

UNCLASSIFIED  
CLASSIFICATION

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PROJECT EVALUATION SUMMARY (PES) - PART I

Report Symbol USAID

1. PROJECT TITLE <b>RURAL AND URBAN ELECTRIFICATION</b>			2. PROJECT NUMBER <b>278-0209</b>	3. MISSION/AID/W OFFICE <b>USAID/Jordan</b>
4. EVALUATION NUMBER (Enter the number maintained by the reporting USAID, Country or AID/W Administrative Code, Fiscal Year, Serial No. beginning with No. 1 each FY) <b>83-3</b>			5. REGULAR EVALUATION <input checked="" type="checkbox"/> SPECIAL EVALUATION <input type="checkbox"/>	
6. KEY PROJECT IMPLEMENTATION DATES			7. ESTIMATED PROJECT FUNDING	
A. From PROGRAM or Equipment <i>11/77</i>	B. From Category <i>77</i>	C. Final Input Output <i>83</i>	1. Total \$ <b>14.5 m</b>	
			2. U.S. \$ <b>9.0 m</b>	
			8. PERIOD COVERED BY EVALUATION	
			From (month/year) <b>9/77</b>	
			To (month/year) <b>9/84</b>	
			Date of Evaluation Report <b>11/84</b>	

B. ACTION DECISIONS APPROVED BY MISSION OR AID/W OFFICE DIRECTOR

A. List decisions and/or unresolved issues, and those items needing further study. (NOTE: Minimal decisions which indicate AID/W or regional office action should specify type of document, e.g., program, SPAR, PIQ, which will present detailed request.)	B. NAME OF OFFICER RESPONSIBLE FOR ACTION	C. DATE ACTION TO BE COMPLETED
Final-Evaluation of Project. No follow-on projects are planned or anticipated.	USAID/J	12/84

9. INVENTORY OF DOCUMENTS TO BE REVISED PER ABOVE DECISIONS

<input type="checkbox"/> Project Paper	<input type="checkbox"/> Implementation Plan (e.g., CPI Network)	<input type="checkbox"/> Other (Specify) _____
<input type="checkbox"/> Financial Plan	<input type="checkbox"/> PIQ/T	_____
<input type="checkbox"/> Legal Framework	<input type="checkbox"/> PIQ/C	<input type="checkbox"/> Other (Specify) _____
<input type="checkbox"/> Project Agreement	<input type="checkbox"/> PIQ/P	_____

10. ALTERNATIVE DECISIONS ON FUTURE OF PROJECT

A.  Continue Project Without Change

B.  Change Project Design and/or  Change Implementation Plan

C.  Discontinue Project

11. PROJECT OFFICER AND HOST COUNTRY OR OTHER RANKING PARTICIPANTS AS APPROPRIATE (Name and Title)

A. Sweis, USAID Engineer  
W. Libby, USAID General Engineering Advisor  
B. Donnelly, USAID General Engineering Officer

12. Mission/AID/W Office Director Approval

Signature  
*Gerald F. Gower*

Type and Name  
Gerald F. Gower

Date  
*31 Dec 1984*

NEAR EAST EVALUATION ABSTRACT

PROJECT TITLE(S) AND NUMBER(S) Rural and Urban Electrification 278-0209	MISSION/COORD OFFICE USAID/Jordan
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PROJECT DESCRIPTION  
To permit the utilization of electric power by 24,000 potential consumer units located in 35 villages and 2 refugee camps and to contribute to the improvement and increased quantity of electricity to consumers in Amman, through the financing of equipment and materials for electrification and to reinforce the Amman distribution system.

AUTHORIZATION DATE AND U.S. COP FUNDING AMOUNT FY 77 \$9.0 Million	PES NUMBER 83-3	PES DATE 12/18/84	PES TYPE <input type="checkbox"/> Regular <input type="checkbox"/> Other (Specify)
ABSTRACT PREPARED BY, DATE Nancy Carmichael Hardy, 12/24 Mission Evaluation Officer		ABSTRACT CLASS. V. DATE A. Swels, USAID/ENG, 12/23 L. Donnelly, USAID/ENG, 12/23 G. Gower, USAID/DIR, 12/23	
		<input type="checkbox"/> Special <input checked="" type="checkbox"/> Terminal	

The terminal evaluation was conducted in September 1984 to assess project implementation and the effects of improved and increased electricity supplies on the rural villages and urban areas affected by the project. Implementation ended in July 1983 and all funds have been disbursed. By September 1984, 78 percent of the 24,000 project consumers had been supplied with electricity and well over 5,000 can be expected to connect to electricity supplies over the next three years. Approximately 125,000 individuals in 35 villages and two refugee camps have now been provided with services.

The project experienced considerable delays in implementation due initially to the inexperience of the implementing agency's Jordan Electric Power Company's (JEPCO), UK consultant, in preparing bid documents in accordance with AID regulations. Poor responses to tenders by US and Code 941 suppliers also contributed to project delays. The latter, coupled with higher than expected inflation rates, prompted JEPCO to request and AID, to approve, that US funds be used solely for the procurement of equipment and material with JEPCO financing erection, installation, engineering services and supervision. This funding arrangement resulted in an unplanned improvement in local construction contractors' capabilities in rural erection work. Rural and Urban Electrification also assisted JEPCO in obtaining financing from other donors for similar projects. The World Bank, the European Investment Bank and the USSR have since contributed to the expansion of JEPCO's urban and rural networks. Approximately 77,000 more customers will receive new or improved supplies from other donor-financed electrification project which extend electrical infrastructure built under 278-0209 in the JEPCO concession area.

An important lesson resulting from Rural and Urban Electrification was the need for US technical assistance in the project's early stages. If an experienced consultant, familiar with AID procurement regulations, had been available, valuable time would not have been lost in re-writing IFBs and contracting with suppliers. Nonetheless, this project was highly successful, and JEPCO, a private company rather than a government agency, was able to respond rapidly and effectively in carrying out project activities.

**RURAL AND URBAN ELECTRIFICATION**

**A.I.D. PROJECT NO. 278-0209**

**A.I.D. LOAN NO. 278-K-020**

**ENG:ASWEIS:SG**

**DECEMBER 23, 1984**

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### ATTACHMENTS:

TABLE I  
TABLE II  
TABLE III

## LEGEND

JD----	Jordan Dinar	
KV----	Kilovolt-----	1,000 Volt
KVA---	Kilovolt Ampere-----	1,000 Volt-Ampere
MVA---	Megavolt Ampere-----	1,000 KVA
KW----	Kilowatt-----	1,000 Watt
MW----	Megawatt-----	1,000 KW
KWH---	Kilowatt-Hour-----	1,000 Watt-Hour
MWH---	Megawatt-Hour-----	1,000 KWH
GWH---	Gegawatt-Hour-----	1,000 MWH
KM----	Kilometer-----	0.62 Mile
JEA----	Jordan Electricity Authority	
JEPCO-	Jordan Electricity Power Company	
IBRD--	International Bank for Reconstruction and Development	
-----	(World Bank)	

13. SUMMARY

AID provided a \$9.0 million loan to the Government of Jordan (GOJ) to assist in funding a rural and urban electrification plan to electrify 37 communities (35 villages and 2 refugee camps), and to provide material and equipment to help strengthen and upgrade the Amman high and low tension power networks. The loan agreement was signed with National Planning Council (NPC) on September 21, 1977; the original PACD was December 31, 1980. The implementing agency was the Jordan Electric Power Company, Ltd. (JEPCO) which is the concessionaire authorized to supply energy to consumers in and around Amman and is a private shareholding company.

The original concession consisted of an area bounded by a 15 Km radius circle centered on the Amman Mosque plus an additional area 20Km wide along the Amman/Zarqa road. The GOJ agreed to extend the JEPCO concession area to serve other villages included in the project.

The project financed equipment and material for electrification and to reinforce the existing urban Amman distribution system to meet the need for additional electrical service. The full amount of the loan was disbursed (see Table I). JEPCO used approximately US\$5,500,000 of its own funds to finance the following:

1. Installation/Erection services by local or Code 941 contractors.
2. Power system erection and maintenance equipment, including trucks, ditch digging equipment, derricks, winches and cable handling equipment.
3. Engineering services to assist in power system design, construction, installation and procurement.

The project was completed with no significant changes in relation to the original design. A substantial part of the rural erection work was completed by local construction contractors. This resulted in an unplanned major improvement in the capability of the local construction industry. The creation of an improved control system, using the System Control and Data Acquisition (SCADA) as a tool, has been implemented by JEPCO. An experienced Control System Engineer, from the company's consultant staff has recently been engaged to facilitate training and improve management aspects of the organization.

In the FP, the project's evaluation was timed to occur when most of the projected 24,000 consumers were supplied with electricity, and the purpose of this evaluation was to assess the results achieved by the end of the implementation period, i.e. July 1983. By September, 1984, a total of 18,752 of the 24,000 allottees or 78 percent of the project consumers had been supplied and well over 5,000 consumers can be expected to utilize the facilities over the next three years.

Major constraints were the initial inexperience of JEFECO's consultant, the U.S. firm of Kennedy and Dunken, in preparing bid documents in accordance with AID regulations and the poor response by U.S. and Code 941 country suppliers. These resulted in implementation delay of two and a half years. Despite these delays the project achieved most of its objectives and is one of the most successful AID projects of its kind in Jordan. The project has been extremely effective in its primary objective of providing reliable electricity service to 35 villages in the rural vicinity of Amman and two areas in suburban Amman. Service was provided to a population of approximately 115,000 individuals and included some 1,000 industrial/commercial consumers by the completion date of the project, representing an annual electricity consumption in excess of 21 GWH.

#### 14. EVALUATION METHODOLOGY

The implementation schedule in the project paper (FP) called for evaluation of the project when most of its estimated 24,000 consumers were connected to the public electric utility system, and required an assessment of the results achieved at the end of project implementation. This final evaluation is based on comprehensive monitoring by USAID personnel during project implementation and after completion. USAID Engineers physically checked almost all completed work.

The number of consumers in each village was obtained from JEFECO records and other details were obtained from contracts and discussions with JEFECO and consultant staff members.

Principal contributors were Mr. Marwan Fakhraq, Technical Manager, JEFECO; Mr. Salim Idris, Financial Chief, JEFECO; Mr. Bernard Burgq, Project Engineer, Kennedy and Dunken, JEFECO consultant; James Fichter, USAID J Controller Office and Mr. William Libby, USAID/J Engineering Office.

#### 15. EXTERNAL FACTORS

In general, there were no significant external factors that unduly influenced the project. It is important to note that

when the project started the Government of Jordan (GOJ), put a high emphasis on rural electrification. However, due to budget constraints and high rates of inflation during the period of project implementation (1977-1983), JEFECO was unable to obtain a significant amount of necessary equipment and materials in a timely manner. This was partly due to delays in issuing the initial IFBs and subsequent poor responses from Code 941 suppliers and partly to the bids themselves, that were significantly higher than the estimates contained in the FF budget. The FF budget equipment estimates were prepared in early 1977 and contained a 19 percent inflation factor. However, bids received between mid-1979 and November 1982 were considerably higher than these estimates, which in turn, formed the basis for planned AID/JEFECO contributions to the Project. This coupled with the unusually poor responses from Code 941 suppliers prompted JEFECO to request that it be allowed to use AID funds solely for procurement of equipment and materials (see Tables I and II) with the understanding that JEFECO would provide funds from its own resources for erection, installation, engineering services and supervision. This request was approved by AID. Although JEFECO's total contribution to the project is reported as \$5.5 million, this figure does not reflect staff time and other in-land costs that, if quantified, would show a much higher contribution and reflect the additional financing provided by JEFECO to cover the cost of the inputs mentioned above.

#### 16. PROJECT INPUTS

Project inputs as planned in the project paper (PP) consisted of:

- A. Extension of electric lines to 35 villages and to the Baq'a and Schneller areas of suburban Amman.
- B. Equipment and materials for reinforcing the existing JEFECO transmission and distribution system.
- C. Installation of a control center.
- D. Purchase of equipment used in installation and construction.
- E. A portion of local costs for erection and installation, and;
- F. engineering services, as required for supervision. The estimated costs were stated in the FF for the entire project as \$19.5 million. AID provided \$9 million and \$5.5 million was provided by JEFECO. Foreign exchange and local cost items were as follows:

ITEM	JEFECO \$	AID \$	TOTAL \$
Material Procurement, for 36 villages: for Amman System (including erection equipment):	2,384,000	4,665,200	7,049,200
Inflation:	1,026,000	1,550,000	2,576,000
	<u>500,000</u>	<u>654,800</u>	<u>1,154,800</u>
Sub-Total (for procurement):	3,910,000	7,220,000	11,130,000
Erection:	1,090,000	1,280,000	2,370,000
Engineering Services	<u>500,000</u>	<u>500,000</u>	<u>1,000,000</u>
<b>TOTAL PROJECT COST</b>	<b>5,500,000</b> *****	<b>9,000,000</b> *****	<b>14,500,000</b> *****

Implementing of the project was delayed because of the following:

- 1) Redrafting of the IFBs because of JEFECO's U.K. consultants' (Kennedy and Dunlop) inexperience in preparing bid documents in accordance with AID regulations.
- 2) Poor response to IFBs by U.S. and Code 941 country suppliers.
- 3) The SCADA system that was originally tendered in February 1980 was rejected due to the high price of all offers.

After the SCADA IFBs were rejected USAID under an agreement with JEFECO consented to the utilization of loan funds to procure a radio communication system that JEFECO had originally intended to finance. Later, JEFECO modified its SCADA system requirements and the SCADA equipment IFB was reissued in August 1981. IFBs were received and analyzed by the project consultant, Kennedy and Dunlop, and Telecom Co. of Vienna, Virginia was awarded a supply and install contract of approximately \$1.2 million. USAID agreed to pay dollar costs up to the balance of the loan and JEFECO financed installation-erection services by local or Code 941 contractors; power system erection and maintenance equipment, including trench, ditch digging equipment, derricks, winches and cable handling equipment; and engineering services.

Because of these unanticipated events AID's contribution of \$9 million to the project was used to finance material and some equipment. A breakdown of AID financed commodities is given in Table 1.

JEPCO financed approximately \$5.5 million for local contractors, equipment and engineering services. JEPCO's total contribution included considerably staff time and other in-kind costs that cannot be completely quantified.

Although there were significant problems in the delivery of project commodity inputs, USAID staff monitoring and advice to both JEPCO and its consultant were instrumental in achieving project success.

## 17. QUIQUES

The project paper (FF) envisaged providing and installing that material and equipment necessary to complete an electricity distribution system in 35 villages and two camps and to upgrade the electric distribution network in Amman.

IFB documents for all items (see Table II) of the project with the exception of the System Control and Data Acquisition (SCADA) system were approved in February 1979. IFB documents for conductors, poles, insulators, auxiliary switch gear, and transformers were released in March 1979 with a closing date of May 16, 1979. The response to these invitations to bid was very poor. As a result, it was only possible to award three contracts by the closing date.

The remaining IFBs were reissued, together with IFBs for tariff meters and radio equipment in October 1979. A new closing date of February 13, 1980 was approved for all material except the tariff meters and SCADA equipment.

Contracts for the above items were awarded in June and December 1981, respectively. Work commenced on the rural electrification element of the project in January 1980 utilizing JEPSCO funds account forces and material from JEPCO stocks. This was necessary because the supply of material under the project was late due to delays in award. During 1980 supplies were made available to a few villages and 750 consumers were connected during this period. In 1981 a further 7 villages were electrified and a total of 2,091 consumers were connected. Also, some 400 consumers in the refugee camp at Schneller were connected during this period.

An additional 5 villages were electrified during 1982 along with 3,365 consumers in the refugee camps at Baq'a and Schneller. The remaining 17 villages were electrified during 1983 and, to date, the total number of consumers connected in the 35 villages and two refugee camps has reached 9,741 and 9,011 respectively. Additionally, applications for electricity in the villages and camps totaled 1,473 at mid February 1984. (See Table III).

Work commenced on the urban elements of the Project in December 1980. The installation of 17 Power transformers having a total capacity of 125 MVA was carried out between January 1981 and March 1983. This work has increased the power transformer capacity of the JEFCCO network by some 30 percent and allowed an additional 14,000 consumers to be connected to the system. Work started on the installation of a radio communications network in January 1981 and, by the end of February 1982, communications via fixed UHF radio links and mobile VHF radios had been established linking 30 substations, 5 JEFCCO satellite offices/stores completed, and 10 specially equipped radio vehicles. The system has since been augmented to provide radio links to 20 additional vehicles and 20 members of the JEFCCO staff through a one way speech paging system. As a result of the provision of this system, response time to network outages and disturbances has been cut by some 50% and permanent independent communications facilities now exist between all JEFCCO office and stores locations and main substations in the JEFCCO concession area. Following the award of the SCADA system contract in December 1981, a turnkey systems engineering was carried out to provide an acceptable data base for the central processor included in the contract. Delivery of hardware to Jordan commenced in August 1982 and installation was started in April 1983.

Test have now been completed on the central processors and at the 20 remote terminal units and the system was handed over to JEFCCO at the end of March 1984. Minor modifications to some of the high voltage switchgear is still required before full monitoring and control functions can be undertaken by the System Control Center (SCC). When this work is complete the status of the high voltage system within the whole extended JEFCCO concession area will be permanently recorded within the SCC. The SCC is now manned on a 24 hour basis. Extension to the SCADA system to include substations installed under later projects, together with those proposed under the five year plan ending in 1985, have already been planned and work on these extensions is expected to start in late 1984. When the system is fully operational the operating standards and safety performance of the JEFCCO system is expected to be equal to any similar system in the western world. Training of JEFCCO engineers on both the radio communications system and the SCADA system was provided the supplier and accomplished in the U.S. This training continued throughout the system installation period.

## 18. PROJECT PURPOSE

The purpose of the project, according to the Project Paper, is:

- (1) To permit the utilization of electric power by 24,000 potential consumer units located in 35 villages and two camps.

- (2) to contribute to improvements in the reliability and to increase the quantity of electricity available to industrial, commercial and residential consumers in Amman.

Evidence of progress towards individual EOPS indicators as of September 1984 is as follows:

1. Table III shows the development of rural consumption in the 35 villages and the two camps in the project area during the project implementation period. By the end of 1983 the number of rural consumers in the 35 villages and two camps was 9,741 and 2,011 respectively. Additional applications for electricity in the 35 villages and two camps totaled 1,473 as of mid-February 1984.
2. The SCC in Amman is operational and additional transformers are in the process of being installed in an upgraded system.

From a practical point of view, both the purpose and the EOPS have been achieved.

#### 19. GOAL/SUBGOAL

The goal of this project, as envisaged in the Project Paper was to extend the benefits of electricity to low income urban and rural inhabitants. Subgoals were to improve the urban electrical distribution system and to modernize control facilities.

Information gathered by both JEFECO and the USAID/Engineering Office was used for this evaluation. Work was physically checked, in a random manner, to establish how much of the ultimate project goal had been achieved. In addition to systematic monitoring, this included visiting all villages in the project area, the JEFECO stores, substations and the SCADA control room. In every case the planned physical plant was in service. A spot check on the stores showed that virtually nothing funded under the project remained unused. Stores issue records were complete and maintained in a workmanship like manner. The number of consumers in each village was obtained from JEFECO records.

Sales figures or statistics to verify appliance use were unavailable. However, the number of visible TV aerials; the quantity of goods, including frozen food, being sold locally; the number of electrical retailers; the number of lighted mosques and schools and street lighting in the project areas provides very convincing evidence that the project has achieved its goal.

## 20. BENEFICIARIES

The direct beneficiaries are the over 125,000 village and camp inhabitants in the project area, the 19,000 consumer units connected to the system: the homes, businesses, mosques, churches, schools, clinics and street which are lighted by electricity due to this project. The indirect beneficiaries are the engineers and technicians of JEPCO, who have gained additional knowledge through training in the U.S. with the suppliers of equipment, and through on-the-job training during the installation of equipment such as the SCADA system, radio communication network, auxiliary switchgear and transformers provided by this project. Indirect beneficiaries also include land owners in the project area as property values have increased two to three times due to the availability of electricity.

In addition, supplies to 2,500 housing units (initially) will be made available in three new low cost housing developments and an extension of the rural networks (erected under USAID Project 279-0209) will provide electricity to a further 6,000 consumers in 21 villages in the Salt, Madaba and Zarqa areas of the JEPCO concession area.

## 21. UNPLANNED EFFECTS

Implementation of this USAID financed project has helped JEPCO to obtain similar projects and financing sources other than the GOJ and USAID. The project has encouraged other donors to finance similar projects including the following:

### 1. WORLD BANK ENERGY DEVELOPMENT PROJECT (ERD-1)

This project allows for the extension and reinforcement to the JEPCO urban distribution network by 140 MVA of 33/115.6 KV power transformers, 120 distribution substations (115.6/0.4 KV) with associated 33 KV, 11 KV and 0.4 KV cables, switchgear and auxiliary plant.

Electricity supplies to 3 low cost housing development and 21 villages are also included in the project together with training, organization and management studies of the present JEPCO structure.

The total project cost is estimated at US\$25,000,000. Funds are being made available from the World Bank (US\$20.00 million) and from the European Investment Bank (US\$4.50 million) for the project. Implementation is expected to be completed during 1985.

A total of 42,000 new and existing urban consumers will receive new supplies or improvements to existing supplies as a result of this project.

2. WORLD BANK ENERGY DEVELOPMENT PROJECT (IBRD-II)

This project includes the extension of the JEPSCO urban network by 40 MVA of 33/11/6.6 KV power transformers and 120 distribution substations (11/6/6.6/0.4 KV) with associated 33 KV, 11 KV and 0.4 KV cables, switchgear and auxiliary plant.

Electricity supplies to 20 villages in the Madaba and Salt areas of the JEPSCO concession area are to be provided.

A total of 21,000 urban consumers and 2,000 rural consumers will be connected during implementation of the project, which is due for completion early in 1987.

The project cost is estimated at US\$21.00 million and funds are being made available from the World Bank (US\$13.5 million) and from the European Investment Bank (US\$2.0 million).

3. SOVIET RURAL ELECTRIFICATION PROJECT

This project allows for the extension of rural electrification in the Salt, Madaba, Sahab and Zarqa areas of the JEPSCO concession area to an additional 62 villages having some 6,500 consumers.

The project is due to be implemented in two stages. The first stage is due for completion early in 1985 and covers 33 villages having a total population of 24,000 people with some 4,000 consumers to be supplied with electricity. The project cost is estimated at US\$7.50 million of which the Soviet Union is contributing US\$2.90 million. The second stage of the project is due for completion in 1986 and is expected to make electricity available to a population of 14,000 people in 29 villages in the Baq'a, Salt and Madaba regions. Second stage project cost is estimated at US\$6.00 million of which the Soviet Union is contributing US\$2.00 million.

Implementation of these projects will help improve the social structure, environment, health services, technical and economic situation of all villages inhabitants in the project area.

22. LESSONS LEARNED

U.S. technical advisory assistance is badly needed in the early stages of any project such as this. The U.K. consultant had no experience with U.S. procurement rules and regulations and this delayed the project for several months because all IFB documents had to be rewritten to include AID standard clauses. Most of these delays could have been avoided if an experienced consultant, familiar with AID financed projects had been available. Fortunately, JEFECO was able to supply sufficient material from its stock to keep the project moving until the material funded and procured under this project had arrived.

23. SPECIAL COMMENTS ON EFFORTS

The use of an existing private institution to expand a public service was very effective. JEFECO is a shareholder enterprise company, established in November 1962, and authorized to generate, transmit, distribute, regulate, buy and sell energy to consumers in the concession area.

Its original concession consisted of an area bounded by a 15 Km radius circle centered on the town of Mosque plus an additional area 20 Km wide along the Amman-Zarqa road. The GOJ agreed to extend the JEFECO concession area to serve other villages included in the project. JEFECO's rapid response to physical changes that occurred in the villages between the original survey and implementation represented a real advantage over the rigidities often found in government departments.

The results of this project:

- A) Reinforcement of the urban distribution network by some 145 MVA of 33/11/6.6 KV transformer capacity allowed an additional 14,000 consumers to be connected to the system, including some 1,000 industrial consumers, and an annual electricity consumption totaling 150 GWH.
- B) Extension of the rural distribution network to 35 villages and two camps provided electricity supplies to a population in excess of 125,000 people with a total annual consumption of 21.75 GWH.
- C) The provision of a fully independent radio and telephone communication system covering the entire JEFECO concession area provided telephone facilities between the main substations, the JEFECO head office and satellite offices in Zarqa, Salt and Madaba and also provided a VHF mobile radio communication system between all engineering centers and some 70 vehicles operating over the entire concession area.

- D) The project provided a computer based System Control and Data Acquisition (SCADA) system to monitor and control the main 33/11 KV substations on the JEFECO system. The existence of this system allowed JEFECO to establish a full operations and control department responsible for monitoring the electricity distribution system throughout the concession area. System outage time (both planned and due to breakdown) has been significantly reduced now that the Control Center is fully functional and providing continuity of supply to all classes of consumers.
- E) Under the project, 21,000 tariff meters were purchased from the USA. These meters incorporate magnetic suspension type bearings in accordance with present American standards. Since this contract was placed a further 10,000 meters of the same design have been purchased. JEFECO expects to make significant savings by adopting this design of meter as their standard for future supplies.

A sample of the jewel bearing type meters (which JEFECO used previously) indicated an error in excess of 12% on some 20% of meters tested. Based on an average domestic consumption of 2.5 units per annum and 120,000 domestic consumers, JEFECO could expect to lose some 1,000,000 JD of revenue due to low accuracy meter utilization in any one year. The high accuracy magnetic type meters offer a maximum 1.5% error. The net reduction in possible meter error losses far outweighs the additional capital cost of the magnetic type US meters which presently cost some 24.00 US dollars compared with 18.00 US dollars for the jewel bearing meter design.

- F) The introduction of independent communications within the JEFECO organization, together with the provision of a System Control and Data Acquisition system will inevitably lead to a significant improvement in the quality and continuity of electricity supply to all classes of consumer within the JEFECO concession area. To put definite fiscal values on such improvements is difficult but the cost of revenue lost on a typical 33 KV system fault in Jordan is in the order of JD500 per hour. This figure does not include any cost of inconvenience to the consumer. Savings of 2 to 3 hours in supply restoration time result in savings of up to JD1,500 per breakdown.

Further savings in the cost of collecting and analysing system load flow information are expected as a result of the computer based data collection system now operating in the area. Load readings are normally taken twice a

year and, prior to the installation of the data acquisition system, could occupy 40 staff members over a period in excess of one month. Similar information can now be tabulated within 24 hours from the computer print-outs provided under the SCADA system.

J JAPANESE ELECTRIC POWER CO. LTD.  
U.S. AID RURAL ELECTRIFICATION PROJECT (LOAN No. 278-K-020)

TABLE I

CASH FLOW OF US AID FINANCED PORTION

(THOUSANDS)

CONTRACT No. JEP.	COMMODITIES	CONTRACT VALUE	CASH FLOW										
			1980	1981	1-3/82	4-6/82	7 - 9/82	10-12/82	1-3/83	4 - 6/83	7 - 9/83		
51A/USAID	CU. COND.	1,838,314	1,838,314										
51B/USAID	ACSR COND.	210,082	210,082										
52A/USAID	TUB. POLES	1,497,343		1,497,343									
52B/USAID	GALV. STEEL	1,065,370		1,065,370									
52C/USAID	CLAMPS ETC.	130,211		130,211									
53/USAID	INSULATORS	CANCELLED	Transferred to JEPSCO Finance										
54A/USAID	33KV ISOL'RS	58,750	58,750										
54B/USAID	33 & 11KV GEAR	100,050		100,050									
55/USAID	DIST. TRANS.	159,300	159,300										
56/USAID	POWER TRANS.	987,081	786,268	200,813									
57/USAID	RADIO COMM.	907,254		818,568	1,380				11,343			75,963	
58/USAID	SCADA	CANCELLED											
59/USAID	METER TESTING	CANCELLED											
60/USAID	TARIFF METERS	549,314				549,314							
72/USAID	SCADA	1,255,781 JD 275,780							331,375	70,079		296,251	799,216
	Total	9,000,000	3,052,714	6,865,069	6,866,449	7,415,763	7,415,763	7,758,481	7,828,560	3,200,784		9,000,000	

NOTE - ALL FIGURES IN US DOLLARS, EXCEPT WHERE STATED OTHERWISE

BEST AVAILABLE DOCUMENT

TABLE II

PROGRAMME FOR PROCUREMENT AND INSTALLATION

Contract No. JEP	COMMODITIES	Tenders Returned	Order Placed	Shipment	Equipment Available	Installation		Supplier
						Start	Complete	
651A/USAID	Cu. Cond.	Feb. '80	May '80	Aug. '80	Nov. '80	Jan. '81	Nov. 83	Daewoo Ind. Korea.
651B/USAID	ACSR. Cond.	Feb. '80	May '80	Sept. '80	Jan. '81	Jan. '81	Nov. 83	Southwire, U.S.A.
652A/USAID	Tub. Pole	July '80	Oct. '80	March '81	April '81	Jun. '81	OCT. 83	M.E.C. India
652B/USAID	Galv. Steel	July '80	Oct. '80	March '81	April '81	Jun. '81	OCT. 83	Daewoo Ind. Korea American Export USA
652C/USAID	Clamps Etc.	July '80	Oct. '80	March '81	April '81	April '81	Nov. 83	Daewoo Ind. Korea
653/USAID	Insulators		Aug. '79	Dec. '80	Jan. '81	Mar. '81	Nov. 83	Jaya Shree - India
654A/USAID	Isolators	Feb. '80	May '80	Dec. '80	Feb. '81	April '81	Nov. 83	American Exp. U.S.A.
654B/USAID	Fuse Isol. etc.	Feb. '80	May '80	Dec. '80	Feb. '81	April '81	Nov. 83	Westinghouse, U.S.A.
655/USAID	Dist. Trans.		Aug. '79	April '80	June '80	Feb. '81	Nov. 83	Daewoo Ind. - Korea
656/USAID	Power Trans.		Aug. '79	Aug. '80	Oct. '80	Oct. '80	Feb. 83	Daewoo Ind. - Korea
657/USAID	Radio Comm.	Feb. '80	July '80	Jun. '81	July '81	Aug. '81	JAN - 84	Telcom, U.S.A.
658/USAID	Scada							See JEP 772/USAID
664/JEP AID	Dist. Pillars		Nov. '79	June '80	Aug. '80	Feb. '81	Nov. 83	Lucy - U.K.
665/JEP AID	Unit Subs.		Nov. '79	Oct. '80	Nov. '80	Nov. '80	Dec. 81	I.E.O. - HOLLAND
666A/JEP AID	Joints Etc.		Jan. '80	June '80	Aug. '80	Sept. '80	Dec. 81	Delta - U.K.
666B/JEP AID	HV. & LV Cab.		Jan. '80	June '80	Aug. '80	Sept. '80	Aug. 81	Pirelli - U.K.
667/JEP AID	T'comm. Post	Feb. '80	July '80	Dec. '80	Jan. '81	Feb. '81	July 81	J.L. Eve, U.K.
736/USAID	Meter Testing	May '81	Jun. '81	Dec. '81	Jan. '82	Feb. '82		Cancelled
737/USAID	Tariff Meters	Sept. '81	Dec. '81	July '82	Aug. '82	Sept. '82	Jan - 84	General Electric USA
792/USAID	SCADA	Nov. '81	Jan. '82	Nov. '82	Mar. '83	Mar. '83	Mar. - 84	Telcom USA
778/JEP AID	18 Villages (erection)	Feb. '82	May '82	May '82	May '82	June '82	Jan. 84	Mediterranean Eng.Co.

BEST AVAILABLE DOCUMENT

TABLE III

## Consumers/ Consumption Data for Rural Consumers

Village Name	1981		1982		1983	
	Consumers	Consumption (GWh)	Consumers	Consumption (GWh)	Consumers	Consumption (GWh)
El Juweideh	300	0.334	500	0.587	647	0.808
Tabia	270	0.436	350	0.589	406	0.728
Khuribet De Suq	450	0.674	601	0.989	790	1.398
Jawa	-	-	89	0.068	133	0.135
Mafo	-	-	-	-	100	0.008
Manja	-	-	-	-	42	0.014
Um Quseir	-	-	71	0.117	115	0.209
Mugablein	-	-	399	0.674	823	1.495
Rumein	-	-	75	0.035	85	0.086
Um Jauza :	-	-	-	-	88	0.042
Zai	-	-	-	-	33	0.003
Subeihi	-	-	-	-	82	0.007
Allan	-	-	-	-	131	0.011
Um El Anad	-	-	-	-	53	0.004
Khilda	129	0.102	161	0.201	197	0.259
Tila El Ali	142	0.110	607	0.742	1350	1.774
Um Es Sumaq	131	0.103	344	0.431	444	0.585
Tababour	63	0.092	304	0.477	471	0.786
Nwigi	45	0.054	50	0.063	50	0.068
Rujm Es Shami	-	-	-	-	35	-
Buweida	-	-	-	-	-	-
Matalia	-	-	-	-	-	-
Muwaqqar	-	-	-	-	-	-
Hashimiya	300	0.407	804	1.149	1381	2.147
Manshiyat Hisban	-	-	-	-	97	-
Hisban	-	-	-	-	97	-
Adasiya	-	-	-	-	73	-
El Bassa	-	-	-	-	115	0.009
Um Abhara	-	-	-	-	20	-
El Faisaliya	-	-	-	-	91	-
Iraq El Amir	-	-	-	-	45	-
Marj El Mamam	251	0.382	1017	1.661	1516	2.720
Ira	-	-	-	-	65	-
Yarqa	-	-	-	-	95	-
Abu Nuseir	-	-	75	0.008	131	0.014

TABLE III Contd

Village Name	1981		1982		1983	
	Consumers	Consumption (GWh)	Consumers	Consumption (GWh)	Consumers	Consumption (GWh)
Muzha					37	0.003
Total	2081	2.694	5447	7.791	9741	13.313
Schneller Camp	500	0.347	2513	2.846	2984	3.075
Baga Camp	-	-	3561	1.335	6027	4.966
TOTAL	500	0.347	6074	4.181	9011	8.041

No connections to date, but application for electricity from 289 consumers have been received.