan	Utility Management Training Specialist
Mr. Mohammad Ashraf	Management Curriculum Specialist
Ms. Farida Hasan	Curriculum Production Coordinator
Administration:	
Mr. Mohammad Taqi	Acting Chief Consultant (Administration)

PTAT Subcontractors

Mr. Masood Hasan	Managing Director Emmay Associates Limited
Mr. Masudur R. Chaudhry	Technical Director (Electric) Associated Consulting Engineers (ACE) Ltd
Mr. Altaf R. Siddiqi	Manager, Business Development (ACE)
Mr. Abdur Rashid	ACE
Mr. Anwar Ali	Principal Architect (ACE)
Dr. Zahir Fikri	Managing Director Fikri Associates Consulting Engineers (FACE)

EVALUATION TEAM CONTACTS ISLAMABAD & LAHORE USAID PAKISTAN

Mr. Eugene Staples	Mission Director, USAID/Pakistan
Mr. James Stone	Deputy Mission Director, USAID/Pakistan
Mr. M. Charles Moseley	Chief, Office of the Energy and Environment USAID/Islamabad
Mr. William McKinney	Evaluation Officer, USAID/Islamabad
Mr. Kenneth P. Lue Phang	Deputy Chief Office of the Energy and Environment, USAID/Lahore
Mr. Terence T. D'Souza	Program Manager WAPDA/USAID Rural Electrification Project, USAID/Islamabad
Mr. Peter Davis	Head, Program Office, USAID/Pakistan
Mr. Robert Nochtrieb	Head, Program Development and Management, USAID/Pakistan
Mr. James P. Politte	Procurement and Contracting Officer USAID/Islamabad
Mr. Jaffrey Malick	Program Development and Management, USAID/Pakistan
Mr. Tony Bilecky	Commodity Procurement, USAID/Pakistan
Mr. Susumu Ganiko	Commodity Procurement, USAID/Pakistan
Mr. Jonathan Addleton	Evaluation Officer (Incoming)

EVALUATION TEAM CONTACTS LAHORE

Mr. M. Ayub Sadozai	Member (Power) and Managing Director WAPDA Power Wing
Mr. Raja Saeed Akhtar	General Manager Distribution
Mr. Sardar Noor Alam	General Manager Inventory Control
Mr. Mohammad Afzaal Khan	Deputy General Manager Inventory Control
Mr. Chaudhry Muhammad Rafiq	General Manager Finance (Power)
Mr. M. N. A. Kayani	Chief Commercial Manager
Mr. Muhammad Ibrahim Cheema	Manager Finance (Distribution)
Mr. S. A. Hamid	Chief Engineer Design (Distribution)
Mr. M. Siddiq Quraishi	Chief Engineer Rural Electrification Organization
Mr. Abdul Majid	Chief Distribution Training
Mr. Khan Inayatullah	Former Deputy Managing Director Director Distribution

AEB Lahore

Mr. Ejaz Hussain Bokhari	Executive Engineer, Gulberg Division
Mr. Javed Aziz	Deputy Director, Electric Power
Mr. Zahurul Haq	Deputy Director, Office of Chairman
Mr. Sadiq Ali Shakir	Executive Engineer, Gulshan-i-Ravi
Mr. Ch. Saif Qadir Ghumman	Executive Engineer, Shahdara Division
Mr. M. Nazir Ali Khan	Secretary

Distribution Training Institute, Lahore

Mr. M. S. I. Baig	Principal
Mr. Abdul Ghafoor Cheema	Deputy Director Technical
Mr. Qaisar Zaman	Deputy Director Commercial
Mr. M. Ashraf Munawar	Deputy Director Management

EVALUATION TEAM CONTACTS – GOVERNMENT OF PAKISTAN, ISLAMABAD

Mr. Akram Khan	Additional Secretary Ministry of Water and Power
Mr. Ashraf Mahmood	Head, Energy Cell Ministry of Planning

EVALUATION TEAM CONTACTS OUTSIDE LAHORE

AEB Multan:

Mr. Tariq Shohab	Executive Engineer Operation Division Pak Pattan
Mr. Abdul Ghafoor	Executive Engineer, City Division
Mr. Mohammad Ali Ghumman	Executive Engineer, M&T Division
Mr. Manzoor Hussain Chohan	Regional Store Manager
Mr. M. Muhammad Iqbal Khan	Regional Director Inventory Control
Mr. Muhammad Anis Khan	Commercial Director
Mr. Ch. Sadiq Ali	Superintending Engineer, Ist Circle

AEB Faisalabad:

Mr. Muzafar Shafiq Azhar	Acting Commercial Director
Mr. Zia Ullah Awan	Executive Engineer Construction
Mr. Khalid Mehmood	Dy Commercial Manager under Chairman
Mr. Mohammad Said Naeem	Executive Engineer (E) 2nd Division

AEB Quetta:

Mr. Iftikhar Ahmad	Deputy Director, Office of Chairman
Mr. Dilawar Shah	Chairman
Mr. Noor Ahmad Mengal	Deputy Director office of Chairman (ED)

Mr. Wasif Khan	Junior Engineer Linemen Training Center, Sahiwal
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Muridke Division:

Mr. Arshad Mahmood	Executive Engineer
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Mr. Pervaiz Akhtar	Sub Divisional Officer No. 1
Mr. Nisar Ahmad Bazmi	Sub Divisional Officer No. 2
Mr. Nazir Ahmad	Field Store Manager
Mr. Muhammad Akhtar Khan	Revenue Officer
Mr. Abdul Majid	Sub Divisional Officer (Narang)