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WAPDA-USAID

POWER DISTRIBUTION PROGRAM

EVALUATION OF THE ENERGY LOSS REDUCTION (ELR) PROGRAM

EBASCO

JULY 1992

LAHORE, PAKISTAN

EBASCO OVERSEAS CORPORATION
WAPDA-USAID Power Distribution Program
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EBASCO

EBASCO/AID-92-08-04L

August 5, 1992

Mr. Farrukh Mahmood
Project Manager
Power Distribution Program
USAID
18 Sixth Avenue, Ramna-5
Islamabad

Subject: **Power Distribution Program 391-0473**
Contract # 391-0473-C-00-2589-00
Evaluation Energy Loss Reduction (ELR) Program

Dear Mr. Mahmood:

Attached are two copies of the EBASCO report entitled "Evaluation of the Energy Loss Reduction (ELR) Program", dated July 1992. The report presents the results of the specific task assigned to the EBASCO Team via USAID's Fax dated June 3, 1992.

The report includes recommendations to WAPDA and USAID, which we believe, upon their implementation will ensure the successful completion of the ELR Program.

Sincerely,

Louis A. Rodriguez
General Manager

cc: Javid Akhtar
A. Hafeez Ibrahim
S.M.A. Bokhari
M. Shahabuddin
Meraj Ahmed
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INTRODUCTION

A. PURPOSE AND SCOPE

At the request of USAID, via USAID FAX to EBASCO, dated June 3, 1992, an evaluation has been made of the USAID Energy Loss Reduction Program (ELR). The primary purpose of the evaluation was to examine the effective utilization of USAID financed ELR commodities, particularly the capacitors. In the process of the evaluation EBASCO was also to asses the existence of any ELR Program problems and the respective actions taken by WAPDA to correct such problems. Also, based on available ELR historical data determine the scope for improvements in the technical, operations and ELR administrative fields; review ELR progress and recommend better means, if any, to quantify the benefits being realized by WAPDA.

This report presents the results of the ELR Program evaluation. The evaluation results also identified some administrative and/or technical problems which in the past have delayed the effective implementation of ELR program and the measures taken to address such delays.

The report includes recommendations regarding the continuation of the USAID funded ELR program based on a critical analysis of the conditions affecting efficacy of the program with reference to user attitude and interest in maintaining the program.

B. SUMMARY

1. The results of the feeder rehabilitation and capacitor installation survey are satisfactory. The rehabilitated feeders were found operating satisfactory.

2. The total estimated cost for reconductoring 1,945 km of existing lines, constructing 296 km of new lines, installation of HT/LT capacitors, replacement of defective meters and providing T&P for construction works amounts to US $ 18.6 million. The actual cost to WAPDA after subtraction of USAID contribution of US $ 13.1 million is US $ 5.0 million. An estimated annual reduction in peak demand is 66.3 MW or an equivalent of a 65 MW gas turbine in generating capacity. The estimated economic annual benefit to WAPDA of the USAID and ADB ELR Programs to date is US $ 30.3 million, as shown in the following table:

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	USAID	ADB	TOTAL
Loss Reduction:			
Peak Demand (MW)	54.2	12.1	66.3
Energy (GWh)	171.7	37.5	209.2
Cost US $ Millions	15.8	2.8	18.6
USAID Contribution	-	-	13.1
Savings (US $ Millions)			
Peak Demand	18.1	4.0	22.1
Energy	6.7	1.5	8.2
Total Savings:			**30.3**

3. Minor discrepancies in feeder maintenance were found. In general the rehabilitated feeders maintain their original installation conditions as when originally inspected and certified by EBASCO.

4. The following Table 1 summarizes the results of the surveyed capacitor installations:

TABLE 1

CAPACITOR UTILIZATION STATUS
AS OF JULY 31, 1992
OVERALL SUMMARY - SEVEN AEBs

TOTAL CAPACITORS INSTALLED	=	743		
TOTAL SURVEYED	=	248		33.3%
TOTAL OPEN	=	25	OR	10.1% OF THE SURVEYED
TOTAL CLOSED	=	223	OR	89.9% OF THE SURVEYED

AEB	CAPACITORS INSTALLED	EBASCO* SURVEYED CAPS	EBASCO* SURVEYED %	CLOSED	OPEN	% OPEN
PESHAWAR	98	25	25.5	19	6	24.0
FAISALABAD	76	19	25.0	16	3	15.8
LAHORE	189	81	43.0	71	10	12.3
ISLAMABAD	93	54	58.0	49	5	9.3
GUJRANWALA	115	29	25.2	28	1	3.5
MULTAN	136	28	20.5	28	0	0.0
HYDERABAD	36	12	33.3	12	0	0.0

* Required percent check as per USAID Memorandum of June 03, 1992, is 25 percent minimum.

5. Capacitor installation status is as follows:

Type	Provided By USAID	Certified	Balance
Fixed	600	536	64
Switch	150	150	0
Total	750	686	64

6. Based on the records available within EBASCO, the ELR financial status at July 31, 1992, is as follows:

	Dollars X 1000
Available ELR Resources *	
FAR Funds Allocated by USAID	14,700
Material Purchased by USAID	8,196
Total Available ELR Resources	**22,896**

* ADB and other lending institutions resources not included.

Total Work Orders Certified	
Material Offset	8,196
Amount Reimbursed to WAPDA	4,892
Total Work Orders	**13,088**
Work Orders Pending Execution Based on PILs	
Material to be Offset	0
FAR Funds to be Utilized	1,089
Remaining Available Resources to WAPDA	
Material Available in the Stores	0
FAR Funds to be Utilized	8,719

C. RECOMMENDATIONS

The following recommendation are made, based on the evaluation results, EBASCO's project experience, the technical and economic benefits to WAPDA and the need to bring the project to a successful completion. The recommendations are divided in recommendations to WAPDA and recommendations to USAID as follows:

1. WAPDA

a. Maintain constant supervision on field operations to ensure that capacitors are maintained connected to the system.

b. Capacitor maintenance be transferred from the Operation Divisions to the M & T Divisions.

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c. Training of maintenance and operation staff be provided on a regular basis to ensure understanding of the feeder rehabilitation and capacitor benefits.

2. USAID

a. Continue providing assistance to WAPDA by maintaining the support for the ELR Program.

b. Ensure through the use of the Supervisory Consultant that the facilities remain in service and in operation in accordance with established procedures. Consultant, as in the past, will continue monitoring the program and report accordingly to USAID the progress and need for corrective action, if any.

II ELR PROGRAM

A. BACKGROUND

WAPDA acquired the overloaded and inefficient distribution system in 1959 from a number of private power companies. Since 1959 the WAPDA power system has been growing at a fast rate consistent with the need to provide electricity service to urban and remote areas of Pakistan. The rapid customer and load growth without the required timely addition of system facilities to augment system capacity created the conditions of the unreliable and inefficient system.

At the start of the program, in early 1984, the WAPDA power distribution system feeders were overloaded beyond their normal capacity to transfer electric power to WAPDA's customers. The overloading was primarily caused by the lack of adequate system planning for additional system facilities to meet the requirements for system expansion. This combined with the lack of the required level of funding to rehabilitate the system resulted in an unreliable distribution system with high electric power losses.

Traditionally the distribution system losses were never an important factor in WAPDA engineering decisions. However, the fluctuations in oil prices highlighted the scarcity of energy resources, the increasing costs of the electric energy supply and the value of a kilowatt-hour saved. Pakistan's energy situation made it imperative that the energy losses be decreased at the earliest possible moment. The USAID provided the much needed technical and financial assistance to improve the conditions of the power distribution system through the ELR Program.

B. POWER LOSSES

The electric power losses on a distribution system consist of two types. There is one type derived from the physical characteristics of the feeders used to supply the electric energy to the consumer. These losses are referred to as the "technical losses". Technical losses result from very low power factor, excessive ampere loading and undersize conductors combined with heavy loading conditions. The other type, referred to as administrative or "non-technical losses", is losses derived from the customers having illegal connections to the system, use of un-calibrated energy meters, human and/or software errors and meter readers under reading the actual consumption to reduce customer billings.

Technical losses can be minimized through proper design, planning, operation and maintenance of the system. These losses can be reduced to acceptable technical levels but can never be eliminated completely. The non-technical losses can be eliminated through

proper control and surveillance. Under the USAID funded Power Distribution Program, efforts have been made to control and reduce both technical and non-technical losses. Technical Energy Loss Reduction (ELR) is the subject of this report.

C. ELR PROGRAM

The ELR Program primarily deals with the rehabilitation of the existing heavily loaded feeders. A systematic approach to feeder rehabilitation requires a sequence of actions leading to the successful feeder rehabilitation. The basic description of the actions can be categorized as (1) collection of feeder data; (2) analysis of the feeder data; (3) development of alternative options; (4) selection of best option from a technical view point; (5) evaluation of improvement(s) to determine technical and economic benefits; (6) preparation of the work order proposal; (7) preparation and approval of the work order and finally the (8) implementation of the improvement(s).

There may be more than one solution for improving the feeder operating conditions to reduce the power loss which is the objective of the ELR program. The solutions become alternatives and each alternative must be examined from an economic view point. The alternative with the highest benefit to cost ratio is selected for implementation.

Attachment 1 includes some photographs that illustrate the conditions of the distribution system "before and "after" the feeder rehabilitation and capacitor installation program.

D. ELR PROGRAM FINANCIAL RESOURCES

Under the USAID Power Distribution Technical Assistance Program, the high power loss feeders considered to have the highest financial loss to WAPDA were identified. To improve the conditions of this power system required material, equipment and outside technical assistance. This in turn called for capital investments in the distribution system. USAID through the Fixed Amount Reimbursement Agreement and the Power Distribution Program has provided the financial and technical resources needed to meet program objectives. USAID allocated about 23 million dollars in funds for the Energy Loss Reduction Program under the overall WAPDA/USAID Power Distribution Program. The funds have been used in the procurement of commodities and technical assistance

In addition to the USAID financial aid and apart from WAPDA's own contribution towards distribution system rehabilitation under the Annual Development Program, WAPDA needed assistance from other funding agencies to augment financial resources. Various international funding agencies including Asian Development Bank and World Bank have been providing assistance in this regard.

E. COMMODITIES

The first deliveries of USAID funded commodities that included the HT capacitors both switched and fixed for power factor correction and the circuit rehabilitation commodities like conductors, sleeves and connectors etc., started in September 1986 and were completed by the end of 1988. The total USAID procured commodities amounted to US $ 8,196 Million.

The computer hardware and software for performing computer aided distribution planning and design were ordered in late 1985. The first system was placed in operation in March 1986.

F. TECHNICAL ASSISTANCE

The Consultants designed a microcomputer-based circuit analysis program and a manually operated work order system to initiate the implementation of the ELR program. As the USAID procured planning tools and commodities arrived, the work of Distribution system rehabilitation gained momentum. The manually operated work order system was also replaced with a simplified computerized (PC based) work order system developed by the Consultant (PTAT). Training in its use was provided to all AEB planning staff which facilitated the fast accurate and uniform development of ELR work orders.

As part of the technical improvements program, distribution construction, operation and maintenance reference guides for line crew work were developed. The recommendations for construction, operation and maintenance procedures were intimately associated with safe work recommendations incorporated to strengthen the WAPDA safety code. Side by side, procedures were developed for the monitoring and inspection of distribution construction works to guide WAPDA field staff and the Project ELR Inspectors in the monitoring of feeder rehabilitation works under the ELR Program. WAPDA and USAID signed a fixed amount reimbursement agreement that provided the legal frame work for reimbursement of construction costs of ELR works to WAPDA.

G. FEEDER REHABILITATION "CRASH PROGRAM"

Pending arrival of ELR commodities purchased under USAID funded first Invitation for Bid (IFB-I), a crash feeder rehabilitation program was initiated in early 1985. The program was to use available WAPDA commodities under the guidance and methodology provided by the Consultants (PTAT). Fifty four (54) high loss feeders from the Lahore and Peshawar AEBs were studied in detail. Proposals for 40 feeders were developed based on the technical and economic feasibility of rehabilitation. The proposals included

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feeder bifurcation, load transfers and reconductoring of HT feeder sections with larger ampacity conductor. Application of other ELR options like installation of capacitors was deferred until receipt of USAID funded commodity. This program was successfully completed in 1991.

H. USAID ENERGY LOSS REDUCTION (ELR) PROCEDURES

1. Review and Approval of Work Orders

The ELR program is being implemented in WAPDA's Power Distribution System on a highest energy losses - feeder priority basis. All ELR work orders are checked and reviewed by the Supervisory Consultant (SC) to assure conformity with WAPDA and USAID standards. SC has reviewed and approved **1378** work orders for the issuance of Project Implementation Letters (PILs) by USAID for implementation and reimbursement under the WAPDA/USAID Reimbursement Agreement of the ELR works. This includes **895** work orders reviewed and approved under the ADB funded feeder rehabilitation program. All work orders were reviewed for compliance with approved procedures, guidelines and the calculation methods.

Guidance and assistance on a continuous basis is provided to WAPDA HQ and AEB staff in the preparation of work orders following the approved Work Order procedures.

2. Work Orders Execution, Inspection and Monitoring

ELR Inspectors carried out and inspections of the completed ELR works for which work orders were approved by the SC and PILs were issued by USAID for their implementation. Certification of completion was provided for all such work orders that were completed by WAPDA in accordance with the work order proposals and following the approved applicable standard guides and design/drawings and which were constructed using USAID funded material, ADB funded material or WAPDA's own material procured from USAID approved sources. To date **566** work orders have been inspected and certification of completion provided for **564** work orders.

Documentation for Fixed Amount Reimbursement (FAR) at 70% involving about US $ 13.09 millions under the Reimbursement Agreement (RA) were prepared and provided to WAPDA/USAID for reimbursement processing. Training and guidance was provided to WAPDA staff for the finalization of reimbursement documentation following the approved procedures.

Attachment 2 graphically represents the utilization of funds in Work Orders certified as completed by EBASCO that qualify for reimbursement by USAID.

3. Construction, Maintenance and Operation Procedures/On the Job Training

As part of the effort of providing assistance and guidance to WAPDA in the implementation and institutionalization of the approved CM&O procedures, ELR Inspectors, during their inspection of ongoing and completed ELR works provided on the job training and advice, as required, to WAPDA construction staff in the proper utilization of construction procedures to achieve acceptable workmanship levels while adhering to the construction standards and design.

Relevant operating division technical representatives (Line Superintendents/Linemen) who are required to be available at the time of final inspections were provided with necessary guidance regarding the maintenance and operation aspects of the installed equipment and facilities. The objective is to achieve continued ELR benefits through the correct operation and timely maintenance of the facilities in accordance with predetermined schedules as established in the Maintenance Procedures Manual for line staff.

4. Safety

Field guidance and on the job training and clarifications, as needed, were provided to WAPDA construction staff in safety work procedures in accordance with the WAPDA Safety Code for constructing the lines and installing the proposed equipment during inspections of the ELR work orders. Completion of ELR work orders in accordance with laid down construction standards following the approved procedures ensures safety of the maintenance and operation (M&O) personnel and the installed equipment. In the performance of the final inspections the M&O staff were guided in the safety aspects of line and equipment maintenance in accordance with safety procedures and the available Distribution Maintenance and Switching guides.

5. Post Construction Monitoring

In order to ensure that the facilities constructed and installed under the ELR program remain energized and are utilized by WAPDA to their optimum benefits and with continued adherence to construction standards/specifications and safety requirements, random field inspections were carried out by ELR Inspectors of the completed and certified ELR works.

The Inspectors particularly made random inspections of installed capacitor banks in Lahore AEB for their continued utilization. The Inspectors provided field guidance in

capacitor operations and reemphasized their importance and benefits through classroom lectures. Reports were issued to WAPDA suggesting the needed remedial actions. Attachment 3 include copies of PTAT/EBASCO reports showing the results of post construction inspections conducted by EBASCO. Attachment 4 includes documentation showing WAPDA's corrective actions to ensure the success of the program. It should be note that WAPDA has taken strong measures in many cases to eliminate staff reluctance to the use of new facilities, methods and procedures.

6. Reporting of ELR Progress

ELR Inspectors prepare Inspection Reports of ELR works. These reports state the feeder location, name, inspection results, discrepancies and recommendations for corrective actions, etc. These reports are sent to WAPDA for review and corrective action including removal of discrepancies by AEBs in their feeder rehabilitation construction works - Attachment 5.

Monthly progress reports are prepared by EBASCO showing progress of various steps involved in the ELR activity. The reports summarize:

- The progress of work orders prepared by WAPDA and submitted to SC for review.
- WOs reviewed and approved by SC.
- Project Implementation Letters issued by USAID.
- WOs implemented by WAPDA.
- WOs inspected and certified by SC and
- reimbursements made to WAPDA by USAID.

These reports are issued to all relevant WAPDA offices for review, comments and action needed to expedite the ELR program where necessary. Sample copies of these reports are included in Attachment 6 of this report. Upon completion of the rehabilitation works by WAPDA and certification by the SC, WAPDA is assisted in preparing documentation for the reimbursement of completed work order by USAID as stipulated under the WAPDA/USAID Reimbursement Agreement.

We consider that the ELR reporting system as being followed is efficient and adequate to meet the requirements of the ELR program.

III. EVALUATION

A. APPROACH

The approach used to evaluate the effectiveness of the ELR Program was to conduct a survey of the facilities built/installed under the USAID program and to review available WAPDA, USAID and EBASCO documentation to determine problems, corrective actions and overall program status to date. EBASCO inspectors were sent to each Area Electricity Board to determine the physical status of the feeders rehabilitated and the capacitors installations. A review was made of available EBASCO reports and miscellaneous documentation on the subject to ascertain the overall benefits, if any, to WAPDA. EBASCO also conducted some interviews with key planning and operating personnel in an attempt to identify problems and possible solutions.

B. FIELD INSPECTIONS

1. Capacitors:

In accordance with the guide lines provided in USAID's memorandum of June 3, 1992, the EBASCO ELR Inspectors visited seven AEBs during June/July 1992 to inspect the rehabilitated feeders and capacitor installations. A list of all EBASCO certified line capacitor banks was used to randomly select the sites to be visited. EBASCO inspectors were to verify their continued utilization of the facilities. A minimum of 25% of the installed capacitor banks were inspected/surveyed at each AEB, the overall inspection percentage of installed capacitors for all AEBs is 33.3%. The capacitors operation was verified by ascertaining that these were connected to their respective circuits in continued conformance to the construction standards and were properly maintained as per established procedures and safety requirements.

Attachment 7, "Capacitor Utilization Status as of June 30, 1992" includes the tabulated results of the capacitors surveyed. A tabulation has been prepared for each AEB as shown in Attachment 7. The tables indicate the operational status of the inspected capacitors. A summary table provides information on the total capacitors installed at each AEB's operational area, total surveyed per AEB and the number of closed and open capacitors within each AEB.

2. Feeders

The EBASCO Inspectors while surveying the capacitors for their proper utilization by WAPDA, simultaneously checked the rehabilitated distribution feeders completed by WAPDA and certified by EBASCO Inspectors. The purpose of inspection was

to ascertain whether these feeders are being maintained by WAPDA operating staff properly in continued conformance with the established standards and safety requirement.

In general there were no problems identified with the rehabilitated feeders as these were found operating in accordance with their original installation.

IV. EVALUATION RESULTS

The following are the results of the evaluations which are based on the field surveys carried out by EBASCO Inspectors to assess the utilization and maintenance levels of the ELR facilities by WAPDA.

A. CAPACITORS

At the completion of the survey it was found that within seven AEBs an 89.9% utilization of installed capacitors (based on a sample check of 33.3% of the total capacitors installed in all AEBs). This result indicates a marked improvement in WAPDA's utilization of capacitors which was as low as 30% during the year 1991 as indicated in the post construction monitoring reports of the installed ELR facilities (capacitors) by PTAT during 1990-91 for Lahore AEB.

This capacitor utilization level by WAPDA is, however, below the limits maintained by power utilities around the world and needs further improvement. Based on capacitor utilization periodic status reports provided by the Consultants, efforts have been underway by WAPDA senior management to enhance the capacitor utilization to appropriate levels in order to achieve the envisaged ELR benefits. WAPDA has taken a number of measures both in technical and administrative areas to improve the situation. Sharp increase in the utilization of capacitors from 30% to 89.9% is the result of the measures taken by WAPDA to correct the problem.

B. DISTRIBUTION FEEDERS

Upon completion of the ELR work order, the rehabilitated feeders are handed over by the construction staff to the relevant Operating Division for their maintenance and operation. Generally the conditions of the rehabilitated feeders were found satisfactory in accordance with the construction standards and safety requirements. The workmanship levels have been maintained. In isolated instances some connectors on T-off connections were found removed. Such conditions were reported to relevant WAPDA staff for rectification. Apparently the M&O staff missed replacing the connectors after completing the maintenance work on the relevant T-off. Grounding of structures in some cases was found displaced due to public vandalism. WAPDA has been taking appropriate measures to restore the grounding system.

V. ELR PROGRAM BENEFITS

A. OVERALL

The ELR program has been a key element in the USAID technical improvements program for the WAPDA Power Distribution Wing. It has been and continues to be the means by which the many technical procedures, specifications, computers, software, material and tools, meters and other improvements developed and/or provided under the WAPDA-USAID Power Distribution Program (PDP) can be tested.

The program has provided enormous opportunities to WAPDA Distribution staff to understand, learn and implement the upgraded standards, policies, procedures and methods applicable to Distribution Planning, Engineering, Construction, Maintenance, Safety and System Operations functions. Modern and sophisticated computerized work techniques and evaluation tools used in system planning and engineering have been made available to WAPDA under the PDP to assist in the efficient implementation of the ELR program.

WAPDA Distribution planning, engineering and CM&O functions have gradually adopted the modern concepts and methodologies introduced under the PDP to upgrade the power distribution system. As an example, at present every AEB is utilizing the computerized Work Order System (CWOS). The CWOS is the latest tool provided to WAPDA to expedite the development of ELR Work Orders. The program will be used by WAPDA to control all construction works, issuance of store material, costs and completion schedules. A major tool in accountability for senior management with significant benefits to WAPDA. The progress in the preparation and implementation of ELR WOs, although slow in the beginning, has increased sharply as the staff's reluctance and resistance to change from the traditional methods was overcome.

To successfully achieve the projected ELR objectives, a close and vigorous follow up joint effort by WAPDA and the Consultant must continue. To discontinue the program at this stage would have upon WAPDA detrimental technical and economic effects. This may lead to the failure of the ELR program. Continuation of USAID ELR program will ensure that the technical concepts and procedures already in use will become a permanent asset within the WAPDA Distribution function. The program, after the implementation of the corrective actions to ensure proper use of the installed capacitors, can be considered successful. The program has saved WAPDA millions of Rupees through the reduction of power losses.

Field maintenance and operation staff are more conscious of their obligations to maintain the installed facilities in accordance with the approved standards. The customer service reliability has improved, power losses have decreased, revenue has increased and customers and WAPDA are satisfied.

Continuation of ELR program with USAID assistance will provide the impetus to WAPDA in moving forward to become a self sufficient and efficient power utility.

B. TANGIBLE

Implementation of the USAID funded ELR program via the Distribution system rehabilitation and capacitor installation has substantially benefitted WAPDA in terms of energy loss savings. An estimate of this tangible benefit to WAPDA is summarized in Attachment 8 which highlights Area Board wise the "before " and "after" rehabilitation peak demands and kW losses and the net kW loss saved. The resultant annual energy loss savings in terms of US dollars for both demand and energy saved is calculated.

The estimated annual saving to WAPDA to date as a result of implementation of ELR program is estimated as US $ 30.3 Million. The "before " and "after" rehabilitation power loss percentages shown in the last columns of the table depict the power loss savings to WAPDA.

The following are other tangible technical benefits that can be measured:

- Improved power factor.
- Improved voltage levels.
- Improved reliability in customer service.
- Reduction in maintenance costs.

C. INTANGIBLE

Implementation of USAID ELR program has greatly benefitted WAPDA in terms of intangible benefits. These benefits are evident in the specific areas where implementation of ELR work orders has been effected. Contact with customers, grid station information on feeder loadings and trippings and the field operating staff reports on power failure emergencies are a measure of assessing the intangible benefits accruing to WAPDA. Some of the intangible benefits are listed below:

- Increase in revenues due to increased continuity in supply of electric power to customers.

- A kilowatt of power saved results in an equivalent deferral in a kilowatt of generating capacity.

- Improved public image.

- Reduction in capital investment in power generation.

In addition to the above benefits the ELR program has been instrumental in the institutionalizing in WAPDA system of the modern planning/engineering tools like the computerized work order system and the computerized feeder operating conditions analysis programs.

VI. RECOMMENDATIONS

The following recommendation are made, based on the evaluation results, EBASCO's project experience, the technical and economic benefits to WAPDA and the need to bring the project to a successful completion. The recommendations are divided in recommendations to WAPDA and recommendations to USAID as follows:

A. WAPDA

1. Maintain constant supervision on field operations to ensure that capacitors are maintained connected to the system.

2. Capacitor maintenance be transferred from the Operation Divisions to the M & T Divisions.

3. Training of maintenance and operation staff be provided on a regular basis to ensure understanding of the feeder rehabilitation and capacitor benefits.

B. USAID

1. Continue providing assistance to WAPDA by maintaining the support for the ELR Program.

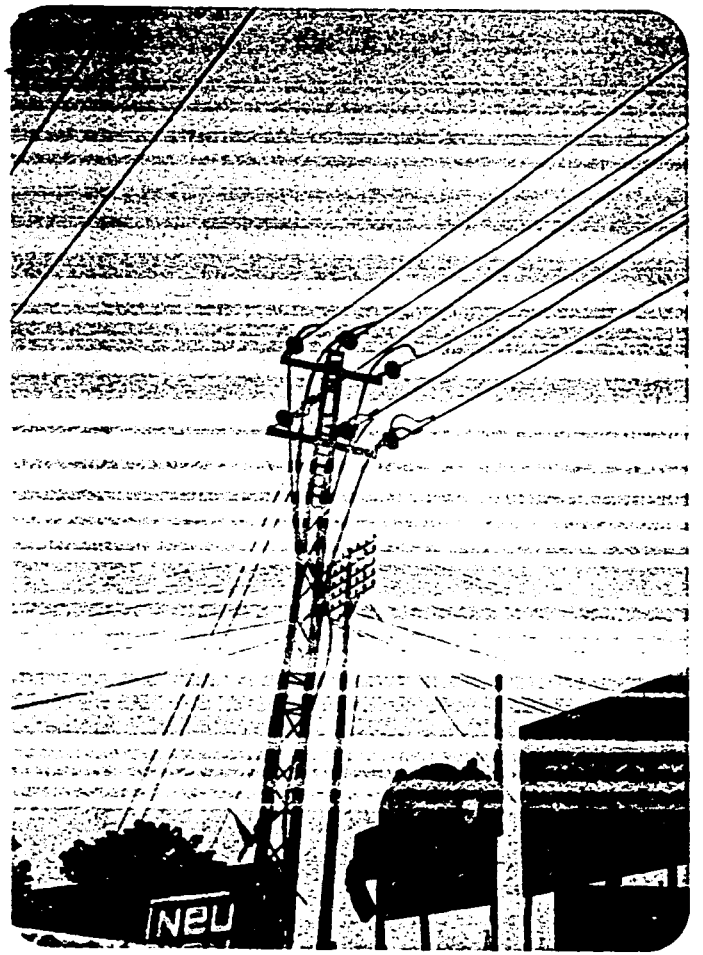
2. Ensure through the use of the Supervisory Consultant that the facilities remain in service and in operation in accordance with established procedures. Consultant, as in the past, will continue monitoring of the program and report accordingly to USAID progress and need for corrective action, if needed.

VII. ATTACHMENTS 1-8

ATTACHMENT 1

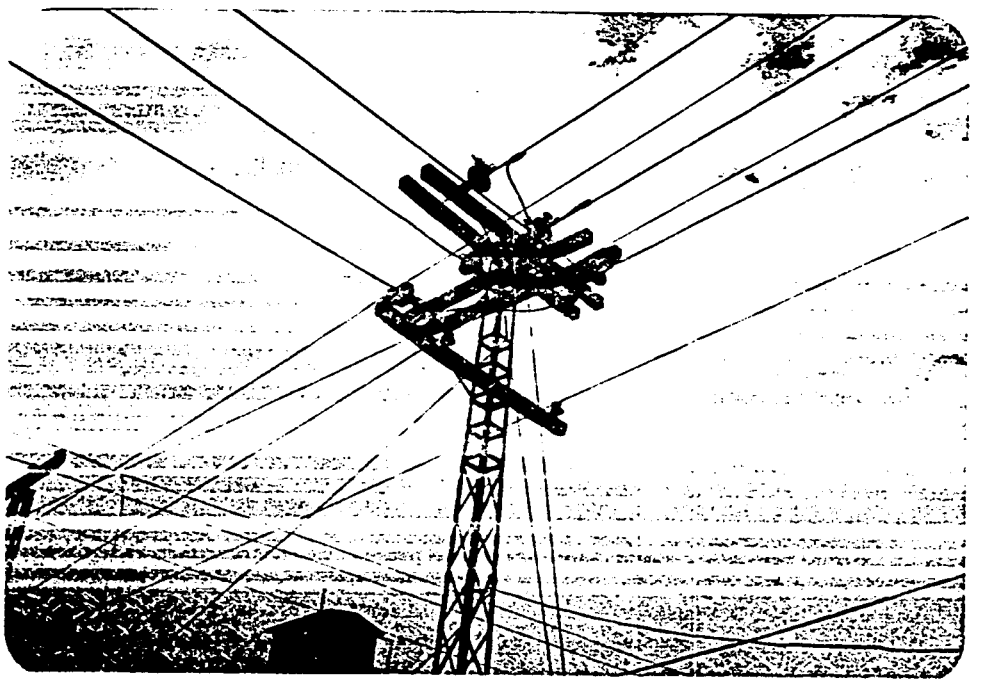
PHOTOGRAPHS ILLUSTRATING CONDITION OF
DISTRIBUTION SYSTEM "BEFORE" AND "AFTER"
FEEDER REHABILITATION

BEST AVAILABLE COPY



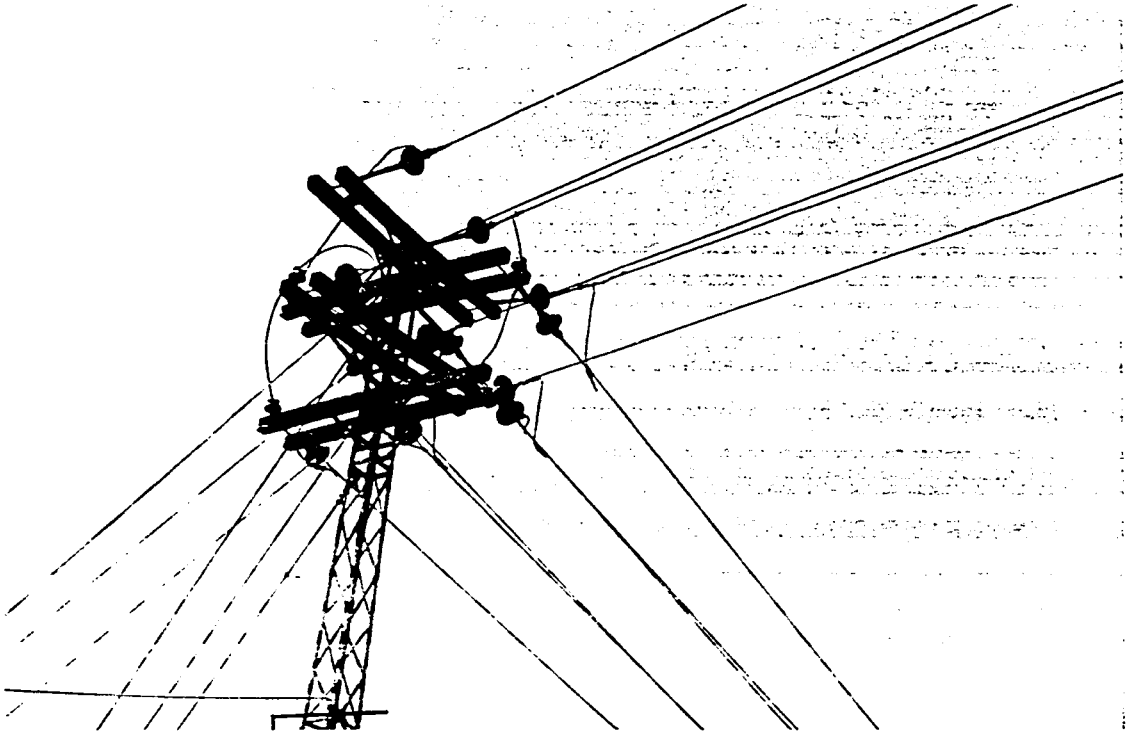
"BEFORE"

NON-STANDARD
"WRAPPED AROUND"
CONNECTION



"AFTER"

PARALLEL GROOVE CONNECTORS
USED AS PER SPECIFICATION

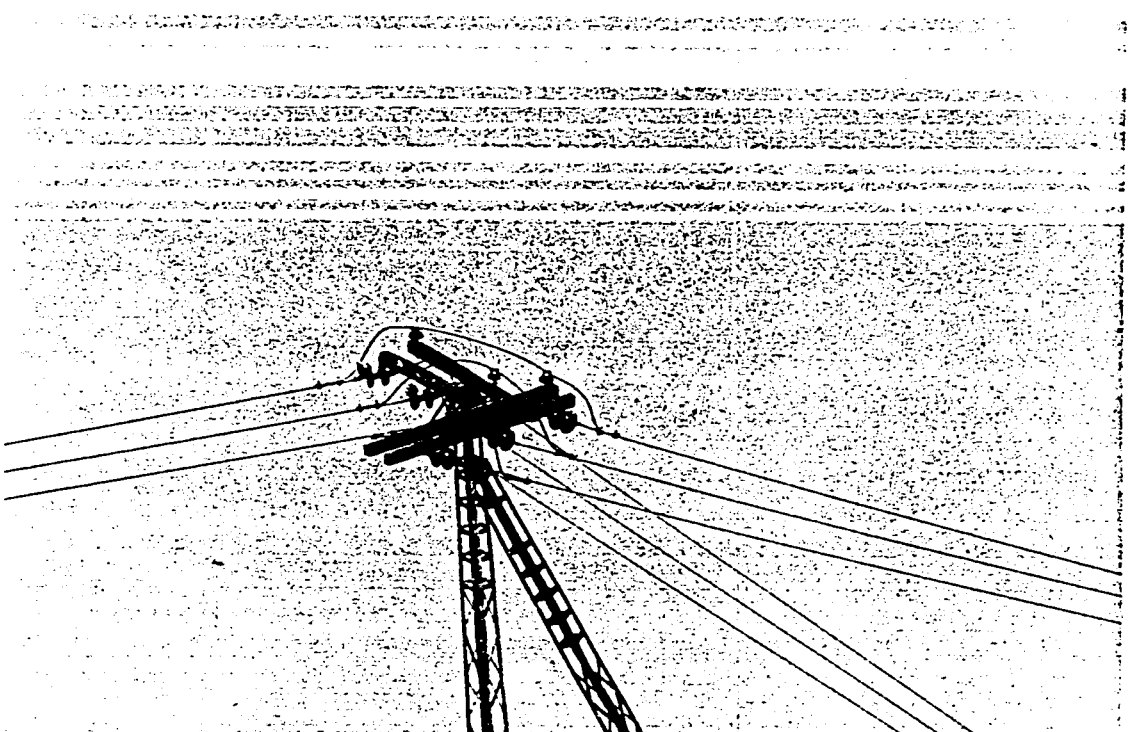


"BEFORE"

NON-STANDARD
"WRAPPED AROUND"
CONNECTION

"AFTER"

PARALLEL GROOVE CONNECTORS
USED AS PER SPECIFICATIONS



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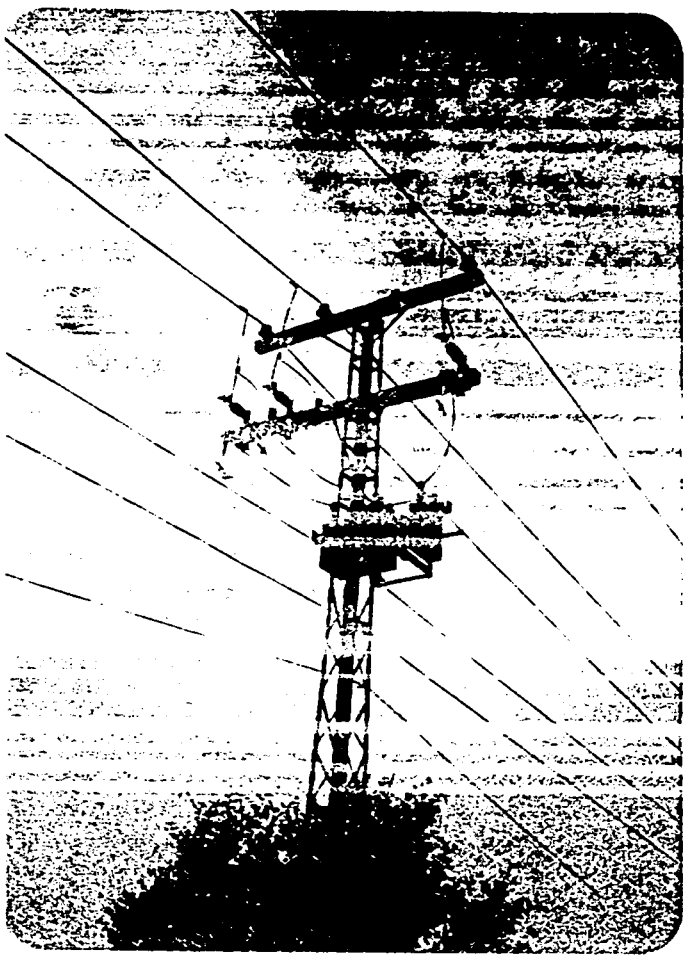
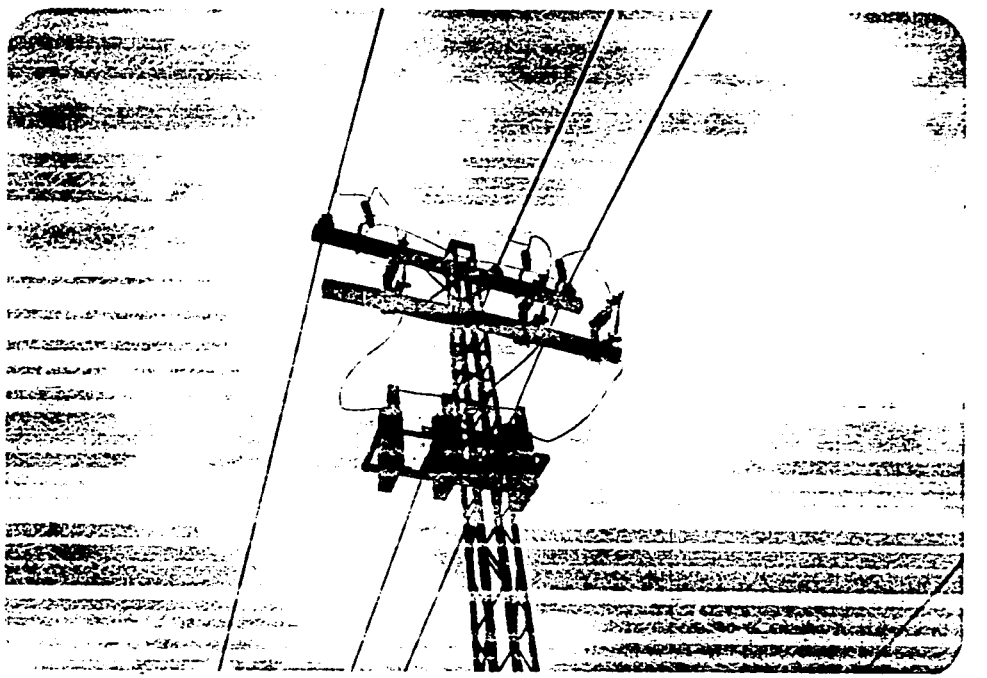


OPEN CAPACITOR



CLOSED CAPACITOR

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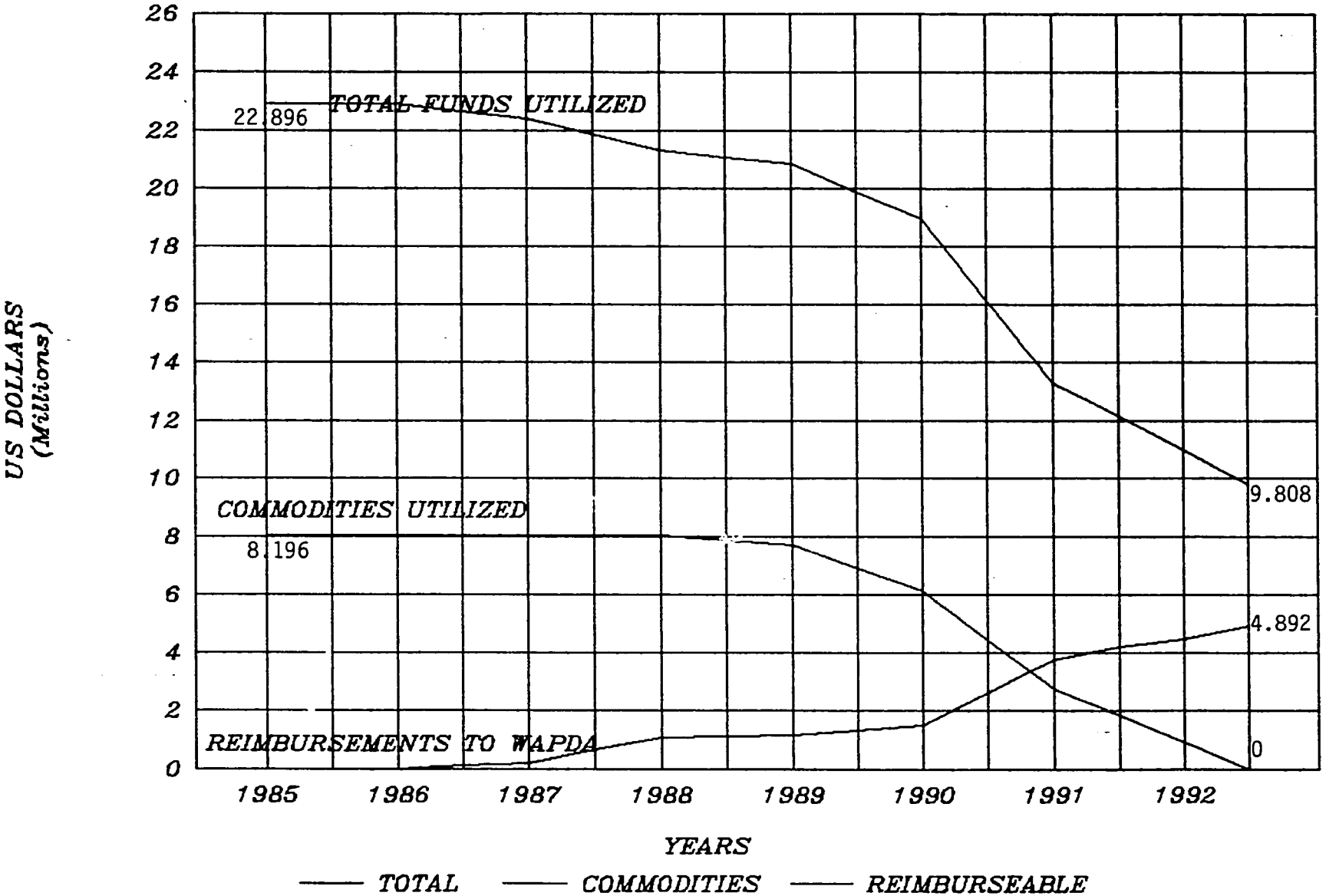
ATTACHMENT 2

GRAPH ON UTILIZATION OF ELR FUNDS

USE OF ELR FUNDS

TO JULY–1992



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ATTACHMENT 3

PTAT/EBASCO CAPACITOR STATUS REPORTS

INTER-OFFICE MEMORANDUM

IOM/30/90/121 September 24, 1990

To : S M A Bokhari
GM Operation (D), WAPDA

From : L A Rodrigues
CC Plng, Engg & Opr, PTAT

Subj : Survey Results of Disconnected 11 kV Capacitor Banks

On August 29 and 30, 1990, a physical survey of capacitor banks was conducted in the Lahore AEB by PTAT Operations Component. This survey was a follow up of the June 4, 1989 survey report prepared by PTAT on capacitor banks installed but not connected to the distribution system. Mr Waseem Khan, former Managing Director, issued an Office Order dated December 26, 1989, (Attachment A) instructing all AEBs that field staff was to maintain the capacitors connected to the system if WAPDA was to derive the full economic benefit of the power loss reduction program. Included herewith are the findings of the August 1990 Lahore AEB Survey.

The list of capacitors installed and certified as operational in various AEBs to the end of August 1990 is as follows:

AEB	Capacitor Banks Both Switched & Fixed
Lahore	127
Gujranwala	95
Hyderabad	10
Islamabad	82
Multan	71
Peshawar	93
Faisalabad	60

The above listing shows that 127 capacitor banks have been installed in the Lahore AEB.

A random inspection of 28 out of the Lahore 127 capacitor banks (See Attachment B), already certified under the USAID ELR Program, was carried out on August 29 and 30, 1990. The result of that survey/inspection showed that 19 banks were not in operation due to having their fuse link rods open. Only 9 capacitor banks out of the 28 were operating. That is, 68% of the surveyed capacitor banks were found disconnected from the system.

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Attachment C includes a series of photographs along with the capacitor locations that clearly illustrate the current status of the capacitor banks inspected.

In general, it has been noticed that many of the installed capacitor banks are out of circuit in other AEDs also.

Apart from the indifference displayed by the operating staff in keeping the capacitor banks connected to the system, the following problems have been identified as contributors to the operational inefficiency of both staff and the equipment:

1) Fuse cutouts used are of poor quality. Vibration may cause the fuse to drop out of the holder. Subsequent arcing can cause damage leading to failure of the other phases.

2) Lack of proper tools available for the construction crews which result in poor connections leading to failures or improper operation of the capacitors.

3) Lack of specific training of linemen, supervisors and technical personnel. The result is fear and lack of understanding. Linemen attempt to re-fuse capacitors using under sized fuses.

4) Installing fuses from the ground is very difficult. The result is that sometimes the fuses are dropped and damaged.

The following recommendations are offered:

1. Increase training of construction, operating and engineering personnel.

2. Available guides must be used to determine the proper initial capacitor control settings on switched capacitors.

3. A monitoring process should be set up. Metered load and power factor data could be extracted from the feeder data base. Analysis of historical information from before and after capacitors were installed could determine if the capacitors are energized or not.

4. Implement recommendations made in the June 4, 1988 report. (Attachment D).

cc: H Ibrahim, A Sayed, H H A Rayani, Shahab-ud-din, A H Hassoem, J B Carter, C H Wright, L A Kittilstad

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ATTACHMENT B

LIST OF CAPACITOR INSTALLATIONS SURVEYED AUG 30, 1990

S.No	450 kVAr Capacitor Banks	Location	Status	Remarks
1.	Fixed	Opp. Services Hospital Jail Road	Open	-
2.	Fixed	Near Cricket House Bldg Jail Road	Open	-
3.	Fixed	Opp Lahore College for Women - Jail Road	Closed	-
4.	Fixed	Near Ichhra More - Main Ferozpur Road	Open	Jumpers have been removed.
5.	Fixed	Canal Bank between Mall & Saddar (Garhi Shahoo)	Closed	-
6.	Switched	Dharmpura Main Road - Near Dhobi Ghat	Open	-
7.	Fixed	In front of Saddar WAPDA Substation on round-about	Closed	-
8.	Fixed	Near Saddar Police Station	Open	-
9	Switched	Near Gonda Nala - Dharmpura	Open	-
10.	Switched	Near Shama School - Saddar Dharmpura	Open	-
11.	Fixed	Main Timber Market - Ravi Park	Closed	Direct Jumpers to Capacitor
12.	Fixed	Near 169-Ravi Park	Closed	Direct Jumpers to Capacitor and Common Point Burnt
13.	Fixed	Near Ihbab Hospital - Ravi Park	Closed	L A out of Circuit
14.	Fixed	Texali Gate	Closed	
15.	Switched	Data Darbar Chowk	Open	

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16.	Fixed	Opp Sardar Bakery Samanabad	Open	-
17.	Fixed	Muslim Store - Isar School, Samanabad	Open	-
18.	Fixed	Makki Thati Aslam Eye Hospital Samanabad	Open	-
19.	Fixed	Aaurangzeb Block - New Garden Town	Open	-
20.	Fixed	Davis Road opp Jang Newspaper Office	Open	All Jumpers and L A Removed
21.	Fixed	Lane Near Jang News-Paper Ofc, Davis Road	Closed	-
22.	Fixed	Abbot Road opp T V Station	Open	P out cut without fuse closed
23.	Fixed	Opp General Hospital Ferozpur Road	Open	-
24.	Fixed	Daras Road	Open	-
25.	Fixed	Sham Nagar	Closed	-
26.	Fixed	G.T. Road (Shahdara)	Open	-
27.	Fixed	Faki Thatti Samanabad	Open	-
28.	Fixed	Newage Coaching Centre Samanabad	Open	

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"ATTACHMENT "D"

INTER-OFFICE MEMORANDUM

IOM/30/88/89

June 04, 1988

To : Mr. Waseem Khan
Managing Director, WAPDA

From : L. A. Rodriguez
Managing Consultant Operations (A)

Subj : HT Capacitor Installations
Study & Investigation of Operational
Hold-ups

As per your request, we have completed the field investigations made to determine the reasons for the significantly high number of disconnected 11 kV capacitors.

The attached report presents the results of these investigations. It includes recommendations which are to be followed by WAPDA Planning and Engineering (Dist.) and Distribution Operations Departments.

cc: Ch. Ghulam Farid, G.M. Operations
M. Rafiq, Director, WAPDA
Bahadur Ali Khan, Deputy Director, WAPDA
Sheikh Saleem, Assistant Director, WAPDA
J E Andrews
J E Heifner
L A Rodriguez
T J Walker

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H.T. CAPACITOR INSTALLATIONS
STUDY & INVESTIGATION OF OPERATIONAL HOLDUPS

A. GENERAL

In accordance with the study plan outlined by PTAT Managing Consultant in his IOM dated May 21, 1988, visits were scheduled within the Lahore City area to investigate reasons and problems affecting the utilization of the HT capacitors installed on various 11 kV circuits emanating from different Lahore City grid stations.

Thirty (30) job orders comprising sixty one (61) capacitor installations involving thirty feeders emanating from seven different grid stations were selected for investigation (see Attachments I and II). WAPDA Distribution Engineering staff along with PTAT Operations personnel carried out the investigation.

Visits were made on May 23, 25 and 26, 1988.

The team consisted of the following personnel:

WAPDA	PTAT
M. Rafiq, Director	U. H. Khan, Advisor Operations
Bahadur Ali Khan, Deputy Director	R. Naseem Khan, Inspector
Sheikh Saleem, Asst. Director	L.A. Rodriguez (Part-time) Chief Consultant, Operations
	T.J. Walker (Part-time) Chief Consultant, Planning and Engineering

ATE-WISE VISIT ACTIVITIES

3-5-88

artaba grid station was visited. Nine of the affected 11 kV ircuits, with capacitor installations, emanate from this grid tation. Concerned XENs Operation, their SDOs and Line uperintendents, along with the related XEN Cohstruction and his taff were present for discussion.

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Comments/observations were invited from all present on the following pertinent points :

1. An appreciable number of capacitor banks had been lying disconnected for indefinite periods. Was there any valid reason for this?

2. Did the grid station operators experience problems with the operation of circuit breakers controlling the feeders with capacitors in circuit?

Regarding the first point, no reason for keeping the capacitor installations open, except where damage was apparent, was put forward by the Operations staff. Out of the 13 capacitor banks reported earlier to have been lying disconnected, ten (10) had been put back into circuits. The remaining 3 banks could not be energized because of visible or suspected damage.

As regards the second point the gridstation operators were clear that neither any problem had been encountered at the time of switching in of the circuit breakers after installation of the capacitors nor the Operations line staff had ever informed them that any feeder tripping was attributable to the capacitor installations.

In order to verify the effect on the grid station breaker operation of the capacitors installed on the circuit, Rajgarh feeder from Qartaba grid station, with 5 HT capacitors in circuit, was opened and reclosed after an interval of two minutes. The circuit breaker held perfectly.

Each individual capacitor installation location was visited to ascertain its current operational status. Except for the three where damage was apparent, all other capacitor banks were operational.

5-5-00

Three grid stations (Garden Town, Shadman and Ravi) were visited. 10 feeders emanating from these grid stations had 7 capacitor banks lying disconnected according to the earlier report. With 2 more installations damaged by the time this investigation went underway, the total of capacitor banks lying disconnected had risen to 9. Out of these, 3 banks had been put into circuit by the Operations staff. Four (4) are lying open due to visible damage (3 on Ravi Park and 1 on Lahore - 4 feeders) and 2 installations have been left disconnected without any apparent reason. Operations line staff was not available for connecting these 2 installations at the time of investigation team's visit to the individual capacitor installation.

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26-5-88

17 Capacitor installations on 11 feeders emanating from 3 grid stations (Sunny View, Fort and Saidpur) were visited. 11 installations out of the total 17 had been reported disconnected according to the earlier report. The status observed was still the same.

It was noted that 5 of the banks were left open without any reason. 5 banks were lying disconnected due to apparent damage. One bank (McLeod Road feeder) has been dismantled after the structure on which it had been mounted was hit by a truck and had to be replaced.

B. CONCLUSIONS

As a result of the above visits to 7 grid stations involving 30 feeders with 61 capacitor installations, following conclusions have been drawn:

1. The summarized status of the 61 capacitor locations inspected (Attachment 1) reveals that although 12 installations were lying disconnected, having been damaged, another 19 had been left disconnected without any valid reason. 12 out of these 19 had been brought on to circuits just before the visit of the investigation team. The remaining seven are still open without apparent reason

2. Most of the undamaged but disconnected banks have remained disconnected for months on end. No record of any capacitor banks connected to or disconnected from a circuit exists. Similarly, not a single report on any of the damaged installations was made to the relevant authorities. It is impossible, at this stage without any written record, to correlate line faults with the damaged capacitors.

3. In most cases the damage observed is on the common neutral side of the capacitor cans where the bushing has cracked, common neutral burnt and the fluid spilled out.

4. Preliminary information, obtained from Peshawar and Multan AEDs, indicates no serious problems in terms of damage to capacitor banks or their functioning.

5. All capacitors failures appeared to be resulting from transient over voltages. Generally, the neutral bushing of the middle phase capacitor flashed over. In 3 cases, a lightning arrester also failed.

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6. The transient overvoltage is aggravated by the poor earthing conditions which exist.

C. RECOMMENDATIONS

1. WAPDA Operation/Maintenance staff have to be educated and briefed thoroughly on the merits and benefits of HT capacitor installation.

2. Monitoring of the HT capacitors installed is required.

3. Damaged capacitors have to be dismantled and examined for the extent and reasons of damage. The manufacturers/suppliers may have to be contacted for warranty if possible manufacturing defects are identified.

4. The damaged capacitor cans should be removed and replaced with new ones to ensure continued benefits of capacitor installation program.

5. Perform similar investigations into capacitor behaviour in Peshawar and Multan AEDs where a sizeable number of capacitor installations have been completed. Earth resistance measurements should be made at representative locations in these AEDs.

6. Failed capacitor cans should be replaced. The failed can should be shop tested to measure capacitance. The range of acceptable values is 11.84 to 13.6 mfd.

7. Earthing measurements should be made at each location; pole base and at arrester connection. Comment on compliance with standards.

8. A sample of 15 banks should be connected grounded wye, and any resultant protection problems closely monitored and documented to allow further study.

9. The standard for grounding should be reviewed.

10. The surge arrester specification should be reviewed and compliance of existing arresters confirmed.

11. The capacitor specification should be reviewed with emphasis on the bushing BIL, and compliance confirmed.

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ATTACHMENT I

STATUS OF 51 H.T. & PROTOR INSTALLATIONS INSPECTED IN LAHORE A.E.S.

DATE VISITED	GRID STATION	J.O. NUMBER	FEEDER	TOTAL NO. OF CAPS INSTALLED	CAPS. OBSERVED DISCONNEC PER PREV. VISIT BY PTAT	CAPS. OBSERVED DISCONNEC ON THIS VISIT	REASON FOR DISCONNECTION: NOS	REASON FOR DISCONNECTION: APPARENT DAMAGE	REASON FOR DISCONNECTION: NOS. WITHOUT APPARENT DAMAGE
23/5/88	QARTABA	23	POONCH ROAD	4	4	1	1	FLUID LEAK	-
"	"	39	TEMPLE ROAD	5	4	-	-	-	-
"	"	33	RACE COURSE	3	1	1	1	NEUTRAL BROKEN	-
"	"	29	FATEHSHER	1	-	-	-	-	-
"	"	34	JAIL ROAD	2	1	1	1	TWO FUSES BLOWN DAMAGE SUSPECTED	-
"	"	42	ALFALAH	2	1	-	-	-	-
"	"	27	NEW SAMANABAD	3	1	-	-	-	-
"	"	30	RAJGARH	6	1	-	-	-	-
"	"	10	C.T.O.	1	-	-	-	-	-
25/5/88	GARDEN	47	GARDEN TOWN	2	2	-	-	-	-
"	TOWN	36	FEHMANPURA	1	-	-	-	-	-
"	"	49	LINGRE 4	2	2	2	1	FLUID LEAK ON ONE	1
"	"	32	ICHHRA WEST	2	-	1	-	-	4
"	"	45	INDUSTRIAL	2	-	-	-	-	
"	SHADMAN	31	GHAZALI ROAD	2	1	-	-	-	-
"	"	44	ICHHRA EAST	1	-	-	-	-	-
"	RAVI	16	RAVI PARK	3	1	3	3	NEUTRAL BROKEN BUSHINGS DAMAGED	-
"	"	9	ROHKI ROAD	1	1	-	-	-	-
"	"	1	SHAGAIPURA	1	-	-	-	-	-
26/5/88	SUNNY	47	WAPDA CENTER	1	-	-	-	-	-
"	VIEW	41	EGERTON ROAD	1	-	1	-	-	1
"		11	MCLEOD ROAD	3	3	3	2	(1) NEUTRAL BROKEN (2) STRUC. HIT BY TRUCK. DISMANTL.	1
"	"	31	DAILY MASHRIQ	2	2	2		-	2
"	"	13	DAVIS ROAD	2	1	2	1	FLUID LEAK. PHASE BUSHING DAMAGED.	1
"	"	25	BEADON ROAD	2	1	2	2	NEUTRAL BROKEN ON DOTH.	-
"	FORT	17	DATA DARBAR	2	1	-		-	-
"	SAIDPUR	25	CHAUBURJI PARK	1	1	1	1	FLUID LEAK. NEUTRAL BUSHING DAMAGED.	-
"	"	24	SULTHAN-E-RAVI	1	1	-	-	-	-
"	"	26	MAHANKOT	1	1	-	-	-	-
"	"	23	MIAZ BEG	1	-	-	-	-	-

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ATTACHMENT 2

GRID STATION DATA

SR. NO.	FEEDER	MAX. LOAD (AMPS) JAN	FEB	MAR	APR	GRID STATION	RELAY SETTINGS O/C (AMPERES)	E/F (AMPERES)	INST (AMPERES)	TIME SEC.	C.T. RATIO	NO. OF CAPS	NO. OF TRIPPINGS JAN	FEB	MAR	APR
1	RAJGARH	210	240	200	250	QARTABA	5	0.5	20	0.2	400/5	6	6	9	5	-
2	POONCH ROAD	230	180	170	180	"	5	0.5	20	0.2	"	4	21	23	16	1
3	TEMPLE ROAD	170	160	170	200	"	5	0.5	20	0.2	"	5	11	25	9	6
4	ALFALAH	110	110	90	150	"	5	0.5	20	0.2	"	2	7	9	7	5
5	C.T.O.	200	190	170	270	"	5	0.5	20	0.2	"	1	8	21	10	5
6	NEW SAMANABAD	100	100	100	120	"	5	0.5	20	0.2	"	3	5	7	2	5
7	FATEHSHER ROAD	80	80	90	110	"	5	0.5	20	0.2	"	1	8	10	2	3
8	RACE COURSE [illegible]	110	90	90	120	"	5	0.5	20	0.05	"	3	-	-	-	-
9	JAIL ROAD	90	100	90	120	SHADMAN	5	0.5	20	0.1	"	2	-	-	-	-
10	GHAZALI ROAD	190	200	200	150	"	5	0.5	20	0.1	"	2	38	82	31	2
11	IQBAL EAST	150	140	120	150	"	5	0.5	20	0.1	"	1	14	12	1	4
12	IQBAL WEST	150	150	150	150	"	5	0.5	21	0.1	"	2	17	15	3	4
13	GARDEN TOWN	110	115	100	270	GARDEN TOWN	1.75	1	20	0.15	"	2	-	1	-	1
14	REHMANPURA	140	120	125	155	"	5	0.4	20	0.1	250/5	1	-	2	-	1
15	LAHORE 4	110	110	115	150	"	5	0.5	20	0.1	"	2	-	-	-	1
16	INDUSTRIAL	155	70	60	125	"	2.5	1	20	0.1	400/5	2	1	2	-	-
17	HAYAT CENTER	110	70	80	120	SUNNY VIEW	2.5	0.5	10	0.1	"	1	15	25	18	8
18	EGERTON ROAD	120	100	100	160	"	3.75	1	20	0.1	"	1	15	35	21	23

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GRID STATION DATA

ATTACHMENT 2

SR. NO.	FEEDER	MAX. LOAD (AMPS) JAN	FEB	MAR	APR	GRID STATION	RELAY SETTINGS (AMPERES) O/C	E/F	INST	TIME SEC.	C.T. RATIO	NO. OF CBS	NO. OF TRIPPINGS JAN	FEB	MAR	APR
19	McLEOD ROAD	240	300	220	290	SUNNY VIEW	3.75	0.5	10	0.1	400/5	3	17	57	44	21
20	DAILY MASHRIQ	140	320	160	240	"	3.75	0.5	20	0.1	"	2	16	21	22	21
21	DAVIS ROAD	110	100	100	160	"	5	0.5	20	0.15	200/5	2	1	8	8	9
22	BEACON ROAD	190	180	170	220	"	3.75	0.5	10	0.1	400/5	2	20	40	18	26
23	RAVI PARK	190	190	200	240	RAVI	4	1	20	0.1	"	3	7	10	11	14
24	MOHNI ROAD	160	180	200	210	"	4	1	20	0.1	"	1	13	14	10	13
25	SHAGATPURA	190	210	200	220	"	4	1	20	0.1	"	1	3	10	6	7
26	DATA DARBAR	210	210	220	250	FORT	4	1	20	0.1	"	2	12	25	19	8
27	NAWANSHI	140	140	180	200	SAIDPUR	5	0.5	20	0.05	"	1	2	7	4	4
28	SULCHAN RAVI	110	120	100	110	"	5	0.5	20	0.05	"	1	20	20	8	1
29	CHAUBURJI PARK	200	200	250	210	"	5	0.5	20	0.05	"	1	6	17	14	2
30	NIRE BEG	150	150	150	150	"	3.75	0.5	20	0.05	"	1	6	11	6	13

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INTER-OFFICE MEMORANDUM

IOM/30/91/110 September 19, 1991

To : S M A Bokhari
GM Operation (D), WAPDA

From : L A Rodriguez
CC Planning, Engineering & Operations, PTAT

Subj : **Disconnected 11 kV Capacitor Banks**

Random field surveys of H.T. line capacitors installed under the USAID ELR Program have been carried out by PTAT in Lahore city area from time to time to verify utilization of the capacitors for their continued benefit to the WAPDA Distribution system. Many of the capacitor banks were found to have been in-operational/disconnected from the system. The results of the surveys were conveyed to General Manager Operation (GMO)(D) for information and suitable action.

Acknowledging the serious set back to the ELR effort due to the disconnected capacitor banks, different directives were issued to the Maintenance/Operation staff by the GMO (D)/Managing Director (D) at different times to address the issue. Punitive action was also taken against six SDOs considered responsible for the negligent attitude of their supervisory staff in keeping the capacitors in circuit.

PTAT survey results are summarized below:

First Survey - August 28-30, 1990:

19 capacitor banks were found open out of the 28 surveyed. Thus 68% of the surveyed capacitor banks were found disconnected from the system.

Second Survey - April 21, 1991:

10 capacitor banks out of the 14 inspected were found open. This amounted to 72% of capacitor banks disconnected out of the 14 inspected.

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Third Survey - September 3-10, 1991:

43 capacitor banks out of the 70 surveyed were found either disconnected from line or their dropout cutouts were closed without fuses to create an impression of capacitor being in circuit. In some cases individual units of the capacitor bank were found to have been removed for reasons unknown. 61% capacitor banks were thus found disconnected out of the 70 inspected. Attached list shows the locations of the recently surveyed capacitor banks in Lahore city area.

The total number of capacitor banks both fixed and switched installed at Lahore AEB and certified as operational under the USAID/ADB feeder rehabilitation (ELR) programs are as follows:

	450 kVAr Banks Fixed	450 kVAr Banks Switched	900 kVAr Banks Switched
USAID ELR Prog	131	56	10
ADB ELR Program	50	40	36
	181	96	46

A lot of time, money, and effort have been put in, both by WAPDA and the USAID in proposing and installing the capacitors to achieve the badly needed ELR benefits and voltage improvements. Yet in-spite of repeated surveys and the resulting disciplinary actions taken by WAPDA authorities, there appears to be no tangible improvement in keeping the capacitors in circuit and the available ELR benefits are being wasted.

Recommendations:

The feeder improvements are being carried out by the Project Director Construction (PD, C) in each AEB. Training and advice in work order implementation is imparted by PTAT Inspectors to the Construction Supervisors. It has, however, been observed that the Operation Supervisors responsible for maintenance and operation of the installed capacitors lack knowledge of capacitor benefits and their correct operation. To overcome this deficiency, regular monitoring with on the job instructions including brief but precise field training sessions must be arranged by WAPDA under the guidance of Director CM&O of each AEB and the Superintending Engineer (SE) of the area.

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In the present AEB Construction set up, every Xen Construction is assigned one Circle for new construction as well as the feeder rehabilitation works. The scope of work in rehabilitation generally consists of reconductoring of a definite portion of the line and the capacitors installation at selected locations. PTAT Inspectors check only the works executed under the approved rehabilitation work order. The remaining part of the feeder remains without the benefit of inspection and the improvements that would have resulted, thus the system reliability and the ELR benefits as envisaged in the work order proposal are compromised. Preventive maintenance of the system is also not done on a regular basis, by the Operations staff due to various reasons.

As a remedy, it is proposed that each ELR work order should consist of two components, one relating to the rehabilitation and the other for the general maintenance of the remaining portion of the feeder. The maintenance scope of work will be based on the latest patrolling of the feeder by supervisory level staff from the relevant Division and should essentially include but not confined to the following:

- ensure that capacitors are connected and operating.
- elimination of undersize jumpers.
- elimination of long spans.
- replacement of unserviceable poles.
- removal of the wraparound (jhapa) joints.
- replacement of broken and non-standard x-arms.
- provision of foundations.
- replacement of the broken insulators. and
- improvement of the general line configuration for conformity to acceptable standards.

The maintenance part of the work order should be assigned for execution to the same Construction staff as implementing the rehabilitation part of the work order. Subsequently, both components of the completed work order will be inspected by PTAT Inspectors. This process will not only ensure system reliability but the envisaged ELR objectives will also be effectively achieved. It is understood that PTAT will not be able to cover all the feeders within a given AEB. PTAT can only inspect those feeders for which USAID has issued PILs. WAPDA can also set up its inspection teams reporting directly to the GMO. PTAT is willing to assist you in finding the best solution to what appears to be a management control problem.

cc: A Hafeez Ibrahim
A Savul
Rafique A Shams
Shahabuddin
Chaudhry Ikramullah
J B Carter

C H Wright

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SURVEY RESULTS
11 KV CAPACITOR BANKS
STATUS AS OF SEPTEMBER 10, 1991

S.No	Capacitor Location	Fixed/Switched kVAr	Status
1.	Officer Colony, Lahore Cantt	Fixed 450 kVAr	Closed
2.	Officer Colony, Lahore Cantt	Switched 450 kVAr	Closed
3.	10-Orangzaib Block, Garden Town	Fixed 450 kVAr	Open
4.	Xen (C) Office, Ichhra	Fixed 450 kVAr	Open
5.	Jamia Ashrafia, Ichhra	Fixed 450 kVAr	Closed
6.	Opp. Lahore College, Jail Road	Fixed 450 kVAr	Closed
7.	APWA College, Jail Road	Fixed 450 kVAr	Open
8.	Cricket House, Jail Road	Fixed 450 kVAr	Closed
9.	Infantry Road, Near CMH, Lahore Cantt	Fixed 450 kVAr	Closed
10.	Dharampura Canal Bridge	Fixed 450 kVAr	Open
11.	Opp. General Hospital	Fixed 450 kVAr	Open
12.	Davis Road, Opp. Jang Newspaper	Fixed 450 kVAr	Removed
13.	Dharampura Canal (Opp. SE Irrigation Office)	Switched 450 kVAr	Open & Control Box Removed
14.	Dhobi Ghat Dharampura	Switched 450 kVAr	Open
15.	Saddar Round About	Switched 450 kVAr	Closed
16.	Saddar Round About	Fixed 450 kVAr	Closed
17.	Saddar Round About	Fixed 450 kVAr	Closed
18.	Ordnance Depot, Sarfraz Rifiqui Road, Lahore Cantt	Switched 450 kVAr	Closed
19.	20/G Gulberg III	Fixed 450 kVAr	Open
20.	Telephone Exchange, Samanabad	Fixed 450 kVAr	Closed
21.	Sardar Bakery, Samanadbad, (First R'About from Multan Rd)	Fixed 450 kVAr	Open
22.	Muslim Store, Samanabad, First Round About from Multan Road)	Fixed 450 kVAr	Closed
23.	Gulshan State Agency, Paki Thatti	Fixed 450 kVAr	Closed
24.	Aslam Eye Hospital, Samanabad	Fixed 450 kVAr	Closed
25.	Girja Chowk (Nicholson Road)	Fixed 450 kVAr	Open
26.	Opp. American School Canal Bank	Fixed 450 kVAr	Closed
27.	Sham Nagar (Chouburji)	Fixed 450 kVAr	Open*
28.	Sham Nagar (Chouburji)	Fixed 450 kVAr	Open*
29.	Sham Nagar (Chouburji)	Fixed 450 kVAr	Open*
30.	Alfalah Building	Fixed 450 kVAr	Removed
31.	Abbot Road (Opp. PTV Building)	Fixed 450 kVAr	Open*
32.	Abbot Road on PTV Building towards McLeod Road Chowk	Fixed 450 kVAr	Open*
33.	Davis Road (Gali on the side of Jang Newspaper)	Fixed 450 kVAr	Open
34.	G T Road Baghbanpura (Opp. Railway Reservation Agency)	Fixed 450 kVAr	Open
35.	Shahdara Kashmir Park	Fixed 450 kVAr	Closed
36.	Ravi Road (Opp. Lahor Flour Mill)	Fixed 450 kVAr	Open

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37.	Maulana M. Ali Road (Ravi Park) Opp. Health Center	Fixed 450 kVAr	Removed
38.	169-Ravi Park	Fixed 450 kVAr	Removed
39.	Ravi Road (Opp. Shahi Mohallah Rd)	Fixed 450 kVAr	Open
40.	WASA Main Disposal Pump	Fixed 450 kVAr	Open
41.	WASA Main Disposal Pump	Fixed 450 kVAr	Closed
42.	Siddiq Akbar Road Wahdat Colony	Fixed 450 kVAr	Open
43.	Siddiq Akbar Road (inside) Wahdat Colony	Switched 450 kVAr	Open
44.	Nawaz Sharif Park (Ferozpur Road)	Fixed 450 kVAr	Open
45.	Glaxo Factory Ferozpur Road	Fixed 450 kVAr	Open*
46.	Ghazi Road, Saddar	Switched 450 kVAr	Closed
47.	Vetenary Research Institute Ghazi Road, Saddar	Fixed 450 kVAr	Closed
48.	Ghazi Road, Soya Feed	Switched 450 kVAr	Closed
49.	Jora Pull, Ghazi Road	Fixed 450 kVAr	Open Contact Damaged
50.	Jora Pull, Ghazi Road	Switched 450 kVAr	Closed
51.	Sagar Road, Saddar	Switched 450 kVAr	Open
52.	Infantry Road Saddar (Disposal Pump)	Switched 450 kVAr	Open
53.	Infantry Road Shama Public School	Switched 450 kVAr	Open
54.	Beadon Road (near McLeod Road)	Fixed 450 kVAr	Open*
55.	Cinema Corner near Entry of WAPDA McLeod Road Office	Fixed 450 kVAr	Removed
56.	Allama Iqbal Town Main Road	Switched 450 kVAr	Open
57.	Haider Road, Islampura	Switched 450 kVAr	Closed
58.	Islampura Main Bazar	Fixed 450 kVAr	Closed
59.	Sanat Nagar (Islampura Feeder)	Switched 450 kVAr	Closed
60.	Madina Road Feeder (Chowk T'ship)	Switched 450 kVAr	Open
61.	Temple Road Near Samsung N'sign	Fixed 450 kVAr	Open*
62.	Temple Road Millat Islamia C'ege	Fixed 450 kVAr	Open*
63.	F C College Chowk (Ch. Zahoor Elahi Road	Fixed 450 kVAr	Open
64.	Allama Iqbal Road	Switched 450 kVAr	Not Working
65.	Allama Iqbal Road Near Ijtimai Council Gate	Switched 450 kVAr	"
66.	Allama Iqbal Road Near Railway HQ	Switched 450 kVAr	"
67.	Gowal Mandi on road from Lahore Hotal	Fixed 450 kVAr	Open
68.	Mayo Hospital backside near Daily Pakistan Times	Fixed 450 kVAr	Closed
69.	Birdwood Road Chemical Examiner Office, Jail Road	Fixed 450 kVAr	Open
70.	Main Temple Road near Regal side	Fixed 450 kVAr	Open

ATTACHMENT 4

WAPDA CORRECTIVE ACTIONS

ATTACHMENT "A"

PAKISTAN WATER AND POWER
DEVELOPMENT AUTHORITY

215-Wapda House, Lahore

Waseem Khan
Managing Director Distribution (Power)

Telephone Nos. 302790-69911/290
Fax : 44869

No. PS/MD (D)/ CEDE/D(RED&S)/7895-7906

Date December 27, 1989

All Chairman
Area Electricity Boards
WAPDA _____.

SUBJECT: ENERGIZATION OF 11 KV CAPACITORS BANKS

It has been noticed with great concern that soon after the charging of 11 KV Capacitors Banks worth Million of Rupees, the same are de-energised from the lines by the Line staff at their will. In this way, the entire efforts by the authority to reduce the Energy Loss in the Distribution System are completely jeoperdised. Distribution Engineering Department Circular Instructions to field formations vide its No. CEDE/D(RED&S)/3595-3600 of 7th July, 1989 to use the said equipment with proper care by the field Engineers appear to have also remained un-attended. The equipment is left at the mercy of Linemen/Assistant Linemen to fiddle with these at their will without notice of their supervisory staff. Such a situation cannot be allowed to continue any more in the field formations.

It is therefore, enjoined that the SDO shall make it his personal responsibility to continue keeping the capacitors energised after installation as per Standard Design Instructions DD-6 & 7. The Director Technical of each Area Board shall also keep a continuous watch over each capacitor bank and shall monitor its status monthly to his Chairman, Area Board, General Manager (Operation), General Manager (PE&S) with a copy to the undersigned for further necessary action.

Continued Page - 2

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PAKISTAN WATER AND POWER
DEVELOPMENT AUTHORITY

715-Wapda House, Lahore

Vasoem Khan
ging Director Distribution (Power)

hone Nos. 302790-69911/290
: 44869

No. PS/MD (D)/ _____ Date _____

Please be notified that if any of the field formation is found out to have de-energized capacitor bank after its installation, the SDO/Line Mupdt. Incharge will be booked under WAPDA E&D Rules without fail.

Please acknowledge receipt of this circular instructions.

(M. WASEEM KHAN)
MANAGING DIRECTOR DISTRIBUTION (POWER)

CC:

1) PS to Member (Power) WAPDA
WAPDA House, Lahore.

2) The General Manager (Operation)
Wapda, Waoda House, Lahore.

3) The General Manager (PE&S) WAPDA,
LDA Plaza, Lahore.

4) The Chief Engineer (Distn) Wapda,
LDA Plaza, Lahore.

For information please.

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PTAT/AID-92-04-03L April 7, 1992

Mr. Tahir Ali
Program Manager
Power Distribution Program
USAID
P.O. Box 1028
18 Sixth Avenue, Ramna-5
Islamabad

Subject: Utilization of Installed Capacitor Banks

Dear Tahir:

I wish to inform you that WAPDA's efforts regarding the utilisation of capacitors continues at an accelerated pace. The following summarizes some of WAPDA's most recent efforts whose primary objective is to ensure that WAPDA derives the maximum economic benefit from the continued operation of the capacitors.

The attached letter No. 8561 56 dated December 19, 1991 from Chairman AEB Lahore to the Superintending Engineers of Lahore AEB Circles is an indication of the many efforts being made by WAPDA to ensure proper utilisation of the ELR facilities installed under the USAID ELR Program.

The scheduled refresher training course in the switched capacitor bank controls at M/s. PEL, the local agents for Mcgraw Edison will update the WAPDA engineers and supervisors in the judicious use of the switched capacitors in conformity with the daily and seasonal load variations.

In addition to the training in capacitor controls, WAPDA has initiated the implementation of remedial actions to bolster the USAID ELR effort by ensuring the continued use of the installed fixed and switched capacitor banks. WAPDA has assigned a full time Deputy Director from the General Manager Operation's office to visit each AEB and randomly inspect the installed capacitor banks in each Division operational area to ensure their continued connection to the system. He will submit his reports to the Chief Engineer HQ (Operation) for review and action by the GMO (copy of office order enclosed).

Regarding disconnected capacitors the General Manager PE&S recommended remedial and punitive actions to ensure continued capacitor utilisation (copy of letter enclosed). The General Manager Operation (Distribution) requested PTI to arrange seminars and meetings to preach the use and benefits of the capacitors to the Distribution operating staff so that the line staff is motivated and reconciled into accepting the positive role that the capacitor banks play in improving the Distribution system operating capability.

The principal DTI, as an addition to the various ongoing Distribution training courses (including lessons on capacitor installation), requested PTAT to provide the services of ELR Inspector Shakir Mian to deliver lectures to the line staff (SDOs, Supervisors, Linesmen and Assistant Linesmen) on the importance of the use of capacitors both HT and LT. These lectures are delivered by Shakir Mian periodically at the DTI and at the Lahore AED's Shalimar Training Center respectively. PTAT will continue to provide further assistance in this regard by participating in similar lectures and seminars outside Lahore as arranged by the DTI.

WAPDA's actions are indicative of their effort towards making the capacitor installation program a success. PTAT is providing guidance and advice as necessary and will keep reviewing the progress by arranging field visits and exercising random checks as part of the post construction monitoring of installed ELR facilities to ensure continued benefit to the WAPDA Distribution system.

Sincerely,

Louis A. Rodrigues
General Manager

cc: A. Hafees Ibrahim, Managing Director (D)
S.M.A. Bokhari, GM (Operation), WAPDA
M. Shahabuddin, GM (PE&S) (D), WAPDA
Umar H. Khan

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PAKISTAN WATER AND POWER DEVELOPMENT AUTHORITY

OFFICE OF THE:
CHAIRMAN AREA POLICY BOARD
WAPDA LAHORE

No. 9887-561 Dated: 19-12 Dec: 1991.

1. S.E. 1st Circle, Lahore.
2. S.E. 2nd Circle, Lahore.
3. S.E. 3rd Circle, Lahore.
4. S.E. 4th Circle, Lahore.

SUBJECT:- TRAINING OF EXECUTIVE ENGINEERS/ SUB DIVISIONAL OFFICER'S ON SWITCHED CAPACITORS.

In compliance of General Manager (Operation)'s Orders, a training of all Executive Engineers and Sub Divisional Officers regarding Switched Capacitors has been arranged, with the collaboration of M/s PEL. The training sessions shall be held in the premises of M/s PEL, Ferozepur Road, Lahore according to following schedule:-

S.No.	Name of Circle	Date	Timings.
1.	4th Circle, Lahore	21.12.1991	0900 AM to 1100 AM
2.	3rd Circle, Lahore	24.12.1991	-do-
3.	2nd Circle, Lahore	01.01.1992	-do-
4.	1st Circle, Lahore	02.01.1992	-do-

Please direct your Executive Engineers and SDOs to participate in the training programme according to above schedule.

(AMAIR [illegible] SIDDIQI)
DIRECTOR(OPRO)
FOR CHAIRMAN(AEB) WAPDA LHR.

C.C.
1. General Manager(Operation) Area, Lahore.
2. Mr. L.A. Rodriguez, Planning, Engineering & Operation PTAT, 7th Floor, LDA Plaza, Lahore.

-:-0-0-

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OFFICE OF THE GENERAL MANAGER(OPERATION)

G-44 WAPDA HOUSE
LAHORE.

117-25

No. GMO/CEHQ/PA-6 Dated: 12-1-1992

OFFICE ORDER

Mr. Ghulam Shabbir Memon, Deputy Director Works Section will carry out random 11 KV capacitors check of all Area Boards. He will submit his report to the undersigned.

This issues with the approval of GM(O).

12/1/92

(MUZAMMIL RASHID)
CHIEF ENGINEER(HQ)

c.c.
1. Mr. L.A.Rodrigoez, PTAT, LDA Palaza Lahore.
2. All Chairman AEBs.

Act:	Date:	Info:
	L. A. R.	
	[illegible]	✓
	[illegible]	
	[illegible]	
	[illegible]	
	[illegible]	
	[illegible]	✓
	[illegible]	✓
	[illegible]	
	[illegible]	

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GM (O)
GM (P&C)
GM (CS)
GM (TES)
GM (A)
GM (WPPC)

PAKISTAN WATER & POWER DEVELOPMENT AUTHORITY

OFFICE OF THE
GENERAL MANAGER(PE&S)WAPDA
LDA PLAZA EGERTON ROAD LAHORE.

NO.GMPE&S/CEDE/DDE/ 5521-31 Dated:- 7/10/1991

The General Manager,
Operation, Wapda,
Wapda House,
Lahore.

SUBJECT: DISCONNECTED 11KV CAPACITOR BANKS.

REF: M/s PTAT letter No.IOR/30/91/110,dt.19.9.91,addressed to you with a copy to this office and others.

Time to time field surveys of HT line have revealed that many of the capacitors installed under the U.S.AID ELR Programme in Lahore City were in-operational and disconnected from the system.

Obviously, this is very unsatisfactory situation as the very objective of installing capacitors is defeated. Therefore, to ensure the best utilization of capacitors, you are requested to devise and introduce an effective monitoring system under which periodic reports should be obtained from the concerned Divisions/Circles with some percentage verification of same by concerned XENs & SEs.

Besides, disciplinary action should also be taken against the officials/Officers found responsible for in-operation/disconnection of the capacitors, as per M.D(D)'s office order No.PS/MD(D)CEDE/D(RELS)895-7906 dt.26-12-1989.

GENERAL MANAGER(PE&S)WAPDA
LAHORE

c.c.to the:-

1. M.D(D), Wapda House, Lahore.
2. All Chairmen AEMs with the request to ensure in-circuiting of the capacitors.
3. L.A.Rodriguez PTAT, LDA Plaza, Lahore.

Principal DTI 13/8/91

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PAKISTAN
WATER AND POWER DEVELOPMENT AUTHORITY.

OFFICE OF THE,
PRINCIPAL; DISTRIBUTION
TRAINING INSTITUTE, WAPDA,
FEROZEPUR ROAD, LAHORE.

No. 8030-33 /PDTI Dated: 10/12/91

Mr. Shakir Mian,
Principal Engineer,
PTAT/USAID, 7th Floor,
L.D.A. Plaza,
Lahore.

Subject: LECTURE ON 11 K.V./L.T. CAPACITORS

Ref: G.M.(PE&S) WAPDA L.D.A. Plaza Lahore
No.5521-31-GMPE&S/CEDE/DDE,
dated 7-10-1991.

As per remarks on the letter noted above by the G.M. Operation that Distribution Training Institute must preach the Technical classes and give the lectures on 11 K.V./L.T. Capacitor to each and every class.

You are, therefore, requested to please give the lecture on 11 K.V/L.T Capacitor's on the date mentioned below :-

1.	18-12-91 at 9.00 AM	P.D.T.I WAPDA Lahore	Lineman & A.L.M classes.
2.	19-12-91 at 9.00 AM	Shalamar Training Centre Lahore	-do-

We hope you will respond positively and thanking you in advance.

Yours faithfully,

9/12

(INAM ULLAH AKHTAR)
PRINCIPAL,
PDTI WAPDA LAHORE.

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cc to :-

1. Mr. Louis Rochiguis,
Chief Consultant PTAT/USAID,
with the request that the officer may be deputed to give lecture on the above subject as per schedule.

2. Instructor Technical, C.T.C. WAPDA,
Shalamar for information and necessary arrangements for lecture of both the classes

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ATTACHMENT 5

ELR INSPECTOR INSPECTION REPORTS
OF ELR WORKS

INTER-OFFICE MEMORANDUM

IOM/30/91/118 October 02, 1991

To : S M A Bokhari
General Manager Operation (D), WAPDA

From : L A Rodriguez
CC Planning, Engineering & Operations, PTAT

Subj : Feeder Rehabilitation under ADB ELR Program - AEB Multan

Attached is a copy of trip report submitted by our Inspector after completion of his inspection of five (5) feeders rehabilitated by WAPDA under the ADB ELR Program.

One feeder has passed the inspection. Four feeders are rejected due to the deficiencies pointed out in the case of L.T. capacitor installations.

Regarding the installed switched capacitor banks, the concerned Operating Division must ensure their continued use and the operation of the capacitor banks should conform to the reactive power requirements under the feeder peak and off peak conditions.

cc: A Savul
Rafique Shams
Chaudhry Ikramullah
CAEB Multan
A H Naseem
J B Carter
C H Wright

janmemos/c

EBASCO-AEPES-ITECO JOINT VENTURE
WAPDA, USAID RURAL ELECTRIFICATION PROJECT
PROJECT TRIP REPORT

Date Submitted October 02, 1991

EAM MEMBERS: Abdul Shakoor Alvi (PTAT)
Sheikh Nizamuddin I/D, (WAPDA)

STINATION: AEB Multan DATE(S) OF TRIP: 15-19 September, 1991

RPOSE OF TRIP: INSPECTION OF THIRTEEN (13) FEEDERS REHABILITATED UNDER ADB ELR PROGRAM

RIEF SUMMARY OF ACTIVITIES:

he feeders rehabilitated are:

No	Name of Feeder	Name of Grid Station	Scope of Work: Reconductoring Length KM P/O	D	R	Capacitor Installation G	F* 450	SW 450	SW 900
1.	New Kot Mela Ram	Kabirawala	-	4.5	-	-	-	1	-
2.	City A.Hakeem	Head Sadhnai	3.62	0.3	-	7.7	1	3	-
3.	Tulumba	Mian Channu	-	-	-	0.7	1	-	-
4.	City M.Channu	Mian Channu	0.99	-	-	-	1	-	-
5.	Old Kassowal	Mian Channu	1.09	1.88	-	0.86	1	1	1
6.	Mamdoot	Mian Channu	-	-	-	-	1	1	-
7.	Old Kacha Khuh	Mian Channu	6.65	1.9	-	3.4	2	4	-
8.	City Kacha Khuh	Kacha Khuh	-	8.631	-	1.2	1	3	-
9.	Old Hasilpur	Hasilpur	0.432	-	-	-	1	-	-
0.	Public Health	Haroonabad	-	-	-	-	-	-	1

(Add Additional Sheets if required)

Signature: Ashakoor Alvi

Reviewed by: [illegible] Date: 2/10/91

Reviewed by: [illegible] Date: 3/10/91

Cont'd...P/2

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No	Name of Feeder	Name of Grid Station	Scope of Work: Reconductoring Length KM P/O	D	R	G	Capacitor Installation F* 450	SW 450	SW 900
.	Power House	Bahawalnagar	-	1.47	0.56	-	1	3	-
.	Tubewell	Lodhran	7.8	-	-	-	1	2	-
.	22/WB	Vehari	-	-	-	-	1	-	-

) Equivalent number of L.T. capacitors installed against 450 kVAr H.T. fixed capacitors.

SERVATIONS

xed Capacitor Bank Installation

r the feeder at serial # 7, the 450 kVAr fixed capacitor bank has been operly installed in accordance with WAPDA Construction Standards and was und in circuit.

witched Capacitor Banks Installation

r the feeders at serial # 1, 5, and 6, the 450 and 900 kVAr switched apacitor banks have been properly installed in accordance with WAPDA onstruction Standards and were found in operation.

r feeders at serial # 2, the installed switched capacitor banks are not as er WAPDA Construction Standards and are out of the circuit.

r the feeder at serial # 7, all the switched capacitor banks have been nstalled as per WAPDA Construction Standards and were found in operation. owever the internal wiring of one control box appears to have been burnt. his should be repaired.

r the feeder at serial # 8, out of three 450 kVAr switched capacitor banks as roposed in the work order, one 900 kVAr switched capacitor bank has been nstalled and the remaining one switched capacitor bank has not been installed. he installed switched capacitor bank is in accordance with WAPDA Construction tandards and was found in operation.

r the feeder at serial # 10, the switched capacitor bank has been installed enerally in accordance with WAPDA Construction Standards. The factory earthed ommon (star) point of the capacitor must be removed for proper operation of he switched capacitor bank.

r the feeder at serial # 11, out of the three switched capacitor banks as roposed in the work order, only one switched capacitor bank has been installed nd the rest have not been installed. The installed switched capacitor bank as the following deficiencies:

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- The dropout cutouts have not been installed.

- The factory earthed common (star) point of the capacitor banks has not been isolated. This earth must be removed for proper operation of the capacitor bank.

- P.G. Connectors have not been used for the H.T. jumpers.

r the feeder at serial # 12, the following general discrepancies were noted the installation of switched capacitor banks:

- The dropout cutouts are on the same side of the switched capacitor banks. These should be on the opposite side of the switched capacitor bank for proper operation of the dropout cutouts.

- Nonstandard H.T. jumpers have been used.

- P.G. Connectors are missing for the H.T. jumpers.

. T. Capacitors Installation

quivalent L.T. capacitors have been installed in place of 450 kVAr fixed apacitor banks. The sizes of the installed L.T. capacitors were checked at ifferent locations for conformity to the recommended distribution transformer izes as per WAPDA Standard Design Instruction (SDI) No.2/DD and were found as ollows:

Size of Capacitor kVAr	Transformer Rating kVA
10	25 and 50
20	50 and 100
40	100 and 200
80	200 and 400

ccording to SDI No.2/DD, capacitors of recommended ratings should be installed n transformers having a mixed load only to avoid reactive over ompensation/voltage rise. The recommended capacitor sizes in relation with istribution transformers and wire sizes for connecting the L.T. Capacitors are s follows:

Size of Capacitor kVAr	Transformer kVA	Wire Sizes
2	25	3/029 copper
5	50	3/029 copper
10	100	7/064 copper
20	200	7/064 copper
40	400	7/2.14 (19/052)
80	630	7/2.14 (19/083)

- The capacitors should be installed on pole/structure on which transformer having mixed load is installed. If not possible, then these should be installed on the adjacent pole/structure.

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- The L.T. capacitors if connected to customer motor terminals should be installed in such a way that these come in circuit only when the motor is running.

- L.T. capacitors have not been installed for the feeders at serial # 3, 6, 8, 9 and 11.

conductoring

conductoring of respective sections of feeders has been carried out as per e approved scope or work. Discrepancies were, however, noted in the llowing three feeders:

City Abdul Hakeem Feeder, non-standard 11 kV assemblies have been used. The w H.T. structures installed have not been earthed. At Power House feeder hawalpur, new H.T. structures installed have not been provided with undations.

Tubewell feeder, Japha joints have been used for Osprey Conductor. These hould be replaced with standard compression sleeves.

ONCLUSION

n view of the deficiencies pointed out in the case of installation of L.T. apacitors and other observations as mentioned above, the feeders at serial # , 3, 4, 5, 6, 7, 8, 9, 11, 12 and 13 are rejected. The deficiencies were iscussed with the concerned WAPDA Construction staff at site for ectification. The feeders at serial # 1 and 10 have passed the inspection.

t has been observed that inspection calls have been sent to PTAT for nspecting incomplete works. For example, H.T./L.T. capacitors as proposed in he work order proposals were not installed in cases of feeders at serial # 3, , 8, 9 and 11. Such visits by PTAT are pointless and entail wastage of time nd effort. It should be ensured for future that only those rehabilitation orks which are complete in all respects in accordance with the work order roposals, are referred to PTAT for inspection.

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ATTACHMENT 6

MONTHLY ELR PROGRAM IMPLEMENTATION
STATUS SUMMARY

INTER-OFFICE MEMORANDUM

IOM/25/91/088 August 08, 1991

To : S M A Bokhari
General Manager Operation (D), WAPDA

From : L A Rodriguez
CC Planning, Engineering & Operations, PTAT

Subj : USAID Funded Energy Loss Reduction (ELR) Program
Implementation Status Summary to July 31, 1991

The attached ELR program summary report presents the status of ELR Work Orders, to the end of July 1991 for which PILs have been issued by USAID.

Tables I and II present the work order implementation and certification/reimbursement status as follows:

Table Ia - Capacitor Installation Program.

Table Ib - Feeder Rehabilitation Program.

Table Ic - Meter Replacement Work Orders.

Table Id - T&P Utilization Work Orders.

Table Ie - Crash Rehabilitation Program.

Table If - Feeder Rehabilitation Program (new proposals).

Table II shows the Work Orders that are pending implementation by WAPDA, and Work Orders which were inspected by PTAT but which were not recommended for reimbursement due to various discrepancies. This information is based on Tables Ia to If above and provides further details of scope of work, material costs to be set aside and the reimbursable amounts of the pending/not recommended Work Orders.

Table IIa is a summary of costs of the pending/not recommended Work Orders.

Table III summarizes the utilization of the allocated ELR Project funds and the remaining balance. This information is based on the certified work orders to July 31, 1991.

The above Tables can be used by WAPDA Area Electricity Boards to determine their accomplishments to date and to identify areas where their efforts are to be concentrated to expedite the Work Order completions.

The updated reimbursement status is as follows:

		REIMBURSABLE (US $)
a.	PILs issued to date (all WOs/JOs)	= 3,778,431
b.	WOs certified to the end of June 1991	= 3,509,499
c.	WOs certified during July 1991	= 105,863
d.	Total WOs certified including July 1991	= 3,615,362 (b+c)
e.	Balance based on pending/not recommended WOs from PILs issued to date	= 163,069 (a-d)

cc: A Hafeez Ibrahim
Anwar Savul
Rafique Shams
Ch. Ikramullah
All Chairmen AEBs
A H Naseem
J B Carter
C H Wright

elr.wps/c

USAID ELR PROGRAM
IMPLEMENTATION STATUS SUMMARY

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PENDING WORK ORDERS

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TABLE I

WO IMPLEMENTATION CERTIFICATION
AND REIMBURSEMENT STATUS

Ia - CAPACITOR INSTALLATION PROGRAM

SR NO	AEB	APPROVED WOs/JOs	CERTIFIED WOs/JOs	NR WOs/JOs	PENDING WOs/JOs	CERTIFIED WOs REIMBURSABLE US$	CERTIFIED WOs MATERIAL SETOFF US$
1	FAISALABAD	17	16	-	1	9,627	37,336
2	GUJRANWALA	43	43	-	-	33,966	135,249
3	HYDERABAD	-	-	-	-	0	0
4	ISLAMABAD	39	39	-	-	23,489	88,830
5	LAHORE	48	48	-	-	33,027	127,023
6	MULTAN	64	64	-	-	38,735	148,979
7	PESHAWAR	44	42	2	-	27,845	107,101
8	QUETTA	-		-	-	0	0
	TOTALS	255	252	2	1	166,689	634,520

Ib - FEEDER REHABILITATION PROGRAM

1	FAISALABAD	6	6	-	-	80,561	231,316
2	GUJRANWALA	9	9	-	-	80,944	199,335
3	HYDERABAD	5	5	-	-	46,030	158,389
4	ISLAMABAD	4	4	-	-	25,862	90,954
5	LAHORE	13	12	1	-	47,501	192,964
6	MULTAN	7	7	-	-	130,647	499,225
7	PESHAWAR	5	5	-	-	44,923	141,802
8	QUETTA	3	3	-	-	72,574	223,242
	TOTALS	52	51	1	0	529,042	1,737,227

* NR = NOT RECOMMENDED

JOBORD1/C

Ic - METER REPLACEMENT

SR NO	AEB	APPROVED WO/JO NOS.	CERTIFIED WO/JO NOS.	NR WO NOS.	PENDING WO/JO NOS.	CERTIFIED WOs REIMBURSABLE AMOUNT $	CERTIFIED WOs MATERIAL SETASIDE $
		(**)	(***)		(****)		
1	FAISALABAD	(7000 1-P)	7000	-	-	98,555	379,059
		(6000 3-P)	6000				
2	GUJRANWALA	(7000 1-P)	5861	-	1	48,706	187,337
		(6000 3-P)	2438				
3	HYDERABAD	(5000 1-P)	5000	-	-	55,858	214,840
		(4000 3-P)	4000				
4	ISLAMABAD	(7000 1-P)	7000	-	-	82,561	317,542
		(5000 3-P)	5000				
5	LAHORE	(7500 1-P)	7500	-	-	88,681	341,850
		(6500 3-P)	6500				
6	MULTAN	(7000 1-P)	7000	-	-	71,238	273,993
		(5000 3-P)	5000				
7	PESHAWAR	(7000 1-P)	7000	-	-	86,074	331,062
		(5000 3-P)	5000				
8	QUETTA	(2500 1-P)	2500	-	-	33,289	128,033
		(2500 1-P)	2500				
	TOTALS		55948	0	1	565,164	2,173,716

(*) NR = NOT RECOMMENDED
(**) Meters allocated in Work Order.
(***) Meters Replaced to date.
(****) Partially Complete Work Orders

Id - T&P UTILIZATION

1	FAISALABAD	1	1	-	-	0	71,641
2	GUJRANWALA	1	1	-	-	0	77,905
3	HYDERABAD	1	1	-	-	0	64,464
4	ISLAMABAD	1	1	-	-	0	81,619
5	LAHORE	1	1	-	-	0	75,462
6	MULTAN	1	1	-	-	0	62,463
7	PESHAWAR	1	1	-	-	0	77,891
8	QUETTA	1	1	-	-	0	61,970
	TOTALS	8	8	0	0	0	573,414

Ie - CRASH PROGRAM (COMPLETE)

SR NO	AEB	APPROVED WO/JO NOS.	CERTIFIED WO/JO NOS.	NR* WO/JO NOS.	PENDING WO/JO NOS.	CERTIFIED WOs REIMBURSABLE AMOUNT $	CERTIFIED WOs MATERIAL SETASIDE $
1	LAHORE	19	19	-	-		0
2	PESHAWAR	15	15	-	-		0
	TOTALS	34	34	0	0	3,283,428	0

If - FEEDER REHABILITATION PROGRAM (NEW PROPOSALS)

1	FAISALABAD	14	3	-	11	5,621	20,403
2	GUJRANWALA	6	1	-	5	1,372	4,588
3	HYDERABAD	0	-	-	-	0	0
4	ISLAMABAD	13	5	-	6	5,987	23,025
5	LAHORE	14	10	1	3	17,905	59,586
6	MULTAN	0	-	-	-	0	0
7	PESHAWAR	13	7	-	6	39,954	100,978
8	QUETTA	0	-	-	-	0	0
	TOTALS	60	26	1	33	71,039	208,580

* NR = NOT RECOMMENDED

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Ic - METER REPLACEMENT

SR NO	AEB	APPROVED WO/JO NOS.	CERTIFIED WO/JO NOS.	NR WO/JO NOS.	PENDING WO/JO NOS.	CERTIFIED WOs REIMBURSABLE AMOUNT $	CERTIFIED WOs MATERIAL SETASIDE $
		(**)	(***)		(****)		
1	FAISALABAD	(7000 1-P)	7000	-	-	98,555	379,059
		(6000 3-P)	6000				
2	GUJRANWALA	(7000 1-P)	5601	-	1	48,706	187,337
		(6000 3-P)	2439				
3	HYDERABAD	(5000 1-P)	5000	-	-	55,858	214,840
		(4000 3-P)	4000				
4	ISLAMABAD	(7000 1-P)	7000	-	-	82,561	317,542
		(5000 3-P)	5000				
5	LAHORE	(7500 1-P)	7500	-	-	88,881	341,850
		(6500 3-P)	6500				
6	MULTAN	(7000 1-P)	7000	-	-	71,238	273,993
		(5000 3-P)	5000				
7	PESHAWAR	(7000 1-P)	7000	-	-	86,074	331,062
		(5000 3-P)	5000				
8	QUETTA	(2500 1-P)	2500	-	-	33,289	128,033
		(2500 1-P)	2500				
	TOTALS		65240	0	1	565,164	2,173,716

(*) NR = NOT RECOMMENDED
(**) Meters allocated in Work Order.
(***) Meters Replaced to date.
(****) Partially Complete Work Orders

Id - T&D UTILIZATION

1	FAISALABAD	1	1	-	-	0	71,641
2	GUJRANWALA	1	1	-	-	0	77,905
3	HYDERABAD	1	1	-	-	0	64,464
4	ISLAMABAD	1	1	-	-	0	81,619
5	LAHORE	1	1	-	-	0	75,462
6	MULTAN	1	1	-	-	0	62,462
7	PESHAWAR	1	1	-	-	0	77,891
8	QUETTA	1	1	-	-	0	81,970
	TOTALS	8	8	0	0	0	573,414

JOBORD1/C

Ie - CRASH PROGRAM (COMPLETE)

SR NO	AEB	APPROVED WO/JO NOS.	CERTIFIED WO/JO NOS.	NR* WO/JO NOS.	PENDING WO/JO NOS.	CERTIFIED WOs REIMBURSABLE AMOUNT $	CERTIFIED WOs MATERIAL SETASIDE $
1	LAHORE	19	19	-	-		0
2	PESHAWAR	15	15	-	-		0
	TOTALS	34	34	0	0	3,383,428	0

If - FEEDER REHABILITATION PROGRAM (NEW PROPOSALS)

1	FAISALABAD	14	3	-	11	5,821	20,403
2	GUJRANWALA	6	1	-	5	1,372	4,588
3	HYDERABAD	0	-	-	-	0	0
4	ISLAMABAD	13	5	-	8	5,987	23,025
5	LAHORE	14	10	1	3	17,965	59,586
6	MULTAN	0	-	-	-	0	0
7	PESHAWAR	13	7	-	6	39,554	100,978
8	QUETTA	0	-	-	-	0	0
	TOTALS	60	26	1	33	71,699	209,580

* NR = NOT RECOMMENDED

JOBORD1/C

TABLE II

PENDING WORK ORDERS
FAISALABAD ASE

SR NO	W.O. NO.	PIL NO.	NAME OF FEEDER/WORK	INSPECTION DATE	N.R.	P.C.	LINE LENGTH (KM) CONDUCTOR P	Y	R	G	CAPACITORS F	3W	3W	MTRL COST TO BE DEDUCTED(70%) $	AMT REIMB AS PER FIL $
											450	450	900		$
	OLD WORK ORDERS														
1	9003001	68	RAVI				-	-	-	-	3	-	-	3679	957
							0.000	0.000	0.000	0.000	3	0	0	3.679	957
3	METER REPLACEMENT WORK ORDER COMPLETED.														
4	T&P WORK ORDER COMPLETED.														
	NEW PROPOSALS														
1	9003017	80	DANABAD				-	-	-	-	-	-	-	35,071	11,2[illegible]
2	9003018	80	BHAKAR CITY				-	-	-	-	-	-	-	1,960	5[illegible]0
3	9003020	80	BHALWAL CITY				-	-	-	-	-	-	-	5,146	1,3[illegible]8
4	9003001	81	MAQAM-E-HAYAT				-	-	-	-	-	-	-	10,634	2,9[illegible]6
5	9003002	81	KACHERY BAZAR				-	-	-	-	-	-	-	8,294	2,2[illegible]5
6	9003003	81	CITY SARGODHA				-	-	-	-	-	-	-	7,226	2,0[illegible]6
7	9003004	81	TARIQABAD				-	-	-	-	-	-	-	19,755	5,5[illegible]3
8	9003023	81	SATIANA				-	-	-	-	-	-	-	5,204	1,4[illegible]4
9	9003024	81	MADUANA				-	-	-	-	-	-	-	1,871	4[illegible]6
10	9003025	81	BHERA NOON				-	-	-	-	-	-	-	3,041	7[illegible]1
11	9003026	81	GOGERA				-	-	-	-	-	-	-	4,912	1,3[illegible]7
							0.000	0.000	0.000	0.000	0	0	0	103.114	29.9[illegible]

N.R. = NOT RECOMMENDED
P.C. = PARTIALLY COMPLETE

TABLE II

PENDING WORK ORDERS
GUJRANWALA AEB

SR NO	W.O. NO.	PIL NO.	NAME OF FEEDER/WORK	INSPECTION DATE	N.R.	P.C.	LINE LENGTH (KM) CONDUCTOR P	D	R	G	CAPACITORS F	SW	SW	MTRL COST TO BE DEDUCTED(70%) $	AMT REIMB AS PER PIL $
											450	450	900		
	OLD WORK ORDERS														
1	8802012	39	METER REPLMNT			P.C	-	-	-	-	-	-	-	194,775	50,641
2	CAPACITOR INSTLLATION, FEEDER REHABILITATION AND TR. WORK ORDERS - COMPLETED														
	NEW PROPOSALS														
1	9002025	72	PASRUR				-	-	-	-	-	1	-	1,960	509
2	9002026	72	SATRRAH				0.855	-	-	-	1	1	-	6,526	2,094
3	9002044	72	SCRAP NO.2				1.583	-	-	-	-	1	-	8,853	2,869
4	9002045	72	KOT NAINA				-	-	-	-	-	1	-	1,960	509
5	9002050	72	KOLAR				-	-	-	-	-	1	-	1,960	509
							2.438	0.000	0.000	0.000	1	5	0	21,259	6,410

N.R. = NOT RECOMMENDED
P.C. = PARTIALLY COMPLETE

TABLE II

PENDING WORK ORDERS
HYDERABAD AEE

SR NO	W.O. NO.	PIL NO.	NAME OF FEEDER/WORK	INSPECTION DATE	N.R.	P.C.	LINE LENGTH (KM) CONDUCTOR P	D	R	G	CAPACITORS F	SW	3W	MTRL COST TO BE DEDUCTED(70%) $	AMT REIMB AS PER P.L $
											450	450	300		

OLD WORK ORDERS

CAPACITOR INSTALLATION, FEEDER REHABILITATION, T&P AND METER REPLACEMENT WORK ORDERS - COMPLETED

NEW PROPOSALS - NIL

N.R. = NOT RECOMMENDED
P.C. = PARTIALLY COMPLETE

ELRFDR2/C

TABLE II

PENDING WORK ORDERS
ISLAMABAD ESB

SR NO	W.O. NO.	PIL NO.	NAME OF FEEDER/WORK	INSPECTION DATE	N.R.	P.C.	LINE LENGTH (KM) CONDUCTOR P	D	R	G	CAPACITORS F	SW	SW	MTRL COST TO BE DEDUCTED(70%) $	AMT REIMB AS PER PIL $
											450	450	900		
	OLD WORK ORDERS														
	CAPACITOR INSTALLATION, FEEDER REHABILITATION, T&P AND METER REPLACEMENT WORK ORDERS - COMPLETED														
	NEW PROPOSALS														
1	8705021/45	72	H-11F				-	-	-	-	-	-	-	2,753	716
2	8705021/49	72	KHAIRANWALA				-	-	-	-	-	-	-	2,753	716
3	9005021/50	80	HOONA WALI				-	-	-	-	-	-	-	5,146	1,338
4	9005021/51	80	DINGA				-	-	-	-	-	-	-	7,105	1,847
5	9005021/52	80	BASCO				-	-	-	-	-	-	-	3,186	828
6	9005021/53	80	PARIANALI				-	-	-	-	-	-	-	9,065	2,357
7	9105001	81	DINA - I				-	-	-	-	-	-	-	32,243	11,538
8	9005008	81	BEOWALI				-	-	-	-	-	-	-	8,508	2,772
							0.000	0.000	0.000	0.000	0	0	0	70,759	22,107

N.R. = NOT RECOMMENDED
P.C. = PARTIALLY COMPLETE

ELRFDR2/C

TABLE II

PENDING WORK ORDERS
LAHORE AEB

SR NO	W.O. NO.	PIL NO.	NAME OF FEEDER/WORK	INSPECTION DATE	N.R.	P.C.	LINE LENGTH (KM) CONDUCTOR P	D	R	G	CAPACITORS F	SW	SW	MTRL COST TO BE DEDUCTED(70%) $	AMT REIMB AS PER PIL $
											450	450	900		
	OLD WORK ORDERS														
1	8701021	39	RANG MAHAL	03-09-90	N.R		0.695	-	0.177	-	1	6	-	19,074	5,062
				TOTAL			0.695	0.000	0.177	0.000	1	6	0	19,074	5,062
2	METER AND T&P WORK ORDERS COMPLETED.														
	NEW PROPOSALS														
1	9101008	81	GHAZIABAD				-	-	-	-	-	-	-	3,771	1,066
2	9101011	81	OLD AMER SIDHU				-	-	-	-	-	-	-	0	683
3	9101012	81	GUMTI				-	-	-	-	-	-	-	3,041	791
4	9101014	81	OFFICER COLONY				-	-	-	-	-	-	-	27,582	9,530
							0.000	0.000	0.000	0.000	0	0	0	34,394	12,070

N.R. = NOT RECOMMENDED
P.C. = PARTIALLY COMPLETE

TABLE II

PENDING WORK ORDERS
MULTAN AEE

SR NO	W.O. NO.	PIL NO.	NAME OF FEEDER/WORK	INSPECTION DATE	N.R.	P.C.	LINE LENGTH (KM) CONDUCTOR P	D	R	G	CAPACITORS F	SW	SW	MTRL COST TO BE DEDUCTED(70%) $	AMT REIMB AS PER P.L $
											450	450	900		

OLD WORK ORDERS

ALL WORK ORDERS INCLUDING METERS AND T&P - COMPLETE.

NEW PROPOSALS NIL

N.R. = NOT RECOMMENDED
P.C. = PARTIALLY COMPLETE

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ELRFDR2/C

TABLE II

PENDING WORK ORDERS
PESHAWAR AEB

SR NO	W.O. NO.	PIL NO.	NAME OF FEEDER/WORK	INSPECTION DATE	N.R.	P.C.	LINE LENGTH (KM) CONDUCTOR P	D	R	G	CAPACITORS F	SW	SW	MTRL COST TO BE DEDUCTED (70%) $	AMT REIM AS PER P $
											450	450	300		
	OLD WORK ORDERS														
1	8706184	46	BARA	23-2-89	N.R		-	-	-	-	3	-	-	4,412	1,14
2	8706184	46	JAMRUD	23-2-89	N.R		-	-	-	-	2	-	-	2,938	76
							0.000	0.000	0.000	0.000	5	0	0	7,350	1,91
3	METER AND T&P WORK ORDERS - COMPLETED.														
	NEW PROPOSALS														
1	9006007/05	72	DIR CANET				2.570	-	1.000	-	-	-	-	7,715	3,49
2	9006007/09	72	JALALA				5.550	4.000	8.000	-	-	-	-	30,433	12,47
3	9006007/10	72	EXPRESS TOWN				-	-	-	-	2	-	-	2,453	63
4	9006003	80	KIKA CHUND				-	-	-	-	-	-	-	3,980	1,03
5	9006007/14	80	FAQIRABAD				-	-	-	-	-	-	-	3,186	82
6	9006007/06	80	NSR CANTT				-	-	-	-	-	-	-	33,221	15,47
							8.120	4.000	9.000	0.000	2	0	0	80,988	33,94

N.R. = NOT RECOMMENDED
P.C. = PARTIALLY COMPLETE

TABLE II

PENDING WORK ORDERS
QUETTA AEB

SR NO	W.O. NO.	PIL NO.	NAME OF FEEDER/WORK	INSPECTION DATE	N.R.	P.C.	LINE LENGTH (KM) CONDUCTOR P	D	R	G	CAPACITORS F	SW	SW	MTRL COST TO BE DEDUCTED (70%) $	AMT REIMB AS PER PIL $
											450	450	900		

OLD WORK ORDERS

CAPACITOR INSTALLATION, FEEDER REHABILITATION, T&P AND METER REPLACEMENT WORK ORDERS - COMPLETED

NEW PROPOSALS - NIL

N.R. = NOT RECOMMENDED
P.C. = PARTIALLY COMPLETE

ELRFDR3/C

TABLE IIa
COST SUMMARY OF PENDING/NOT RECOMMEND WORK ORDERS
STATUS ENDING JULY 1991

OLD WORK ORDERS

SR NO	AEB	MATERIAL COS. TO BE DEDUCTED (70%) US$		AMOUNT REIMBURSABLE AS PER PIL US$	
		FDRS/TAPS	METERS	FDRS/TAPS	METERS
1	FAISALABAD	3,[illegible]79	COMPLETE	[illegible]657	COMPLETE
2	GUJRANWALA	COMPLETE	44,775	COMPLETE	60,641
3	HYDERABAD	COMPLETE	COMPLETE	COMPLETE	COMPLETE
4	ISLAMABAD	COMPLETE	COMPLETE	COMPLETE	COMPLETE
5	LAHORE	19,[illegible]74	COMPLETE	[illegible]	COMPLETE
6	MULTAN	COMPLETE	COMPLETE	COMPLETE	COMPLETE
7	PESHAWAR	7,[illegible]50	COMPLETE	[illegible]	COMPLETE
8	QUETTA	COMPLETE	COMPLETE	COMPLETE	COMPLETE
	SUB TOTALS	30,103	44,775	[illegible]	60,641
	TOTALS	224,[illegible]		58,571	

Note: T&P Work Orders are complete for all AEBs.

NEW PROPOSALS

SR NO	AEB	MATERIAL COS. TO BE DEDUCTED (70%) US$	AMOUNT REIMBURSABLE AS PER PIL US$
1	FAISALABAD	103,114	39,900
2	GUJRANWALA	21,259	8,480
3	HYDERABAD	0	0
4	ISLAMABAD	70,759	32,107
5	LAHORE	34,394	12,070
6	MULTAN	0	0
7	PESHAWAR	30,986	33,941
8	QUETTA	0	0
	TOTAL	10,514	104,498

Total Balance Reimbursable Amount as per PIL = 58,571+104,498 = 163,069 US$

JOBORD5/C

TABLE III
STATUS ENDING JULY 1991
FUNDS UTILIZATION SUMMARY

SR NO	PROGRAM	CERTIFIED WORK ORDER AMOUNTS		
		REIMBURSABLE US$	MATERIAL SET OFF US$	TOTAL REIMBURSABLE & MATERIAL SETOFF US$
1	CAPACITORS	1[illegible]6,689	[illegible]34,520	8[illegible]1,209
2	FEEDER REHAB.	5[illegible]9,042	1,737,227	2,266,269
3	METERS	5[illegible]5,164	2,178,716	2,738,880
4	T&P	0	573,414	573,414
5	CRASH	2,2[illegible]3,428	0	2,233,428
6	NEW REHAB PROPOSALS	[illegible]1,039	201,580	279,619
	TOTAL	3,6[illegible]5,362	5,327,457	8,942,819

MUS$

Earmarked Reimbursbale Amount	=	14,700
Certified Reimbursable Amount	=	3,615
Balance Reimbursable Amount	=	11,085
Material Cost Procured under IFB-I	=	8,066
Certified Material Setoff Amount	=	5,327
Balance Material Cost to be Setoff	=	2,739

JOBORD4/C

INTER-OFFICE MEMORANDUM

IOM/25/91/111 September 19, 1991

To : S M A Bokhari
GM Operation (D), WAPDA

From : L A Rodriguez
CC Planning Engineering & Operations, PTAT

Subj : WAPDA/USAID Power Distribution Program -
ELR Program Implementation Status to August 31, 1991

The attached table presents a summary of work orders implementation/certification and reimbursement status to the end of August 1991.

Based upon the costs of ELR Work Orders implemented by WAPDA and certified by PTAT against the USAID earmarked PIL amounts of US$ 9,873,000, the utilization of total allocated ELR funds to the period ending August 1991 is as follows:

	Allocated ELR Funds US$x1000	Amount in PILs US$x1000	Amount Certified (Utilized) US$x1000	Balance (un-utilized) US$x1000
Reimbursable	14,700	3,844	3,638	11,062
Commod. under IFB-I	8,066	6,029	5,403	2,663
Leftover from IFB-I	1,144	-	-	-
Totals:	23,910	9,873	9,041	13,725

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In order to liquidate the balance amount of US$ 2,663,000 from the IFB-I commodities pending adjustment to WAPDA's account, WAPDA will have to generate additional ELR Work Orders.

Based on the latest WAPDA Work Order cost statistics, an average ELR Work Order costs about Rs.400,000 (US$ 16,000 at the current exchange rate) including labor and other charges @ 26% of material cost. 70% of the overall work order cost is reimbursable to WAPDA under the ELR Reimbursement Agreement. At this rate, at least 300 new ELR Work Orders are needed to liquidate the balance of USAID IFB-I commodities. 70% of the labor and other cost component of the work orders will as usual be reimbursed to WAPDA as cash Rupees based on the PIL's approved WO Dollars.

The balance ELR funds amounting to approximately US$ 10.365 Million, after liquidation of IFB-I ELR commodities, will be available for reimbursing to WAPDA based on the continuing ELR activity by WAPDA under the USAID and ADB Programs to its completion by 1994.

cc: A Hafeez Ibrahim
Anwar Savul
Rafique A Shams
Chaudhry Ikramullah
All Chairmen AEBs
A H Naseem
J B Carter
C H Wright

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SUMMARY
IMPLEMENTATION/CERTIFICATION AND REIMBURSEMENT OF ELR WORK ORDERS
BASED UPON PILS ISSUED TODATE
STATUS ENDING AUGUST 1991

AEB	APPROVED WOs/JOs	CERTIFIED WOs/JOs	NR* WOs/JOs	PENDING WOs/JOs	CERTIFIED WOs REIMBURSABLE US$	CERTIFIED WOs MATERIAL SETOFF US$
FAISALABAD	39	27	-	12	194,564	739,757
GUJRANWALA	60	54	-	6	164,990	594,414
HYDERABAD	7	7	-	0	101,888	437,693
ISLAMABAD	58	50	-	8	137,899	601,970
LAHORE	107	98	-	9	1,979,406	872,353
MULTAN	76	73	-	3	240,620	984,659
PESHAWAR	80	73	-	7	712,879	758,834
QUETTA	5	5	-	0	105,863	413,245
TOTALS	432	387	0	45	3,638,109	5,402,925

R = Not Recommended

ATTACHMENT 7

CAPACITOR UTILIZATION STATUS
AS OF JULY 31, 1992

CAPACITOR UTILIZATION STATUS

AS OF JULY 31, 1992

OVERALL SUMMARY - SEVEN AEBs

TOTAL CAPACITORS INSTALLED	=	743		
TOTAL SURVEYED	=	248		33.3%
TOTAL OPEN	=	25	OR	10.1% OF THE SURVEYED
TOTAL CLOSED	=	223	OR	89.9% OF THE SURVEYED

AEB	CAPACITORS INSTALLED	EBASCO* SURVEYED CAPS	%	CLOSED	OPEN	% OPEN
PESHAWAR	98	25	25.5	19	6	24.0
FAISALABAD	76	19	25.0	16	3	15.8
LAHORE	189	81	43.0	71	10	12.3
ISLAMABAD	93	54	58.0	49	5	9.3
GUJRANWALA	115	29	25.2	28	1	3.5
MULTAN	136	28	20.5	28	0	0.0
HYDERABAD	36	12	33.3	12	0	0.0

* Required percent check as per USAID Memorandum of June 03, 1992, is 25 percent minimum.

SURVEY RESULTS
AEB PESHAWAR
11 KV CAPACITOR BANKS
STATUS ON MAY 17, 1992

Sr. No.	Capacitor Location	Fixed/Switched kVAr	Status
1.	Secondary BoardJamrud Road (T&T Training Institute)	Fixed 450 kVAr	Open
2.	Deh Bahader Feeder	Switched 450 kVAr	Closed
3.	Bada Bar Kohat Road near Bridge	Fixed 450 kVAr	Closed
4.	Kohat Main Road	Fixed 450 kVAr	Closed
5.	Hangu	Switched 900 kVAr	Closed
6.	Para Chanar	Switched 900 kVAr	Closed
7.	Para Chanar	Switched 900 kVAr	Closed
8.	Para Chanar	Fixed 450 kVAr	Closed
9.	Para Chanar	Fixed 450 kVAr	Closed
10.	KCM Zargari Kohat Road	Switched 900 kVAr	Closed
11.	Ostarzai	Switched 450 kVAr	Closed
12.	Ostarzai	Switched 450 kVAr	Closed
13.	Gharibwal Bannu	Fixed 450 kVAr	Closed
14.	G.T.S. stand Bannu	Fixed 450 kVAr	Open
15.	Custom Park Bannu	Fixed 450 kVAr	Open
16.	Bakhshi Park Charsada Road	Switched 450 kVAr	Open
17.	Shabqadar	Fixed 450 kVAr	Open
18.	Dabgari Garden (Bazar)	Fixed 450 kVAr	Closed
19.	Pabbi Chirat Road	Fixed 450 kVAr	Closed
20.	Dara Zai Camp Chirat Road	Fixed 900 kVAr	Closed

Sr. No.	Capacitor Location	Fixed/Switched kVAr	Status
21.	Pubbi Chirat Road	Fixed 450 kVAr	Closed
22.	Nowshera Cantt.	Switched 450 kVAr	Closed
23.	Dergai	Switched 450 kVAr	Closed
24.	Mardan	Fixed 450 kVAr	Closed
25.	Haripur	Fixed 450 kVAr	Open

SUMMARY

Total Installed	=	98	
Checked/Surveyed	=	25	25.5% Checked of 98
Open	=	6	24.0% Opened of 25
Closed	=	19	76.0% Closed of 25

SURVEY RESULTS
AEB FAISALABAD
11 KV CAPACITOR BANKS
STATUS ON JULY, 1992

Sr. No.	Capacitor Location	Fixed/Switched kVAr	Status
1.	Near Railway Crossing Khushab	Fixed 450 kVAr	Closed
2.	Near Graveyard Khushab	Fixed 450 kVAr	Closed
3.	Near Joherabad Grid	Fixed 450 kVAr	Open
4.	Jhang Chiniot Road	Fixed 450 kVAr	Closed
5.	Jhang Chiniot Rd Kharian Fdr	Fixed 450 kVAr	Defective
6.	Jhang Chiniot Rd Kharian Fdr	Fixed 450 kVAr	Closed
7.	Sargodha Road Sangeet Cinema	Fixed 450 kVAr	Closed
8.	Samanabad Chowk	Fixed 450 kVAr	Closed
9.	Near Rehmanabad Chowk	Fixed 450 kVAr	Closed
10.	Adda Aminpur	Fixed 450 kVAr	Closed
11.	Adda Aminpur Feeder	Switched 450 kVAr	Closed
12.	Nawabanwala Road	Switched 450 kVAr	Closed
13.	Nawabanwala Road	Fixed 450 kVAr	Closed
14.	Nawabanwala Road	Switched 450 kVAr	Closed
15.	Nawabanwala Road	Switched 450 kVAr	Closed
16.	Garden Colony Feeder	Fixed 450 kVAr	Closed
17.	Rabwah near Boat Bridge	Fixed 450 kVAr	Defective
18.	Near Abdullahpur	Switched 450 kVAr	Closed
19.	S-3 Fdr, FBD-SKP Road	Fixed 450 kVAr	Closed

SUMMARY

Total Installed	=	76	
Checked/Surveyed	=	19	25.0% Checked of 76
Open	=	3	15.8% Opened of 19
Closed	=	16	84.2% Closed of 19

SURVEY RESULTS
AEB LAHORE
11 KV CAPACITOR BANKS
STATUS ON JUNE, 1992

Sr. No.	Capacitor Location	Fixed/Switched kVAr	Status
1.	R.A. Bazar, Police Station Lahore Cantt	Fixed 450 kVAr	Closed
2.	Cavalory Patrol Pump, Lahore Cantt	Fixed 450 kVAr	Closed
3.	Cavalory Patrol Pump, Lahore Cantt	Switched 900 kVAr	Closed
4.	CMH & Stadium, Lahore Cantt	Fixed 450 kVAr	Closed
5.	Infantry Road near CMH Lahore Cantt.	Switched 450 kVAr	Closed
6.	Canal Bank Dharampura	Fixed 450 kVAr	Open
7.	Al-Falah Building Mall Road	Fixed 450 kVAr	Closed
8.	Generla Post Office (GPO)	Fixed 450 kVAr	Closed
9.	Railway Headquarters	Fixed 450 kVAr	Open
10.	Davis Road	Fixed 450 kVAr	Closed
11.	Opp. American School Canal Bank	Fixed 450 kVAr	Closed
12.	Dhobi Gat Dharampura	Switched 450 kVAr	Closed
13.	Saddar Round About	Fixed 450 kVAr	Closed
14.	Saddar Islamia H/School	Switched 450 kVAr	Closed
15.	GCO Ordinance Mess Saddar	Switched 450 kVAr	Closed
16.	Cricket House, Jail Road	Fixed 450 kVAr	Open
17.	Services Hospital	Fixed 450 kVAr	Closed
18.	Lahore College for Women	Fixed 450 kVAr	Closed
19.	Ichhra Near Lahore Chemicals	Fixed 450 kVAr	Closed

Sr. No.	Capacitor Location	Fixed/Switched kVAr	Status
20.	Main Road Orangzaib Block Garden Town	Fixed 450 kVAr	Closed
21.	Near Firdous Market, E-III Gulberg	Fixed 450 kVAr	Closed
22.	Sham Nagar	Fixed 450 kVAr	Closed
23.	Bilal Park, Raj Garh	Fixed 450 kVAr	Open
24	Jinnah Colony, Muslim Store Samanabad	Fixed 450 kVAr	Closed
25.	Muslim Road, Samanabad	Fixed 450 kVAr	Closed
26.	Aslam Eye Hospital, Samanabad	Fixed 450 kVAr	Closed
27.	Main Samanabad Road near Ist R/About from Multan Road	Fixed 450 kVAr	Open
28.	Telephone Exchange, Samanabad	Fixed 450 kVAr	Closed
29	Bhalla Stop, Multan Road	Switched 450 kVAr	Closed
30.	Opp. Bhalla Stop, Multan Road	Switched 450 kVAr	Closed
31.	Main Jail Road near ABACUS office	Switched 450 kVAr	Closed
32.	Services Club, Lahore Cantt.	Fixed 450 kVAr	Closed
33.	Chungi Amer Sidhu	Switched 450 kVAr	Closed
34.	Near Nawaz Sharif Park Ferozepur Road	Fixed 450 kVAr	Closed
35.	FC College Chowk, Gulberg-II	Fixed 450 kVAr	Closed
36.	PTV Building, Abbot Road	Fixed 450 kVAr	Closed
37.	Opp. side towards Shimla Hill	Fixed 450 kVAr	Closed
38.	Nicholson Road near Boharwala Chowk	Fixed 450 kVAr	Closed

Sr. No.	Capacitor Location	Fixed/Switched kVAr	Status
39.	Napier Road, Gardee Trust Building	Fixed 450 kVAr	Closed
40.	Ghazi Road, Lahore Cantt.	Switched 450 kVAr	Closed
41.	Hussain Chowk, Culberg	Fixed 450 kVAr	Closed
42.	Near Plot No. 23-L Gulberg	Fixed 450 kVAr	Closed
43.	Liberty Chowk	Switched 450 kVAr	Closed
44.	Near WAKGAS Ltd. Plot No. 135-E, Gulberg	Switched 450 kVAr	Closed
45.	Near Plot No. 80-D, Gulberg	Switched 450 kVAr	Closed
46.	Near MD(Power) WAPDA Residence, Gulberg	Switched 450 kVAr	Closed
47.	Near Azaz Center, Gulberg	Fixed 450 kVAr	Closed
48.	Shafiqabad (Bund Road)	Fixed 450 kVAr	Closed
49.	Khalid Park Tee-off (Bund Road)	Fixed 450 kVAr	Closed
50.	Opp. Khokhar Town (Bund Road)	Switched 450 kVAr	Closed
51.	Opp. Malipura (Bund Road)	Switched 450 kVAr	Closed
52.	Ghazi Road near Officer Colony	Switched 450 kVAr	Closed
53.	Near Veterinary Research Institute, Ghazi Road	Fixed 450 kVAr	Closed
54.	Mohammad Ali Park	Fixed 450 kVAr	Open
55.	Tajpura Street	Switched 450 kVAr	Open
56.	Near Hari Nagar Graveyard (Kamharpura)	Fixed 450 kVAr	Closed
57.	Near Ranger Headquarter (Ghazi Road)	Switched 450 kVAr	Closed
58.	Near Railway Line Mian Mir Colony	Switched 450 kVAr	Open

Sr. No.	Capacitor Location	Fixed/Switched kVAr	Status
59.	Near Jora Pull Ghazi Road	Switched 450 kVAr	Closed
60.	Near Sadar Police Station (Allama Iqbal Road)	Fixed 450 kVAr	Open
61.	Near Sadar Police Station (Allama Iqbal Road)	Switched 450 kVAr	Open
62.	Near Timber Market - Saddar Allama Iqbal Road	Switched 450 kVAr	Closed
63.	Near LDA Disposal Pump (Dharampura)	Switched 450 kVAr	Closed
64.	Near DAD Flat Lahore Cantt.	Switched 450 kVAr	Closed
65.	Near Military Dairy Farm Lahore Cantt.	Fixed 450 kVAr	Closed
66.	Near CMH Hospital	Switched 450 kVAr	Closed
67.	Opp. Christian Graveyard Jail Road	Switched 450 kVAr	Closed
68.	Khawaja Fareed Road	Fixed 450 kVAr	Closed
69.	Khawaja Fareed Road	Switched 900 kVAr	Closed
70.	Malik Munir Road	Switched 900 kVAr	Closed
71.	Darga Street Dharampura	Switched 450 kVAr	Closed
72.	Near Railway Crossing (Allama Iqbal Road)	Switched 450 kVAr	Closed
73.	Near Canal Bridge Dharampura	Fixed 450 kVAr	Closed
74.	Near Railway Canal Bridge	Switched 450 kVAr	Closed
75.	Behind PWD Office Dharampura	Switched 450 kVAr	Closed
76.	Bastami Road	Fixed 450 kVAr	Closed
77.	Noor Ullah Colony	Fixed 450 kVAr	Closed
78.	New Bastami Road	Switched 450 kVAr	Closed
79.	Near Dispensary Punjab Social Security	Switched 450 kVAr	Closed

Sr. No.	Capacitor Location	Fixed/Switched kVAr	Status
80.	Near T&T Quarters, A.I. Town	Switched 450 kVAr	Closed
81.	Zeenat Block	Switched 450 kVAr	Closed

SUMMARY

Total Installed	=	189	
Checked/Surveyed	=	81	43.0% Checked of 189
Open	=	10	12.3% Opened of 81
Closed	=	71	87.7% Closed of 81

SURVEY RESULTS
AEB ISLAMABAD
11 KV CAPACITOR BANKS
STATUS ON JULY 26, 1992

Sr. No.	Capacitor Location	Fixed/Switched kVAr	Status
1.	Industrial Area Islamabad	Fixed 450 kVAr	Closed
2.	Street-9, I-9	Fixed 450 kVAr	Closed
3.	I-9 Markaz	Fixed 450 kVAr	Closed
4.	Near International School	Fixed 450 kVAr	Closed
5.	Near Filtration Plant (Chak Shazad)	Switched 450 kVAr	Closed
6.	Near Filtration Plant (Chak Shazad)	Fixed 450 kVAr	Closed
7.	Near Main Gate NARC	Fixed 450 kVAr	Closed
8.	Near CDA Tubewell No. 1 (Inside NARC)	Fixed 450 kVAr	Closed
9.	Near 11-A Affandi Colony	Fixed 450 kVAr	Closed
10.	Near 51-A Affandi Colony	Fixed 450 kVAr	Closed
11.	Chandni Chowk	Fixed 450 kVAr	Open
12.	Near Holy Family Hospital	Switched 450 kVAr	Open
13.	Near Faisal Mosque, Satellite Town	Fixed 450 kVAr	Open
14.	Near Mala Raj Sultan	Fixed 450 kVAr	Open
15.	Near Mala Raj Sultan	Switched 450 kVAr	Closed
16.	Near Punjab Bank Satellite Town	Fixed 450 kVAr	Open
17.	Near Nadir Cinema	Fixed 450 kVAr	Not at sight
18.	Near Plot No. D-135 Satellite Town	Fixed 450 kVAr	Damaged
19.	Near Asghar Mall Chowk	Switched 450 kVAr	Closed

Sr. No.	Capacitor Location	Fixed/Switched kVAr	Status
20.	Chowk Chah Sultan	Switched 450 kVAr	Closed
21.	Near Patarol Pump Chaklala Road	Fixed 450 kVAr	Closed
22.	Tamasabad	Switched 450 kVAr	Closed
23.	Near Bunny Market Saidpur Road	Fixed 450 kVAr	Closed
24.	Near Bunny Chowk Jamia Masjid Road	Switched 450 kVAr	Closed
25.	Near Hakeem Mohammad Azim Khan	Switched 450 kVAr	Closed
26.	Near Lala Rukh Cinema Hassan Abdal	Fixed 450 kVAr	Closed
27.	Near ACC Cement Factory	Fixed 450 kVAr	Closed
28.	Chur Ghushti Village	Fixed 450 kVAr	Closed
29.	Hazro	Fixed 450 kVAr	Closed
30.	Near Mahmood Mahal Cinema Attock	Fixed 450 kVAr	Closed
31.	Near Police Line Attock	Fixed 450 kVAr	Closed
32.	Near Basti Chowk Wah Factory	Fixed 450 kVAr	Closed
33.	Near Losarmera G.T.Road Wah	Fixed 450 kVAr	Closed
34.	Inside Small Industries Jhelum	Fixed 450 kVAr	Closed
35.	Near Manzoor Shah Stop Lala Musa	Switched 900 kVAr	Closed
36.	Rehmatabad Lala Musa	Fixed 450 kVAr	Closed
37.	Near Sabaz Mandi Lala Musa	Fixed 450 kVAr	Closed
38.	Near Police Station	Switched 900 kVAr	Closed
39.	Near Paswal Village Lala Musa	Switched 900 kVAr	Closed
40.	Behind Govt. College Lala Musa	Fixed 450 kVAr	Closed
41.	Wariach Petroleum G.T.Road Lala Musa	Fixed 450 kVAr	Closed

Sr. No.	Capacitor Location	Fixed/Switched kVAr	Status
42.	Sihala Feeder Rawat	Fixed 450 kVAr	Closed
43.	Jiagali	Fixed 450 kVAr	Disappeared
44.	Guldona Road near USAID Embassy Staffhouse	Fixed 450 kVAr	Closed
45.	Upper Topa	Fixed 450 kVAr	Open
46.	Bakramandi Chowk	Fixed 450 kVAr	Closed
47.	Tanchpata	Fixed 450 kVAr	Closed
48.	Military Hospital	Fixed 450 kVAr	Closed
49.	Peshawar Road	Switched 450 kVAr	Closed
50.	Near Race Course Peshawar Road	Fixed 450 kVAr	Open
51.	Abid Majid Road	Switched 900 kVAr	Closed
52.	Chakwal City Filter Plant Islamabad	Switched 900 kVAR	Closed
53.	Main G.T. Road Gujrat	Switched 450 kVAr	Closed
54.	Main G.T. Road Gujrat	Fixed 450 kVAr	Closed

SUMMARY

Total Installed	=	93				
Checked/Surveyed	=	54	58.0%	Checked	of	93
Open	=	5	9.3%	Opened	of	54
Closed	=	49	90.7%	Closed	of	54

SURVEY RESULTS
AEB GUJRANWALA
11 KV CAPACITOR BANKS
STATUS ON JUNE, 1992

Sr. No.	Capacitor Location	Fixed/Switched kVAr	Status
1.	Jinnah Road Islamia College	Fixed 450 kVAr	Closed
2.	Grunankpura	Fixed 450 kVAr	Closed
3.	Baghbanpura	Fixed 450 kVAr	Closed
4.	Jinnah Road near Mohd. Yousaf Spare Parts	Fixed 450 kVAr	Closed
5.	Jinnah Road near Mohd. Yousaf Spare Parts	Fixed 450 kVAr	Closed
6.	Hafizabad Road	Fixed 450 kVAr	Closed
7.	Gali Duodar Qadria Hafizabad Road	Fixed 450 kVAr	Closed
8.	Near H.M. Abdullah Hafizabad Road (Capital Fans)	Fixed 450 kVAr	Closed
9.	Sultanpura Hafizabad Road Opp. Kashmir Steel	Fixed 450 kVAr	Closed
10.	Near Haji M. Akbar Hafizabad Rd	Fixed 450 kVAr	Closed
11.	Kali Rustam Road	Fixed 450 kVAr	Closed
12.	Sargodha Jute Mill	Fixed 450 kVAr	Closed
13.	Ittehad Steel G.T. Road	Fixed 450 kVAr	Closed
14.	Opp. Sardar Family Hospital G.T. Road	Fixed 450 kVAr	Closed
15.	Chaman Shah Feeder		
16.	Ferozwala Road People Colony	Fixed 450 kVAr	Closed
17.	Ferozwala Road Chowk Gherdor Road	Fixed 450 kVAr	Closed

Sr. No.	Capacitor Location	Fixed/Switched kVAr	Status
18.	Near Bridge Ferozwala By-pass Road	Fixed 450 kVAr	Closed
19.	Near Sampak Sheikhupura	Fixed 450 kVAr	Closed
20.	Ch. Textle Mills Ltd.	Fixed 450 kVAr	Closed
21.	Sargodha Jute Mill Sheikhupura	Fixed 450 kVAr	Closed
22.	Wazirabad Mor	Fixed 450 kVAr	Closed
23.	Wazirabad Mor	Fixed 450 kVAr	Disappeared
24.	Near WAPDA Colony Sialkot	Fixed 450 kVAr	Closed
25.	Bagowal Road Sialkot	Fixed 450 kVAr	Closed
26.	Bhagwal Awan Sialkot	Switched 450 kVAr	Closed
27.	Near PD Office Gujranwala	Fixed 450 kVAr	Closed
28.	Near Entry Gate to Gujranwala	Fixed 450 kVAr	Closed
29.	Lahore-Sheikhupura Road near Ayesha Textile Mill	Fixed 450 kVAr	Closed

SUMMARY

Total Installed	=	115	
Checked/Surveyed	=	29	25.2% Checked of 115
Open	=	1	3.5% Opened of 29
Closed	=	28	96.5% Closed of 29

SURVEY RESULTS
AEB MULTAN
11 KV CAPACITOR BANKS
STATUS ON JULY, 1992

Sr. No.	Capacitor Location	Fixed/Switched kVAr	Status
1.	Eid Gah	Fixed 450 kVAr	Closed
2.	Chungi No.9	Fixed 450 kVAr	Closed
3.	Pul Moj Darya	Fixed 450 kVAr	Closed
4.	Near Irum Cinema Vehari Road	Fixed 450 kVAr	Closed
5.	2nd near Irum Cinema Vehari Road	Fixed 450 kVAr	Closed
6.	Vehari Road	Switched 900 kVAr	Closed
7.	New Gala Mandi Vehari Rd	Fixed 900 kVAr	Closed
8.	New Central Jail Road Ghala Mandi	Fixed 450 kVAr	Closed
9.	Near Telephone Exchange Mumtazabad	Fixed 450 kVAr	Closed
10.	Telephone Exchange Near Multan (By Pass Rd)	Fixed 450 kVAr	Closed
11.	Near Govt. High School Station Road Khanewal	Fixed 450 kVAr	Closed
12.	Near Girls College Khanewal	Fixed 450 kVAr	Closed
13.	Kacha Khu	Fixed 450 kVAr	Closed
14.	Old Kacha Khu	Switched 450 kVAr	Closed
15.	Old Kacha Khu	Switched 450 kVAr	Closed
16.	Timber Market Sahiwal	Switched 900 kVAr	Closed
17.	Timber Market Sahiwal	Fixed 450 kVAr	Closed
18.	Industrial Area Chichawatni	Switched 450 kVAr	Closed

Sr. No.	Capacitor Location	Fixed/Switched kVAr	Status
19.	Canal Feeder Near Rajbaya	Switched 450 kVAr	Closed
20.	Thal Road Sahiwal	Switched 900 kVAr	Closed
21.	Near Amir Cold Storage (11 KV Karamanwala Feeder)	Switched 450 kVAr	Closed
22.	Qadirabad Road Yousafwala	Switched 450 kVAr	Closed
23.	Old Kachery Opp. Microwaves Tower	Fixed 450 kVAr	Closed
24.	Near Kissan Cold Storage	Fixed 450 kVAr	Closed
25.	Near Railway Crossing I	Fixed 450 kVAr	Closed
26.	Lakar Mandi Near SDO Ist office	Fixed 450 kVAr	Closed
27.	Near Sabri Colony Akbar Road	Fixed 450 kVAr	Closed
28.	Chak 3/4 L (Akbar Road)	Fixed 450 kVAr	Closed

SUMMARY

Total Installed	=	136	
Checked/Surveyed	=	28	20.5% Checked of 136
Open	=	0	0.0% Opened of 28
Closed	=	28	100.0% Closed of 28

SURVEY RESULTS
AEB HYDERABAD
11 KV CAPACITOR BANKS
STATUS ON MAY 4, 1992

Sr. No.	Capacitor Location at Hyderabad	Fixed/Switched kVAr	Status
1.	Near Karim Cotton Mill	Switched 900 kVAr	Closed
2.	Near Sarmast Cooking Oil	Switched 900 kVAr	Closed
3.	Opp. Central Cotton Mill	Switched 450 kVAr	Closed
4.	Opp. Awami Textile Mill	Switched 900 kVAr	Closed
5.	Opp. Sufia Textile Mill	Switched 900 kVAr	Closed
6.	Near Quetta Textile Mill	Switched 450 kVAr	Closed
7.	Calico Textile Mill	Switched 900 kVAr	Closed
8.	Near SITE Police Station	Switched 450 kVAr	Closed
9.	Near Atlas Textile	Switched 900 kVAr	Closed
10.	Near Surriya Textile Mill	Switched 450 kVAr	Closed
11.	Near KDM Kotri Offices	Switched 900 kVAr	Closed
12.	Near General Bus Stand	Switched 450 kVAr	Closed

SUMMARY

Total Installed	=	36				
Checked/Surveyed	=	12	33.3%	Checked	of	36
Open	=	0	0.0%	Opened	of	12
Closed	=	12	100.0%	Closed	of	12

ATTACHMENT 8

SUMMARY OF LOSS REDUCTION AND
ESTIMATED SAVINGS

POWER LOSS REDUCTION SUMMARY AND ESTIMATED SAVINGS
DERIVED FROM THE INSTALLATION OF CAP's + COND. TO THE DISTRIBUTION SYSTEM
UNDER " USAID "
(CERTIFIED WORK ORDERS ONLY)

SR NO	AREA ELECTRICITY BOARD	TOTAL WO COST (RS.)	450KVAR CAPACITOR APPLICATION (F)	(S)	900 KVAR CAP. (S)	ACTIVITY: HT LINE(Recon'd)Kms. OSP	PAN	DOG	RAB	GOP	HT LINE (New) Kms. OSP	PAN	DOG	RAB	GOP
1	FAISALABAD	26,105,159	45	34	1	17.64	34.74	28.08	12.06	23.48	0.00	0.00	55.36	0.00	0.00
2	GUJRANWALA	28,992,287	71	44		14.72	21.21	88.33	31.67	29.22	3.20	4.15	15.52	0.00	0.00
3	HYDERABAD	25,299,388	7	29		29.30	28.08	43.27	8.53	0.00	20.70	0.00	32.56	0.00	0.00
4	ISLAMABAD	18,838,517	85	18	4	14.13	14.49	21.96	0.00	0.00	0.00	3.50	23.79	0.00	0.00
5	LAHORE	24,969,042	131	64	6	46.27	12.77	9.96	7.47	12.32	0.00	0.00	0.55	0.00	0.00
6	MULTAN	35,715,804	113	30	23	23.15	38.48	59.33	25.19	32.25	0.00	0.00	17.10	2.50	2.75
7	PESHAWAR	31,977,655	80	24	0	0	66.12	58.79	28.93	6.03	0	17.95	23.81	0.00	0.00
8	QUETTA	20,043,416	4	23		20.39	63.29	4.40	0.65	0.00	0.00	0.00	18.61	0.00	0.00
9	CRASH PRGM.	51,466,503					84.68	400.10	157.46	43.83					
	TOTAL:	263,457,771	536	266	34	166	364	714	272	153	24	26	187	3	3

03-Aug-92

SR NO	AREA ELECTRICITY BOARD	PEAK DEMAND EXISTING (KW)	EXISTING KW(Peak) LOSSES (KW)	PEAK DEMAND AFTER REH (KW)	LOSSES AFTER REHAB. KW(Peak)	KW(PEAK) LOSS SAVING (KW)	ANNUAL SAVING (KWH)	Estimated Savings KW (Rs.1000)	KWH (Rs.1000)	TOTAL (Rs.1000)	Estimated Savings (US $1000)	POWER LOSSES IN PERCENT BEFORE	AFTER
1	FAISALABAD	80819.0	6261.9	77243.0	2686.0	3575.9	13,168,726	29.426	12.510	41936	1.677	7.75	3.48
2	GUJRANWALA	155136.8	13855.8	147293.2	6012.2	7843.6	26,243,484	64.545	24.936	89481	3.579	8.93	4.08
3	HYDERABAD	72254.0	6192.8	68201.0	2140.2	4052.6	15,124,993	33.349	14.369	47718	1.909	8.57	3.14
4	ISLAMABAD	97095.2	6341.9	93965.3	3212.0	3129.9	10,379,724	25.756	9.861	35617	1.425	6.53	3.42
5	LAHORE	218536.0	7312.5	214628.9	3405.4	3907.1	14,049,135	32.152	13.347	45499	1.820	3.35	1.59
6	MULTAN	136019.0	9989.3	130108.0	4077.9	5911.4	17,890,771	48.645	16.996	65641	2.626	7.34	3.13
7	PESHAWAR	116380.0	10672.7	110198.7	4491.2	6181.6	21,590,291	50.868	20.511	71379	2.855	9.17	4.08
8	QUETTA	37299.0	6278.6	32841.0	1820.8	4457.9	16,572,000	36.684	15.743	52427	2.097	16.83	5.54
9	CRASH PRGM.	N/A	N/A	N/A	N/A	15107.0	36,717,699	124.301	34.882	159.183	6.746		
	TOTAL:	913,539	66.906	874,479	27.846	54.167	171,741,823	445.726	163.155	608.881	24.734		

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POWER LOSS REDUCTION SUMMARY AND ESTIMATED SAVINGS
DERIVED FROM THE INSTALLATION OF CAP's + COND. TO THE DISTRIBUTION SYSTEM
UNDER " ADB " LOAN.
(CERTIFIED WORK ORDERS ONLY)

SR NO	AREA ELECTRICITY BOARD	TOTAL WO COST (RS.)	450KVAR CAPACITOR APPLICATION (F)	(S)	900 KVAR CAP. (S)	LT EQ.CAP.COMPENSAT 10 KVAR (F)	20 KVAR (F)	40 KVAR (F)	80 KVAR (F)	ACTIVITY: HT LINE(Recon'd)Kms OSP	PAN	DOG	RAB	GOP	HT LINE (New) Kms. OSP	PAN	DOG	RAB	GO
1	FAISALABAD	404,668	0	3	0	0	0	0	0	0.56	0	0	0	0	0	0	0	0	0
2	GUJRANWALA	1,234,236	0	3	1	0	0	0	0	1.35	0	5	1	3	0	0	0	0	0
3	HYDERABAD	11,578,725	0	40	6	0	0	0	0	7.35	0	0	2	0	0	0	0	0	0
4	ISLAMABAD	11,595,471	0	16	12	19	16	26	20	26.08	0	10	9	1	0	0	6	6	0
5	LAHORE																		
6	MULTAN	606,676	0	4	1	4	3	6	7	0.00	0	0	0	0	0	0	0	0	0
7	PESHAWAR	43,583,922	0	44	37	251	179	138	18	69.40	0	93	8	40	1	0	39	1	0
8	QUETTA																		
	TOTAL:	69,003,698	0	110	57	274	198	170	45	105	0	108	19	44	1	0	45	7	0

03-Aug-92

SR NO	AREA ELECTRICITY BOARD	Peak Demand Existing (KW)	EXISTIN KW(Peak LOSSES	Peak Demand After Reh (KW)	LOSSES AFTER REHAB. KW(Peak)	KW(Peak LOSS SAVING (KW)	ANNUAL SAVING (KWH)	Estimated Savings KW (Rs.1000)	KWH (Rs.1000)	TOTAL (Rs.1000)	Estimated Savings (US $1000)	Power Losses in Percent Before	After
1	FAISALABAD	1,600	95	1,562	57	38	143,027	311	143	454	18	5.95	3.67
2	GUJRANWALA	5,218	347	5,014	143	204	509,876	1,679	510	2189	88	6.65	2.86
3	HYDERABAD	51,405	3,279	50,051	1,925	1,354	4,844,645	11,142	4,845	15987	639	6.38	3.85
4	ISLAMABAD	46,042	3,166	44,151	1,276	1,890	6,405,388	15,556	6,405	21961	878	6.88	2.89
5	LAHORE												
6	MULTAN	8,664	216	8,594	146	70	236,682	576	237	813	33	2.49	1.7
7	PESHAWAR	157,586	13,747	149,058	5,219	8,528	25,384,079	70,177	25,384	95561	3,822	8.72	3.5
8	QUETTA												
	TOTAL:	270,515	20,851	258,430	8,767	12,084	37,523,697	99,441	37,524	136,965	5,478		

ASIM