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Recommendations to rengthen Village Electric Cooperatives in the West Bank

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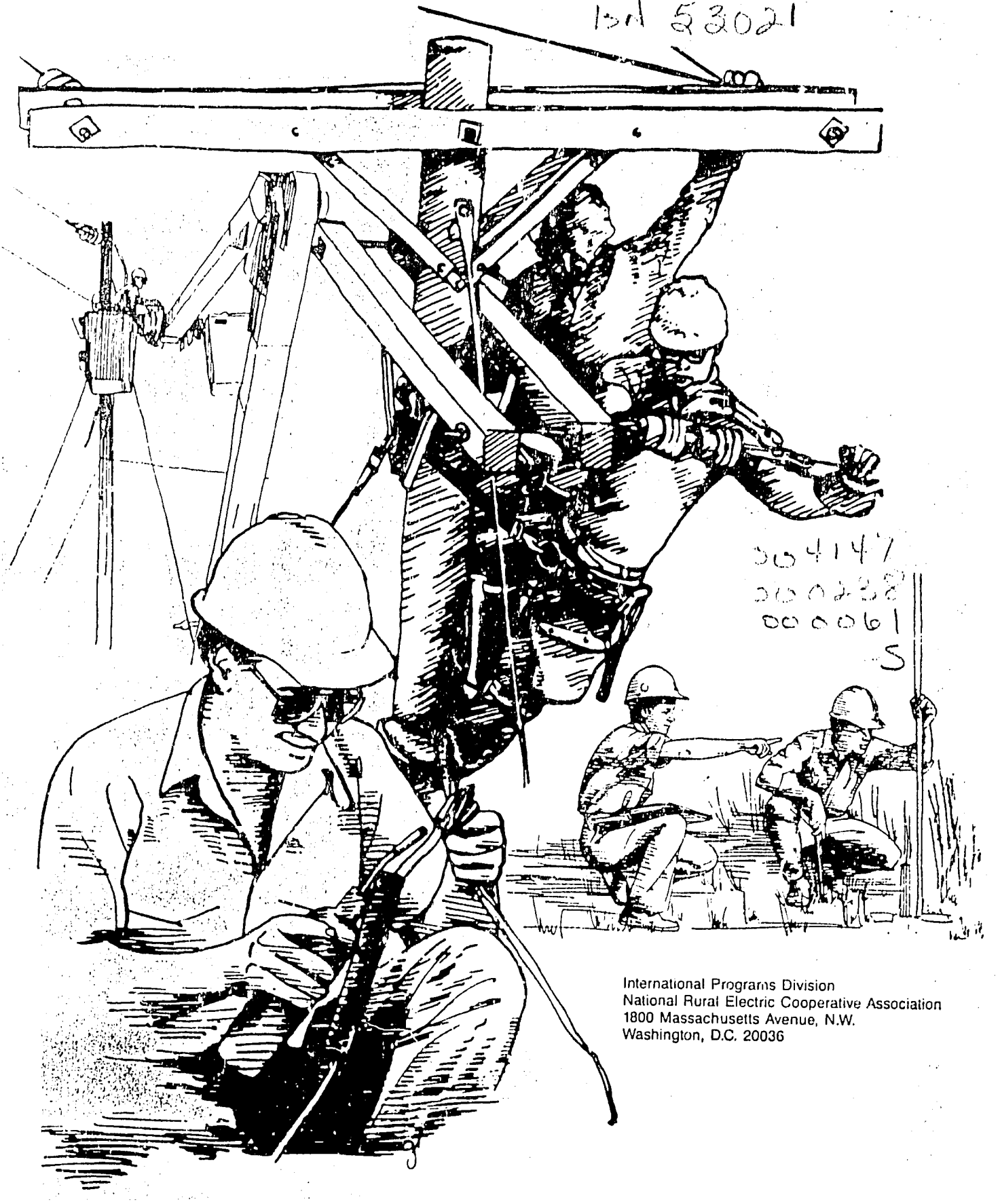

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RECOMMENDATIONS TO STRENGTHEN VILLAGE ELECTRIC COOPERATIVES IN THE WEST BANK

Prepared for the Cooperative Development Project

by Bard Jackson

November 1986

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SUMMARY

In October and November 1986 an NRECA Rural Electrification Specialist spent five weeks in the West Bank assessing the needs and conditions of village electric cooperatives (VECs). During this period he visited 13 active VECs, a number of other electrification projects, and conducted two training sessions.

Of the 19 electric cooperatives registered with the Israeli Civil Administration, only 14 are currently active. Trends indicate the number will continue to decrease unless there is a shift in power supply policy. The 14 active VECs serve over 5,000 meters and have almost 4,000 kW of operating diesel capacity. The systems vary from the smallest serving only 59 meters to the largest with 825 members.

The specialist found that there are wide differences between the best operated VEC and the poorest one. Generally, though, the systems are losing money and will be dependent upon external funds when a major expense such as an overhaul or engine replacement is needed. Operationally, almost one-third of the active systems are considered unsafe, inefficient, and in need of rehabilitation. Most of the VECs provide only a limited number of hours of service per day. The systems operate without management in the sense of directing, coordinating, and controlling day-to-day activities. In these VECs the Board Secretary generally assumes the role of a manager.

Major recommendations are made in the following areas:

Diesel Operations

- use smaller and multiple diesel generator sets
- extend hours of service
- develop qualified technicians

Network Operations

- adopt recognized low voltage (LV) standards
- rehabilitate sub-standard construction and grounding installations
- develop and apply economic conductor size criteria
- provide standby power to nearby independent diesel units

Financial

- increase rates to cover depreciation and overhaul cost
- develop and monitor key indicators
- locate future funding

Management

- develop local management
- adopt written Board policies
- work with consumers to shift electrical usage from on-peak to off-peak hours
- strengthen the Union of Electric Cooperatives

Training courses are recommended in the following subject areas:

Management	Economic operations Policy-making Planning
Financial	Basic accounting Electric utility accounting Rate design
Technical	Diesel maintenance and repair Low voltage distribution Standards Conductor selection Maintenance Safety procedures and first aid

The program should start with director and manager training. This will move the management team to collect operational information, begin evaluating performance, and develop plans to improve their operations. In this process the cooperatives will need guidance, training, and technical assistance in establishing accounting procedures, improving efficiency, and up-grading facilities. This assistance should enable the cooperative employees and directors to evaluate the financial viability of continuing to provide electric service to their consumers, and to plan for future development.

I. BACKGROUND

A. Cooperative Development Program (CDP)

The Cooperative Development Program is a USAID-funded project with the purpose to provide technical assistance, training, and commodities; to strengthen the capability of existing cooperatives; and to assist in the development of new cooperatives of the Palestinians in the West Bank and Gaza. In order to assess the needs and recommend a course of action to assist the electric cooperatives in the region, the program subcontracted with the National Rural Electric Cooperative Association (NRECA) to provide the services of a Rural Electrification Specialist for a period of approximately five weeks.

B. West Bank

The target population of the CDP is the over 1.3 million Palestinian people living in the West Bank and Gaza. In 1984 the Palestinian disposable income was $1,450 - $1,650 per capita, about 30% of the disposable per capita income in Israel.[1] The Palestinian local product (GDP) shows that of each dollar produced in the West Bank sector about 7 cents were earned in industry, 27 cents in agriculture, 16 cents in construction, 36 cents in transport, commerce, and private services, and 14 cents in public services.

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[1]Meron Benvenisti, The West Bank Handbook: A Political Lexicon, The Jerusalem Post, 1986.

Outside the cities and large towns, the Palestinians tend to live in small villages and camps. The villages tend to be composed of a few extended families, heavily involved with agriculture. Farmers tend to live clustered in villages rather than scattered on farmland. Cooperatives have been developed in the villages to provide common services such as water supply, olive pressing, agriculture marketing, electricity, and housing.

Electric service in the West Bank is provided by the Jerusalem District Electricity Company (JDEC), the Israeli Electric Company (IEC), municipal systems, village councils, village electric cooperatives, village electrification committees, and small, privately-owned diesel generator sets.

JDEC has a service area restricted to approximately 20 km from Jerusalem including the cities of Ramallah, Bethlehem, and Jericho. Outside of these cities, it serves 140 villages with residential services. JDEC's concession for exclusive rights to generate and distribute electricity in its service area expires in two years. It would consider granting a concession waiver if one of the eight unserved villages in its service area wanted to generate its own electricity and JDEC could not extend its lines. No village electric cooperatives exist within the JDEC service area. Residential rates are 0.030 Jordanian dinar (JD) per kWh. One JD was worth 3 U.S. dollars during November 1986. JDEC serves one settlement of Israeli citizens with 11 kV bulk power delivery with a tariff 2% lower than residential tariffs.

Since JDEC's new generators have not been allowed to operate, they are purchasing 85%-95% of their energy from the IEC grid for resale to their consumers.

The IEC 33 kV grid has been extended into the West Bank from six substations and provides power to almost all major load centers. The grid was extended to provide reliable service to the Israeli settlements and installations but now provides service to Palestinian cities and towns. Since 1970 the IEC has linked over 130 villages to the grid.[2] The IEC no longer offers residential service to villagers but rather will provide bulk power delivery at 400/230V for villages with loads of less than 630 kVA, and 33 kV delivery for larger villages. The IEC does not allow any other company to extend inter-village service. The retail rate for grid service is approximately 0.120 Israeli shekel per kWh. One Israeli shekel (IS) was worth 1.47 US dollars as of November 1986. Bulk delivery rates for loads under 630kVA are 0.109 IS/kWh for daytime, 0.091 for evening, and 0.0596 for night rates plus a monthly demand charge of 4.39 IS/kW-peak.

The cities of Hebron and Nablus both have municipal electric power systems. Hebron purchases power from the IEC at 33 kV and operates a 6.6 kV and secondary network. Hebron's service area is restricted to the municipal limits plus one adjacent town. Hebron's retail rate is also about 0.120 IS/kWh.

The Nablus municipal electrical department operates two systems: one isolated 4-5 MW system within the municipal borders supplied by their own generation, and a surrounding 6-7 MW system supplied by purchased power from the IEC at 33

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[2]Coordinator of Government Operations in Judea & Samaria and Gaza District, An Eighteen Year Survey (1967-1985), Ministry of Defense, State of Israel, July 1986, p. 81.

kV. It distributes through two 6.6 kV distribution systems. Residential rates are 0.23 IS/kWh.

In several villages the village councils have organized, obtained funds and established a small electric system. Some of these systems have their own diesel-generator set and others are purchasing power from the Israeli grid.

Catholic Relief Services (CRS) has funded six village electrification schemes in the West Bank area under an AID Rural Development Project. None of the six is registered as a cooperative although the Tan'ok system submitted a request for registration but apparently never received a response. Raqa has indicated its intention to register as a cooperative after construction is completed.

C. Village Electric Cooperatives

Since the rural population tends to live in villages rather than on plots of farmland, the electric services usually are confined to the area of the village. Since "rural electrification" is commonly thought of as electric services extended to farms' agricultural loads, the cooperatives in the West Bank are referred to as "village" rather than "rural" electric cooperatives in this report.

Data has been collected from various sources on the village electric cooperatives (VECs) and organized in the database presented in Appendix B. Although the data is not complete it provides a good estimate of the numbers and condition of the existing VECs. The 14 active VECs registered with the Israeli Civil Administration are given in Table 1. The 14 active VECs serve a

Table 1. Members & Installed Capacity

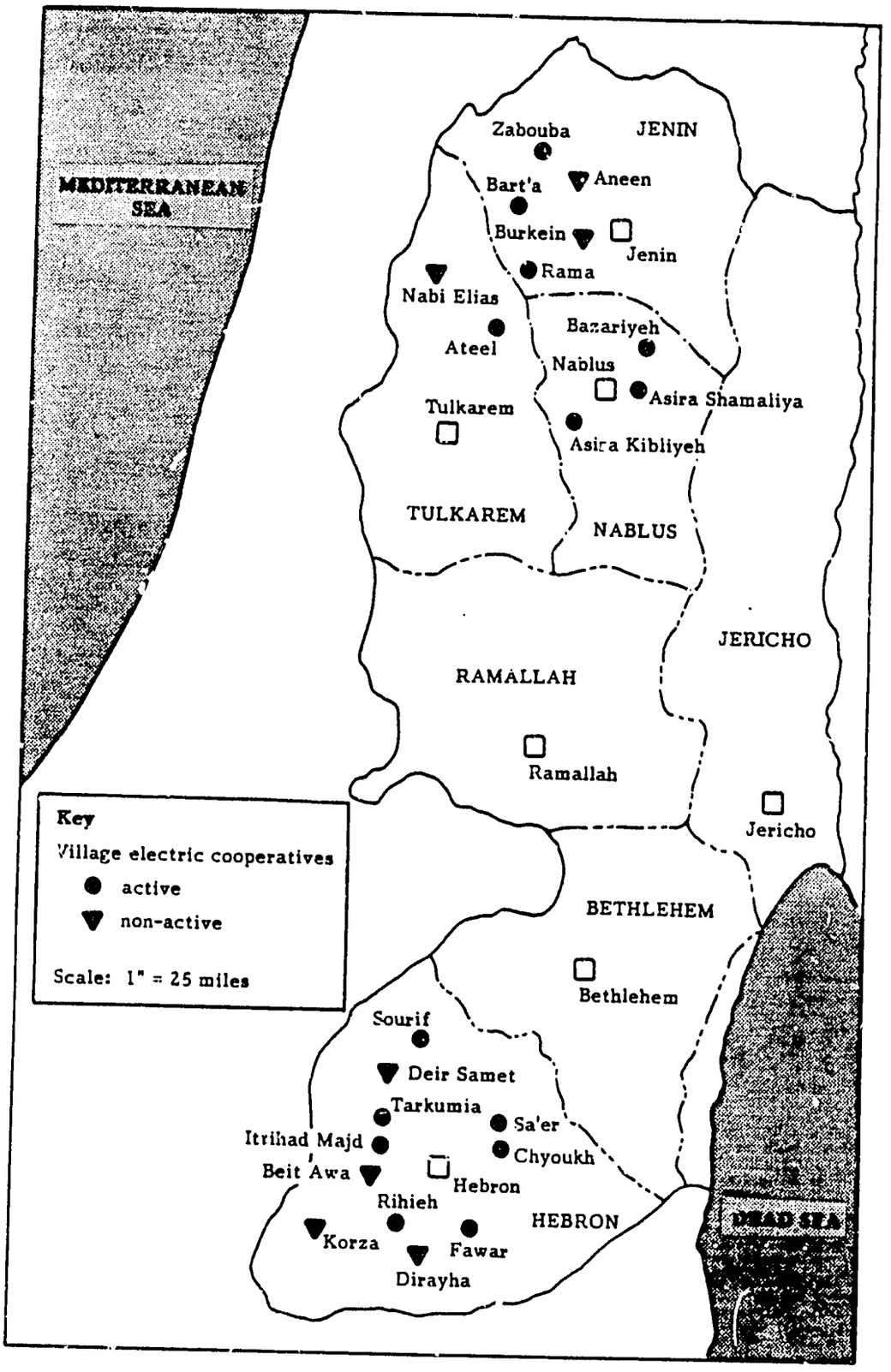
Name of Cooperative	Region	Members	Capacity (kW)
Sa'er Electric Coop	Hebron	767	381
Chyoukh Electric Coop	Hebron	362	480
Rihieh Electric Coop	Hebron	130	115
Sourif Electric Coop	Hebron	742	350
Tarkumia Electric Coop	Hebron	708	546
Ittihad Majd & Sikka	Hebron	103	80
Fawar Camp Electric Coop	Hebron	365	340
Rama Electricity Coop	Nablus	59	40
Bart'a Electricity Coop	Nablus	300	110
Zabouba Electricity Coop	Nablus	140	64
Asira Shamaliya Coop	Nablus	500	580
Bazariyeh Electric Coop	Nablus	128	56
Asira Kibliyeh Electricity Coop	Nablus	146	44
Ateel Coop for Electricity	Nablus	825	744
Totals		5275	3930

total of over 5,200 meters, providing electricity to approximately 25,000 people. They have an installed capacity of almost 4,000 kW. Three registered VECs - Deir Samet, Beit Awa, and Burkein have dissolved the cooperatives. Aneen does not have a power system to operate and Nabi Elias does not have a power supply.

The location of all registered VECs (active and non-active) is shown in Figure 1. The VECs vary in size from 59 consumers to over 800. The installed capacity, capabilities of the operators and managers, and plant conditions vary in the same magnitude, although not specifically according to size.

All the active electric cooperatives produce their own power with diesel engines. They generate at 50 hertz, 400/230 volts, 3-phase, grounded wye

Figure 1. Location of Village Electric Cooperatives in the West Bank.



configuration. All diesels are 4 stroke, 1500 rpm, using light diesel fuel supplied at a cost of 0.54 IS per liter. Each generator has a main circuit breaker. Power is transmitted to a switchboard bus through the generator cable. The switchboards have from 2 to 4 switches and circuit breaker main 3-phase feeders plus 1-phase circuit breakers for streetlights. Power is distributed at 400/230V on overhead lines which extend 2 to 4 km from the power station. Consumers are provided with single-phase, 230 volt service.

II. FINDINGS

The findings in this report are based upon visits to 14 active VECs, two dissolved VECs, JDEC, the IEC, two municipal electric systems, and two village electrification committees. At the cooperatives, discussions were held with the board secretary and, when possible, system managers, operators and bookkeepers. The names of the systems visited are given in Appendix C - Daily Schedule. The findings are grouped into Operational, Financial, and Management issues although they are closely interrelated.

Thirteen of the VECs visited were operating and providing their members with a very valuable service. Most are technically and economically strong enough to continue providing this service for several more years. What follows in this section is a discussion of observed weaknesses which, alone, may portray an unfairly negative picture of the VECs. This is purposely done to emphasize the subjects in which training is needed -- not to present an overall evaluation of their performance.

A. Operational

Power supply. All active VECs have isolated systems powered by diesel units. Six have more than one diesel although only Ateel and Asira Shamaliya have synchronizing panels for parallel operations. The other four have close-over switches (COS) that allow a specific unit to be dedicated to a specific feeder.

Except for speed, voltage and wiring configuration, there are no standard bid specifications used to select diesels. Full-load and part-load efficiencies are not known. In some cases the quoted capacity is a "standby" rating and other times it is a "continuous" rating. In a few cases ratings were based upon American NEMA standards which are much stricter than European ratings. Ittihad Majd and Sikka Electric Co-op has a Caterpillar diesel with droop governor and synchronizing panel although it is a stand-alone unit.

In over one-third of the cooperatives visited, the diesel units are poorly maintained. The powerhouse floors were covered with oil, the engines filthy, and trash scattered about. Cooling radiators were full of dust and dirt, leaks have gone without repair, and the units burn excessive amounts of lubricating oil (one system stated they add almost one liter per hour of operation). Generator cables and ground cables lay on top of the floor and were walked on. Spots with worn insulation were wrapped with electrician's tape. Grounds were not bonded and only in a few power stations were ground rods observed. Cable entrances to junction boxes had no clamps or stuffing tubes.

Only one battery rack was seen (at Zabouba VEC); otherwise, batteries sat on the floor or on the skid. A battery explosion was witnessed when one operator did not follow proper charging procedures and drew a spark on a quickly charged battery.

Generators were generally clean on the exterior, but rarely in the windings or the voltage regulators. In several cases the generator inspection plates had never been opened.

Only one system visited (Ateel) had a maintenance schedule or operating records.

Only two systems visited had the operating manuals for all their units.

A three-year-old diesel in need of overhaul was seen disconnected and sitting idle, having been replaced by a larger unit. Operators told of having units operate only three years and then being discarded -- but no cases of this were observed. At Sourif the village was without electricity as the VEC had sold two small units and the remaining large unit blew a piston.

Switchgear. The generator output panels are mounted on the generator or on the switchgear panels. The output panel meters include frequency, current, and voltage. Only Asira Shamaliya VEC has an output kWh meter. Each 3-phase feeder has a circuit breaker and each single-phase streetlight feeder has a separate breaker. In about half of the systems, the feeder circuits also have current meters.

The following items were noted:

- most panels were missing one or more nameplates, e.g., switch position indicators, phase, etc.
- the COS switch was used to break load;
- meters had never been re-calibrated;
- operating limits are not marked on the meters.

When asked how they select circuit breaker settings, one operator stated they just adjust the setting higher and higher until it no longer trips. No record is kept of the designs or settings and, since there are no operating manuals, the generator fault currents are not known.

Network. Distribution lines are all overhead, with mostly aluminum conductors. Lines are extended for several kilometers with each feeder serving a portion of the village. Two-phase and single-phase taps are extended from the main 3-phase feeders. There are no uniform construction standards or equipment specifications applied to the VECs' LV lines. In searching for appropriate standards for the area, only the Nablus Municipal Electric Department followed a published standard. According to an IEC representative, the Jordanian LV standard would be the most appropriate and recognized standard.

Grounding. A few systems were running both a neutral and a ground conductor without realizing that they were the same. Ground conductors are often the same size as the phase conductors. At two VECs sections of the ground wire (between spans) were missing. No VEC measures consumers' grounds before connecting a new consumer to the system although most require a water pipe connection for those consumers with water service. Consumers are not required to have grounding rods. There is almost no understanding of the safety aspects of grounding nor the economic and voltage benefits associated with good grounding practices.

There is no uniform LV line grounding specification used although JDEC specifies a grounding rod located at every other pole. Newer systems are

using insulated guy wires with the pole top attachments located between the phase conductors.

Voltage. Since most VECs do not have a voltage meter, the voltage level on the lines was unknown. Only Ateel maintained a detailed circuit map. However, it was not uncommon for the voltage at the end of the line to fall below 130 volts. One engineer stated he recommended that people at the end of the lines purchase and use 120 volt class appliances. Typically, consumers will purchase small household voltage regulators to compensate for the poor service quality.

When the systems were designed, the conductors were sized according to the criteria of the design engineer without apparently much consideration of voltage drop or losses. As the systems grew, conductor sizes for extensions were, in some cases, larger than the feeding conductors. As older lines were broken, the conductors seem to have been replaced with whatever size conductor was available.

Poles. Wood, pipe, and steel towers are used for the overhead construction. Generally, the older systems have 8-meter pipe poles. Newer systems use 10- and 11-meter wood poles.

Protection. There is no line protection except for the station circuit breakers. One case was observed where the circuit breakers could not "see" the end of the line and direct phase-to-ground fault (due to improper sagging) went uncleared. No surge arrestors were seen on the lines nor in the

powerhouse although two lightning storms occurred during the time in the field.

Service drops and entrances. In several cooperatives service drops are owned by the consumer, who uses whatever cable he happens to have. Service entrances are not much more than a crack or hole in the wall. Residential kWh meters are 60 amp, indoor, bottom-connected type. No VECs recalibrate meters.

Streetlights. Streetlights are required on every pole or every other pole. They usually are mercury incandescent, 175-watt elements. Only a few systems have spare bulbs or reflectors. At three systems, almost every streetlight observed was damaged in some manner.

Balance. Feeder unbalances of up to 80% were observed. Where the operators have some technical training, the phases are well balanced. At Zabouba it appeared the unbalance and poor grounds were causing the generator to overheat and trip out. They stated that, after the unit tripped, they must wait over half an hour for the generator to cool down again.

Losses. It is estimated that the system losses on the networks are in the range of 20-35%, due mostly to the long lines and small conductors. Where the system is unbalanced these losses are even greater. Small service entrance cables and bad connections also contribute to the losses. Since generally there are no kWh output meters nor system maps, nor voltage records, it would be difficult to calculate the losses.

Hours of operations. Ateel is the only self-generating VEC that provides 24-hour service. Asira Shamaliya provides 16 hours of service and Tarkumia, 8 hours. Other systems operate 4-6 hours every night and those systems which have refrigerators will operate another two hours during the morning. Often, systems will provide one or two hours of service in the dark early morning hours during the winter for lighting.

Staff. The difference in the conditions of the networks between various VECs was closely related to the qualification of the operators. In Ateel, Asira Shamaliya, and Fawar where the operators have a year or two of technical training the lines are correctly sagged, sized, and the feeders balanced. A few VECs hire a qualified electrician to maintain their lines, but most VECs do not have anyone qualified to properly maintain the networks.

Ironically, the West Bank region has a large number of unemployed technicians. Administrators of the Hebron Engineering & Technical College indicated that only about half of their graduating electricity students find employment. A small percentage of these unemployed students must be returning to the villages.

All operators could recite the maintenance they perform, e.g., change oil every so many hours, every other time replacing the filters. Rarely were items such as changing radiator coolant, cleaning the battery, torquing bolts, etc., stated.

All operators interviewed welcomed training, although some stated they would have to be paid for their equivalent non-VEC pay for time spent away from other part-time or full-time employment.

Technical support. A technician working out of the Hebron Cooperative Office assists the VECS with maintenance, construction supervision, and requests for financial support. He will visit a VEC when requested, but otherwise has no apparent responsibilities or standard duties. Although he could serve all the VECs in Hebron and Nablus, the time required to travel from Hebron to the Nablus VECs and the standard short workday make this impractical. He purchased a personal test meter for use at the cooperatives but otherwise has no tools, parts, technical reference materials, or direction.

B. Financial

Balance sheets. The financial statements of the cooperatives indicate that all but three active systems are losing money (see Table 2). When discussing this issue with system managers and Board members, they indicated they are "breaking even" and quickly brought their operating books to show the balance. Their books, however, were strictly a "cash flow" balance and did not include non-cash expenses such as depreciation and major overhauls.

All VECs are required to use a double-entry accounting system. Regional cooperative offices assist the VECs in preparing their records, and local accountants audit the records and prepare annual balance sheets. The regional Cooperative Offices also keep copies of the balance sheets.

Table 2. Financial Report (in JD)

Name of cooperative	Per kWh	Total Assets	Member Equity	Profit
Sa'er Electric Coop	50	36,207	24,381	3,661
Chyoukh Electric Coop*		6,404,381	479,917	(115,672)
Rihieh Electric Coop	50	22,641	8,530	(1,398)
Sourif Electric Coop		64,322	51,292	(6,139)
Tarkumia Electric Coop	50	61,127	33,176	(8,570)
Ittihad Majd & Sikka	50	-	-	-
Fawar Camp Electric Coop	50	21,211	9,730	(1,284)
Rama Electricity Coop	150	20,450	(29,628)	(44,748)
Bart'a Electricity Coop	50	26,000	5,000	(17,000)
Zabouba Electricity Coop	75	42,521	(1,918)	(4,518)
Asira Shamaliya Coop	80	119,407	24,897	12,863
Bazariyeh Electric Coop	80	16,521	7,904	(1,574)
Asira Kibliyeh Electricity	50	16,385	5,325	(105)
Ateel Coop for Electricity	40	140,307	34,651	15,257
Totals		6,991,480	653,257	169,227

* Questionable data.

Depreciation. When board members were asked what they plan to do when their generator needs a major overhaul or wears out, most all expected a private voluntary organization (PVO) or governmental agency to replace their unit -- usually with a larger one. However, American PVOs active in the West Bank stated they will not fund overhauls or replacements. It is not clear if funds from Jordan will be forthcoming for such purposes or if Israel will allow the replacement of the diesel units (see section III, Future of VECs).

O&M. It appears that the VECs are not spending enough for network repairs and maintenance although actual numbers for this item were not obtained. Many systems do not pay a sufficient salary to attract or retain a qualified operator.

Equity. The systems have unusually high member equity due to the large amount of funds given as a grants and, in some cases, the large percentage of the project funds the community must collect to get funding. For example, CRS-funded projects require the community to obtain 40% of the project funds. Another reason for the large equity is the accounting system used by all the cooperatives which places "Depreciation" as a liability and "Accumulated Losses from Operations" as an asset. The effect of this procedure is described in an "Operations/Management Report" to the CDP by John Evavold in September of 1986.

Affordability. The demand for electricity and the ability to pay are present in the villages. Since in most VECs the tariff is kept lower than the actual cost of service, the poorer consumers are using more energy than they would otherwise. Alternatively, since the hours are restricted in all but one system, the consumers who could afford to use more energy for productive uses during the day are not given the opportunity. In two systems, consumers are not allowed to use washing machines or irons.

Unpaid Accounts. Unpaid accounts are not considered a problem by the VECs. Late payment records were reviewed in only two VECs where over 15% of the members were over one month late in paying their bill, and 5% were over two months late. Treatment of unpaid accounts was handled on a case-by-case basis by the Boards of Directors. VECs' rates usually included the cost of technical losses, streetlights, schools, and service to a few widows, etc.

Tariffs. Tariffs charged by the cooperatives range from .040 to .080 JD per kWh (see Table 2 -- the data from Rama is questionable). All VECs had a

minimum fee of 2-4 JDs for the first 10-15 kWh per month. Some offered members lower rates than non-members. At Sa'er they reduce their rate to .030 JD/kWh for usage over 100 kWh per month.

Collection. At the smaller VECs, the diesel operator also reads meters, prepares bills and collects funds. At slightly larger VECs, a Board member does the billings and collections or someone else is given free electricity for performing these jobs. The larger VECs have full-time bookkeepers to perform these tasks.

Funding. No plan exists that outlines the short- and long-term funding needs of the VECs and identifies funding sources.

C. Management

Managers. Most of the systems are too small to afford a full-time manager to control, direct, and allocate resources. In most cases, the Secretary of the Board is the closest position to a manager, although this is not a paid position and it is difficult to hold him responsible for poor day-to-day operations. If the smaller system has a manager, it is usually someone in the village who is trusted to hold funds--but not someone involved with the day-to-day operations.

Directors. VECs have from 7 to 11 Directors who are elected at large.

Policies. Three VECs were asked about Board policies and none had written policies. When Board members were asked how they decide about disconnections,

personnel, pay, tariff, area coverage, etc., the response was simply "we meet and agree upon whatever is needed."

Insurance. It appears that VECs do not carry liability insurance.

Union. There exists, on paper, a Union of VECs for the Hebron area. It apparently has not performed any significant function for several years although no discussions were held with the leadership. No union exists for VECS in the Nablus region.

Receivership. No mechanism exists for an oversight agency to assume control of a cooperative's assets if it should dissolve, default, or disband. Facilities of two registered VEC's that have dissolved are being operated by the village councils.

Also, at two unregistered, dissolved VECs, the facilities are not operated and the network is not used.

III. FUTURE OF VECs

This section contains personal observations as to the future of the VECs in the West Bank. These opinions are primarily based on technical and economic factors and do not take into account political considerations which are beyond the scope of this report. Since these opinions have influenced the recommendations, they are included here to make the ties between the observations stated in the FINDINGS sections and recommendations to be given.

One of the most important issues facing the VECs is whether to connect to the Israeli Electric Co. grid or continue to self-generate. It is generally accepted and recognized that the grid provides higher quality service at a lower price than the VECs. It is also recognized that the VECs are dependent upon Israel for the diesel fuel and, if they were to keep their existing units for stand-by and interconnect, they would be no more or less independent of Israeli control. Although economically it may be attractive to connect, there are political reasons to discourage interconnection. The issue apparently is considered highly symbolic of the Palestinians' independence and it is politically damaging to suggest or support interconnection for rural villagers. This attitude may be changing as the Yatta Village Council recently obtained funds through Jordan to construct a low-voltage network for its 27,000 inhabitants which will be supplied by the IEC grid.

Previously, PVOs were told by the Israeli Government that they will not be allowed to fund new generation for systems that are within 5 km of the IEC

grid. It is not clear if funds coming through Jordan will have the same restrictions. This policy also seems to be changing; the Sourif VEC representatives were recently told they would be allowed to install a new diesel unit.

As more and more consumers ask for better service from the VECs, they may urge interconnection with the Israeli grid. In the past, this has meant that the cooperative was dissolved. Although discussion indicated a potential shift in this policy, the general impression is that the VEC will disband if and when it decides to interconnect to the IEC grid. As the IEC grid expands, more VECs may find it attractive to interconnect. Hence, an opinion held by the few individuals willing to discuss the matter is that the number of VECs will most likely continue to decrease over the next few years and electric cooperatives will soon no longer exist.

This trend could be reversed if VECs and villages connecting to the grid were encouraged, and even recruited into the cooperative movement as distribution systems. Representatives of the two CRS-funded, grid-connected, village electrification projects which were visited expressed a desire to become cooperatives. Their stated reason was that they saw the need for a regional Cooperative Office to audit their books and verify that the villagers were receiving fair treatment. Otherwise, they feared, consumers would be engaged in constant disputes with the Electrification Committee over rates, service, etc. With a shift in policy to support distribution systems, villages like these could be the basis of new, larger electric cooperatives to replace the existing, dying ones.

Villages are being required to pay IEC exorbitant up-front "aid-in-construction" costs. But because of lower energy charges, it is still cost-effective for many of the VECs to interconnect rather than self-generate.

A strong VEC Union could assist villages such as these, the approximately 130 villages presently receiving grid power, and existing VECs that want grid service to obtain fair rates, fair connection fees, and guidance in operating the distribution system. Such a growth in numbers of VECs would allow more effective training programs and coordination.

In the long term such a Union of distribution VECs may be in a position to finance, construct, own, and operate 11 kV feeder lines from the IEC grid to out-lying villages. Although this action is currently prohibited by IEC service territory rights, those rights are generally given with an obligation to provide facilities and service within the territory. Since IEC is unable to finance the facilities (as indicated by the high construction fees), then other parties able to finance facilities should be allowed to own and operate them.

IV. RECOMMENDATIONS

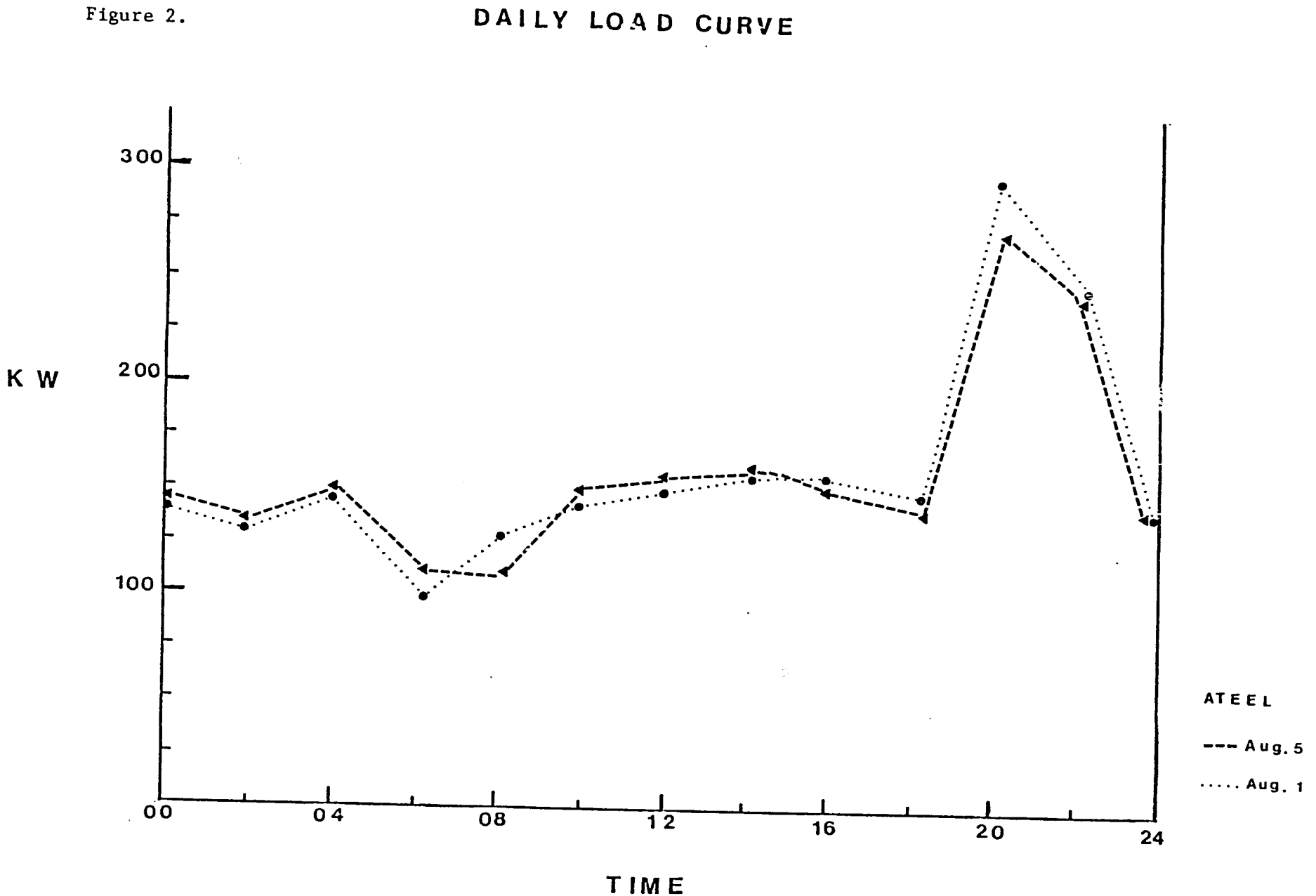
Recommendations given in this section address the need to improve the operations, financial position, and management of the VECs. Implementing these recommendations will help the VECs operate more efficiently, provide better service, and eventually lower their cost of service. Training courses and technical assistance to support these changes are recommended for the CDP's consideration.

A. Operational

In the short term, systems need to start extending service hours, improving network losses and voltage drops, and improving their maintenance practices.

Power Supply. The potential daily load shape for 24-hour service for most of the VECs is shown in Figure 2. To serve this suppressed daytime load, the systems need diesel units that can operate efficiently over the peak and off-peak periods. Since most diesel units will only operate efficiently down to about 50% of rated load, the VECs need to purchase units with smaller capacities and have at least two units for multiple operations. This will also give the VECs greater reliability. Two methods of sizing diesel units are generally accepted. One method is to have two identical diesel units so that operating hours are shared equally and spare parts, service contracts, and operating characteristics are the same. The other method is to size the

Figure 2.


DAILY LOAD CURVE
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16
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24
TIME
ATEEL
--- Aug. 5
..... Aug. 1

larger unit at two-thirds the expected demand, and the second unit at one-third the expected demand. This sizing method gives operators the ability to efficiently serve a wider range of loads. Either method would be acceptable for the VECs.

VECs need to obtain their diesel operating manuals and develop and maintain a maintenance schedule.

VECs need guidelines for sizing new diesel units which should also be provided to the various donor agencies which fund new capacity. Standard bid specifications are desirable for governors, noise abatement, capacity rating, efficiency guarantees, and evaluation criteria.

Switchgear. Most VECs can operate for several years with close-over switches but need to plan for synchronizing of multiple units or with the grid in order to purchase units with appropriate governors.

In the short term, systems need to repair nameplates, mark operating limits on meters, install kWh output meters, and calibrate existing meters. In the longer term, they need to conduct short-circuit studies, re-set feeder breakers, and install line fuses to see beyond the reach of the circuit breakers.

Networks. In the near term, local LV standards should be obtained, distributed to the VECs, and followed in all new construction. Standards to be provided by the Nablus Electrical Department should be reviewed by an outside engineer and, if appropriate, adopted. It is recommended that the CDP

hire a local technical advisor to develop conductor selection guidelines based upon economic evaluation of losses. These should be provided to the VECs and their consulting engineers. Existing systems need to be rehabilitated to meet adopted standards. Safe grounding practices must be adopted and enforced by the VECs.

In the longer term, the larger systems should begin thinking about an 11 kV "backbone" distribution line if they want to extend service beyond a 2 km radius from their station. Ateel VEC has grown to the point where an 11 kV backbone appears economical, especially if they decide to move the powerplant station. If Ateel decides to move further on this idea, it is recommended that the CDP provide technical assistance to study the technical, economic, and institutional aspects of constructing an 11 kV network. The methodology used could become a model for other systems.

Voltage. VECs need to develop a service quality policy for the maximum allowable voltage drop at the end of a feeder during peak load hours. They should measure voltage levels to know what kind of service they are providing, develop maps to analyze the benefits of system improvements, and install appropriate facilities (regulators and larger conductors).

Poles. All new construction should use wood poles because of lower cost and easier construction.

Protection. All systems should have surge arrestors.

Service drops and entrances. Each VEC should own all lines up to the residential meters including the service drops. After a LV standard is adopted, the VECs should correct all sub-standard service drops and entrances. It is recommended that the Hebron technician attend the on-the-job training offered by JDEC to observe how consumer grounds are measured and how residential meters are calibrated.

Balance. VECs need to start making operating records to observe and correct feeder unbalances.

Losses. VECs should develop system maps with conductor sizes and lengths to be able to apply conductor selection guidelines as recommended above.

Hours of operation. Except for Ateel, all VECs need to begin a program to extend daytime operating hours. Increased daytime service will allow shop owners, restaurants, and grocery stores to develop, add refrigerators, freezers, and use other tools. It will also allow consumers to shift present on-peak uses of electricity to off-peak hours, allowing the VECs to use the existing capacity and networks more effectively. If a VEC has designed its rate structure correctly, this will bring down the average residential cost per kWh.

Staff. It is recommended that all VECs with more than 300 meters have an operator with at least one year of technical training beyond secondary school. The operator should be able to read technical manuals and be capable of performing diesel and electrical network repairs.

To encourage those VECs to obtain qualified operators it is recommended that the CDP offer scholarships to students wanting to take a one- or two-year technical training course in the West Bank and agreeing to be employeed by a VEC upon completion. The scholarship should cover about half the student's educational cost.

Each system should have at least two individuals in the village who know how to operate the diesel generator and switchgear in case one operator becomes unavailable.

Technical support. The Hebron technician should continue to provide assistance to the VECs in making repairs and inspecting construction. His duties need to be directed and monitored, preferably by the Union (to be discussed below in the Management sub-section). It is recommended that the CDP assist the regional Cooperative Office to obtain the following tools for his use in carrying out these duties:

- low-voltage multi-meter with clamp-on ampere meter
- megger
- wood pole climbing spikes
- climbing belt
- ladder
- tool belt
- crimper
- wire strippers
- come-along
- First Aid kit
- insulated gloves
- work gloves
- posthole digger (long handled)
- breaker bar
- tamp (long handled)
- level
- hand saw (wood)
- hacksaw
- C clamps
- electrician's knife

- socket set
- drill brace with long bits for wood poles
- block and tackle
- cable cutter
- fire extinguisher - Class B & C
- wire brush
- chisels
- tape measures, 4-meter and 50-meter
- tool box with padlock
- allen wrenches
- various hand tools such as screwdriver set, pliers, hammer, etc.

The tools could also be made available to the VECs at a subsidized price. The CDP program could assist by paying half the cost of the tools and helping in providing training in their use. The VECs would be asked to pay the other half. The technician would be responsible for coordinating the purchases and ensuring that operators know how to use the tools before issuing them to a VEC. Items such as the megger, climbing spikes, and multi-meter should be carefully controlled.

It is also recommended that the technician be in charge of a small amount of spare parts which could be stored at one of the villages. A VEC using parts for an emergency repair would be responsible for replacing or reimbursing the Cooperative Office. Recommended parts are:

- bolt-type connectors of various sizes
- 35 mm ACSR conductor
- 75 mm ACSR conductor
- 10 m pole
- 12 m pole
- kWh meters
- various lugs
- conductor ties
- spool insulators
- screw bolts
- bolts and washers
- ground rods and clamps
- water pipe clamps
- bare copper ground conductor

- circuit breakers for 20,000 ampere duty
  - 150 amp
  - 200 amp
- streetlight parts
- streetlight 1-phase circuit breakers: 25, 50, and 70 ampere
- service entrance cable and messenger
- electrical tape
- cleaning oil
- cable ties

If the Union of VECs (see below) becomes a viable organization, then the tools and spare parts programs should be moved from the Cooperative Office to the Union's control.

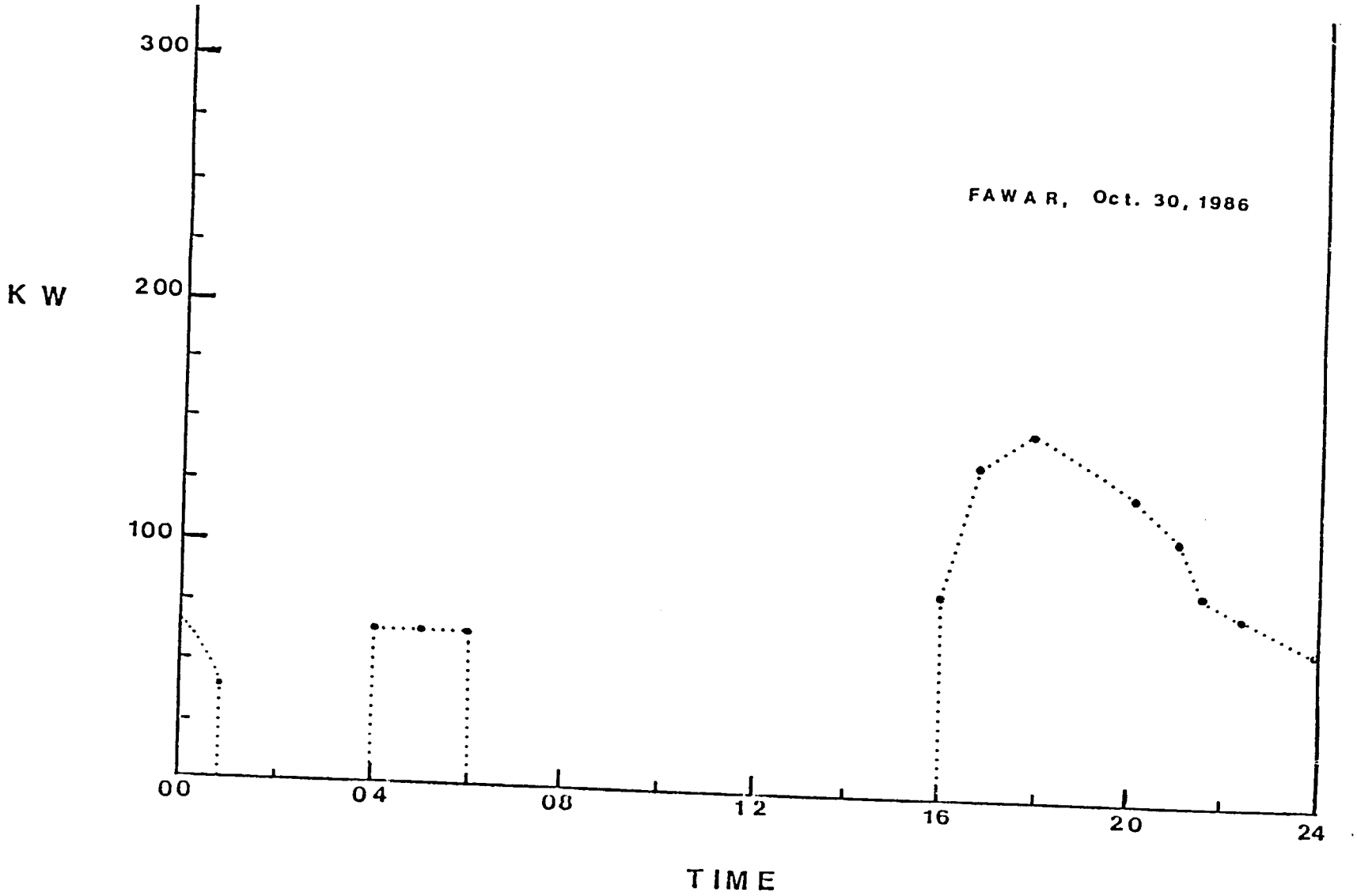
B. Financial

Balance sheets. All the VECs with a negative net margin should review their rates and adjust them upward to recover non-cash expenses such as depreciation.

Economy of scale. Most of the systems would be able to provide lower cost energy if they could sell more energy with the same generator units and staff. This would mean extending hours and looking for new loads. One possibility is for the VECs to provide service to nearby commercial loads. For example, at the Fawar Camp the VEC could provide standby service to the nearby olive press facility when the VEC has excess capacity. Figure 3 is a daily load curve for the Fawar Camp system which indicated they could serve the 60 kW olive press load during all hours except the evening peak period. Alternatively, the olive press unit could be used as a standby unit for the VEC during the nine months of the year the press does not operate. Similarly, in Bart'a the VEC could interconnect with the olive press cooperative and also serve the water supply cooperative when it replaces its diesel and converts the pump to electric drive.

Figure 3.

DAILY LOAD CURVE



Key indicators. The concept of developing and monitoring key indicators is not presently used by the VECs. CDP management training for all the cooperatives is scheduled to introduce these concepts, and VEC managers should attend these courses. The database developed (Appendix B) includes three indicators: percent equity, kW operating per meter connected, and the number of meters served per km of line.

Financing. Sources of future funding need to be located, schedules developed, and programming of funds undertaken.

C. Management

Managers. The CDP should encourage the development of local managers. Since most systems cannot afford a full-time manager, joint managers and multiple cooperative managers should be encouraged, developed, and trained. The Sa'er and Chyoukh systems offer a good opportunity to try a joint manager. Sa'er has 767 members, one full-time and one part-time employee. Chyoukh is adjacent to Sa'er and has 362 members and two part-time employees. Both systems could benefit from professional management. Generally, a system can afford, and needs, one employee per 200 meters. Together, the two systems could well afford to hire another employee.

If the number of VECs increases as discussed in Section III, then the opportunities for joint management will also increase.

Policies. VEC Boards of Directors need to develop numerous written policies and should be given either model policies, sample policies, or policy

guidelines. Policies are needed for:

- unpaid bills and disconnects
- area coverage
- rate structure
- financial performance (targets)
- next-year budget review
- employee compensation
- employee training and development
- cash management
- service quality (voltage drop, hours of operations, etc.)
- representation on Board (district Directors)

Receivership. In any wide-scale cooperative program a small percentage of the cooperatives established will fail. In this event, an oversight agency is needed to step in and temporarily operate the system while correcting the problems and re-constituting the cooperative.

It is recommended that the CDP advocate that the rights of receivership be granted to the regional Cooperative Office and that these rights be secured for all new VEC funding. Then, when and if VECs face internal disruptions or are no longer able to meet expenses, the Cooperative Office would be able to step in and continue operation of the facilities, charge adequate rates, and collect fees to pay necessary expenses. This action not only maintains service for the members but it also makes the VECs more "fundable" since donors see the Cooperative Office in a position to protect their investment.

A potential opportunity to test the rights of receivership exists with the dissolved VEC at Dirayha (see Appendix E).

Union. The VECs are making many of the same mistakes made by electric cooperatives in the U.S., Indonesia, and dozens of other countries around the world. Representatives from U.S. electric cooperatives could offer very

valuable advice based on their long experience in the U.S. and working in the Third World. Unfortunately, there is no-one to tell. No individual in the cooperative offices knowledgeable of power system operations is providing guidance or leadership to the VECs. Until such an individual is identified, there is no effective channel through which to implement recommendations and policy guidance to the VECs nor make effective use of professional management and technical assistance available from U.S. electric cooperatives.

This leadership could be provided through the cooperative offices, a strong VEC manager, or through the Union. It is recommended that the CDP advocate strengthening of the Union of Electric Cooperatives in the Hebron area. If possible, the Union should be expanded to include VECs in the Nablus area, or those VECs could form their own Union. If the cooperative leadership accepts distribution systems as outlined in Section III, and is willing to provide a strong, honest, and knowledgeable leader to head this Union, then it is recommended that the CDP fund a technical advisor from the U.S. rural electric cooperative movement to help guide and direct him. His office expenses, travel cost, etc., should be paid by VEC Union dues, prorated on a kWh sales basis.

The duties of the Union would be:

Feasibility studies:	Conduct feasibility studies of system expansions and new generation facilities.
Funding sources:	Work with donor and financing institutions to arrange continued funds for the VECs
Coordination:	Establish communication links between VECs for assistance with spare parts, emergency repairs, sales of diesel units, tools, etc.

Construction Inspection:	Inspect and approve contractors' work to ensure that it complies with adopted standards
Recruiting new system members:	Seek expanded membership in the Union
Bulk-delivery contracts:	Negotiate with IEC for fair connection terms and rates
Training:	Sponsor, plan, coordinate and conduct training
Economic development:	Promote economic uses of electricity in the villages and help commercial users locate funding
External relations:	Develop sister cooperative relationships with U.S. electric cooperatives

The duties of directing the regional Cooperative Office technician and accountants working with the VECs and of receivership could also be shared between the Cooperative Office and the Union under the right relationship.

D. Training

Management. To bring about significant changes in the operations of the VECs, it is important to first obtain the support of their Boards of Directors and managers. Even with training, it is not anticipated that changes will be seen immediately but gradually over several years.

The first short course recommended was entitled "Economic Operations of Electric Power Systems" and was taught by this Specialist. It presented many of the recommendations included in this report. A course outline is given in Appendix D. The first session was held for VECs in the Nablus area at the Asira Shamaliya cooperative office. Eight attendees representing three VECs participated. The second session was held in the Hebron cooperative where 12 attendees representing six VECs participated. The overall evaluation of the

course (and presumably the recommendations) by the VEC representatives was positive and indicated a desire for further instruction.

The VECs should participate in the management training currently being developed by the CDP. If a significant number of VEC managers attend these, then it is recommended that the CDP conduct specific short courses for the VECs on policy-making and planning. The policy-making course would help the VECs develop the policies discussed in the "Policy" sub-section. The planning course would lead the attendees through the basic content of a feasibility study for system expansion.

Financial. The VECs should participate in the accounting training currently being developed by the CDP. If a significant number of VEC members attend these, then it is recommended that the CDP conduct specific short courses for the VECs on electric utility accounting and rate design. The utility accounting course would show the relationship between the adopted standard balance sheet for all West Bank cooperatives and specific electric power system expenses and accounts. The rate design course would provide instruction on cost-of-service concepts, rate structure, and methods for obtaining membership approval of rate increases.

Technical. Options for training and technical assistance were discussed with the VEC attendees at the first course. General agreement was reached that the VECs needed a combination of short courses and long-term training/technical assistance. Recommended technical short courses are:

Diesel Training. It is recommended that the CDP sponsor a course on diesel maintenance and minor repair. It could be given at local diesel shops in Nablus and Hebron by a qualified local mechanic. The students should be shown examples of damaged diesel parts with explanations for prevention. For example, students should be shown blown head gaskets and then how to torque head bolts. Ideally, the students should receive a copy of the operating manual for their own diesel and be given assistance in developing a maintenance schedule. This course should be open to operators from the olive press cooperatives and other cooperatives with diesel engines. The "Abu Eid & Brothers" garage in Hebron appeared capable and willing to assist in such an effort.

LV Standards. It is recommended that a local electrical engineering consultant be hired by the CDP to select appropriate LV standards for the VECs. After this "technical assistance," the consultant should distribute them and provide short courses in their importance and procedures for adopting them. The courses would be directed to operator/electricians. Ziad Sa'adeddin appeared capable and willing to perform such an effort.

Safety and First Aid. An employee working with and around live electrical circuits should be trained in CPR and basic first aid. This short course should also be provided to operators and maintenance crews of olive press and other such cooperatives and be taught by local medical professionals.

For long-term training it is recommended that the CDP provide scholarships as described in the "Staff" sub-section.

Course plans for the recommended courses are given in Appendix D. Most of the courses could be taught by local engineers and mechanics. The policy-making, planning, and rate design courses will require outside assistance to develop and present.

E. Technical Assistance

Recommended technical assistance is described elsewhere in this report and summarized below.

Conductor selection	Hire a local engineer to develop conductor selection guidelines. Guidelines should be reviewed by an outside advisor before being distributed to the VECs.
LV standards	Hire a local engineer to select and compile LV material and construction standards. Standards should be reviewed by an outside advisor before being distributed to the VECs.
Feasibility study	Provide two outside consultants and one local engineer to conduct a feasibilty study at Dirayha.
Electrical Union	Provide a Program Advisor to the head of a Union of Electric Cooperatives if the VECs and the JCO agree to strengthen this organization.
11 kV Network	Provide an outside engineer and local counterpart to plan and design an 11 kV backbone network for a large VEC.

APPENDIX A - ACKNOWLEDGEMENTS

During the course of this consultancy I was greeted with traditional Arab hospitality in every office, village, and rural street visited. Everyone I contacted give his assistance, advice, information, and direction.

It required a great amount of effort from numerous people to collect the information contained in this report in such a short period. I am particularly indebted to Yasser Nasser and Mohammed Hamsza who accompanied me on several visits to cooperatives and provided translations and explanations. All the VEC leaders patiently answered my long list of questions and also shared many of their experiences which gave me a greater understanding of their difficult situations.

The CDP staff provided me with excellent logistical support and background information. They became quite involved with my assignment and showed a deep sensitivity to the needs and problems facing the West Bank. Their insight and support were invaluable.

APPENDIX B -- MANAGEMENT INFORMATION DATABASE

The information collected at the VECs was organized and entered in the attached database. The database software is REFLEX and is stored on the CDP's IBM-PC. The database contains general, financial, and operational data for each registered VEC. Three indicators are calculated from the data:

%Equ	-	the membership (Memb) Equity divided by the Total Assets.
kW per con	-	the peak demand on the system divided by the number of consumers. This indicates the amount of capacity and the amount of electricity used by each consumer.
Meters per KM	-	the number of meters on the system divided by kilometers of LV line. This indicates the density and the amount of revenues that can be expected for investment in the network.

Electric Cooperatives

NAME OF COOP: Chyoukh Electric Coop

GENERAL

Alt. Name: Sheukh
Israel Reg: 596
Region: Hebron
District:
Village: Chyoukh

YrBegun: 8/26/78
Jordan Reg:

Telephone:

Status: active
Dir: 7

Secretary- Manager:
Memb: 362

Emp: 2

FINANCIAL

Rept Date: 3/01/85
Total Assets: 6,404,381.00
Memb Invest: 204,985.00
Profit: (115,672.00)

Reserves: 390,604.00
Memb Equity: 479917
%Equ: 0.074

GENERATION PLANT

Capacity Installed:: 480 Operating: 320

Unit 1 1kW: 160 1Make: Detroit Di 6 1Year inst: 1983
1No. OH: 0 1Model:
Unit 2 2kW: 320 2Make: Dorman6 2Year inst: 1985
2No. OH: 0 2Model:
Unit 3 3kW: 3Make: 3Year inst:
3No.OH: 3Model:
Unit 4 4kW: 4Make: 4Year inst:
4No.OH: 4Model:

COS: Y SYN: kW per con: 0.88

DISTRIBUTION PLANT KM Low Voltage KLV: 18
No.Meters: 360 Feeders: 4 Meters per KM: 20

OPERATIONS

Hours operations HSummer: 9 HWinter: 7
Peak load kW PSummer: PWinter:

Rate Min.Month: 10 JDs for First: 15
fil perkWh: IS per kWh:

Fuel cost per liter IS: 0.54

Comment1: Unit 1 not working 10/20/86 In need of overhaul

Comment2: Unit 1 -160 is standby rating

Electric Cooperatives

NAME OF COOP: Deir Samet Electric Coop

GENERAL

Alt. Name:
YrBegun: 12/26/77
Israel Reg: 588
Jordan Reg:
Region: Hebron
District:
Village: Deir Samet
Telephone:

Status: non-active
Secretary- Manager:
Dir: 7
Memb: 286
Emp: 2

FINANCIAL

Rept Date: 3/01/85
Total Assets: 2,136,930.00
Reserves: 273,607.00
Memb Invest: 212,287.00
Memb Equity: 1223957
Profit: 738,063.00
%Equ: 0.57

GENERATION PLANT

Capacity
Installed:: 278
Operating:

Unit 1 1kW: 110 1Make: Dorman6 1Year inst:
1No. OH: 1Model:
Unit 2 2kW: 110 2Make: Dorman6 2Year inst:
2No. OH: 2Model:
Unit 3 3kW: 58 3Make: Dorman6 3Year inst:
3No.OH: 3Model:
Unit 4 4kW: 4Make: 4Year inst:
4No.OH: 4Model:

COS:
SYN:
kW per con: 0

DISTRIBUTION PLANT
KM Low Voltage KLV:
No.Meters:
Feeders:
Meters per KM: ERROR

OPERATIONS

Hours operations
HSummer:
HWinter:
Peak load kW
PSummer:
PWinter:

Rate
Min.Month:
JDs for First:
fil perkWh:
IS per kWh:

Fuel cost per liter IS:

Comment1: Although registered as a coop, run by local village committee

Comment2:

Electric Cooperatives

NAME OF COOP: Fawar Camp Electric Coop

GENERAL

Alt. Name:
Israel Reg: 558
Region: Hebron
District:
Village: Al Fawar

YrBegun: 11/25/75
Jordan Reg:

Telephone:

Status: active
Dir: 7

Secretary- Manager: Yousef Al-Ehlayqawy
Memb: 365
Emp: 1

FINANCIAL

Rept Date: 3/01/85
Total Assets: 21,211.00
Memb Invest: 2,325.00
Profit: (1,284.00)

Reserves: 8,689.00
Memb Equity: 9730
%Equ: 0.45

GENERATION PLANT

Capacity Installed:: 340 Operating: 240

Unit 1 1kW: 240 1Make: G.M.8 1Year inst: 1983
1No. OH: 0 1Model:
Unit 2 2kW: 100 2Make: Mercedes6 2Year inst: 1975
2No. OH: 0 2Model:
Unit 3 3kW: 3Make: 3Year inst:
3No.OH: 3Model:
Unit 4 4kW: 4Make: 4Year inst:
4No.OH: 4Model:

COS: Y SYN: kW per con: 0.65

DISTRIBUTION PLANT KM Low Voltage KLV: 8
No.Meters: 365 Feeders: Meters per KM: 45.62

OPERATIONS

Hours operations HSummer: 8 HWinter: 10
Peak load kW PSummer: 150 PWinter: 150

Rate Min.Month: 3 JDs for First: 15
fil perkWh: 50 IS per kWh:

Fuel cost per liter IS: 0.54

Comment1: Operator has 1 year training. Able to string line

Comment2: Feeder well balanced, new network

Electric Cooperatives

NAME OF COOP: Ittihad Majd & Sikka Electric Coop

GENERAL

Alt. Name:
Israel Reg: 589
Region: Hebron
District:
Village: Al Majd/Sikka

YrBegun: 1/22/78
Jordan Reg:

Telephone:

Status: active
Dir: 7

Secretary- Manager: Abadallah Amro
Memb: 103
Emp: 0

FINANCIAL

Rept Date:
Total Assets:
Memb Invest:
Profit:

Reserves:
Memb Equity: 0

%Equ: ERROR

GENERATION PLANT

Capacity Installed:: 80 Operating: 80

Unit 1 1kW: 80 1Make: Caterpillar4 1Year inst: 1981
1No. OH: 0 1Model:
Unit 2 2kW: 2Make: 2Year inst:
2No. OH: 2Model:
Unit 3 3kW: 3Make: 3Year inst:
3No.OH: 3Model:
Unit 4 4kW: 4Make: 4Year inst:
4No.OH: 4Model:

COS: SYN: Y kW per con: 0.77

DISTRIBUTION PLANT KM Low Voltage KLV: 7
No.Meters: 103 Feeders: 3 Meters per KM: 14.71

OPERATIONS

Hours operations HSummer: 5 HWinter: 5
Peak load kW PSummer: 80 PWinter: 70

Rate Min.Month: 3 JDs for First: 15
fil perkWh: 50 IS per kWh:

Fuel cost per liter IS: 0.54

Comment1: Dispute in progress over grid; no reports filed until dispute resolved

Comment2: Operator gets free electricity. Secretary keeps books

Electric Cooperatives

NAME OF COOP: Nabi Elias Electricity Coop

GENERAL

Alt. Name:
Israel Reg: 583
Region: Nablus
District: Tulkarem
Village: Nabi Elias

YrBegun: 4/05/77
Jordan Reg:

Telephone:

Status: non-active
Dir: 5

Secretary- Manager:
Memb: 53

Emp:

FINANCIAL

Rept Date: 12/31/83
Total Assets: 8,009.00
Memb Invest: 6,077.00
Profit: (390.00)

Reserves: 270.00
Memb Equity: 5957

%Equ: 0.74

GENERATION PLANT

Capacity

Installed:: 0

Operating:

Unit 1 1kW:
1No. OH:
Unit 2 2kW:
2No. OH:
Unit 3 3kW:
3No.OH:
Unit 4 4kW:
4No.OH:

1Make:
1Model:
2Make:
2Model:
3Make:
3Model:
4Make:
4Model:

1Year inst:
2Year inst:
3Year inst:
4Year inst:

COS:

SYN:

kW per con: 0

DISTRIBUTION PLANT

No.Meters:

KM Low Voltage Feeders:

KLV:

Meters per KM: ERROR

OPERATIONS

Hours operations
Peak load kW

HSummer:
PSummer:

HWinter:
PWinter:

Rate Min.Month:
fil perkWh:

JDs for First:
IS per kWh:

Fuel cost per liter IS:

Comment1:

Comment2:

15

Electric Cooperatives

NAME OF COOP: Rama Electricity Coop

GENERAL

Alt. Name:
Israel Reg: 614
Region: Nablus
District: Jenin
Village: Rama

YrBegun: 3/08/80
Jordan Reg:

Telephone:

Status: active
Dir: 5

Secretary- Manager: Abdallah Khanafar
Memb: 59
Emp: 1

FINANCIAL

Rept Date: 12/31/84
Total Assets: 20,450.00
Memb Invest: 1,120.00
Profit: (44,748.00)

Reserves: 14,000.00
Memb Equity: -29628
%Equ: -1.44

GENERATION PLANT

Capacity Installed:: 40 Operating: 40

Unit 1 1kW: 40 1Make: Lister6 1Year inst: 1979
1No. OH: 1 1Model:
Unit 2 2kW: 2Make: 2Year inst:
2No. OH: 2Model:
Unit 3 3kW: 3Make: 3Year inst:
3No.OH: 3Model:
Unit 4 4kW: 4Make: 4Year inst:
4No.OH: 4Model:

COS: SYN: kW per con: 0.67

DISTRIBUTION PLANT KM Low Voltage KLV: 4
No.Meters: 59 Feeders: Meters per KM: 14.75

OPERATIONS

Hours operations HSummer: 5 HWinter: 6
Peak load kW PSummer: 40 PWinter: 40

Rate Min.Month: 2.5 JDs for First: 10
fil perkWh: 150 IS per kWh:

Fuel cost per liter IS: 0.54

Comment1: All gas refrig. 90% have irons, 6 washing machines

Comment2: 4 Families in village

Electric Cooperatives

NAME OF COOP: Rihieh Electric Coop

GENERAL

Alt. Name:
Israel Reg: 616
Region: Hebron
District:
Village: Rihieh

YrBegun: 8/03/80
Jordan Reg:

Telephone:

Status: active
Dir: 7

Secretary- Manager: Musa Khailil Altobasy
Memb: 130
Emp: 2

FINANCIAL

Rept Date: 3/01/86
Total Assets: 22,641.00
Memb Invest: 645.00
Profit: (1,398.00)

Reserves: 9,283.00
Memb Equity: 8530
%Equ: 0.37

GENERATION PLANT

Capacity Installed:: 115 Operating: 115

Unit 1 1kW: 115 1Make: G.M. 4 1Year inst: 1981
1No. OH: 0 1Model:
Unit 2 2kW: 2Make: 2Year inst:
2No. OH: 2Model:
Unit 3 3kW: 3Make: 3Year inst:
3No.OH: 3Model:
Unit 4 4kW: 4Make: 4Year inst:
4No.OH: 4Model:

COS: N SYN: kW per con: 0.88

DISTRIBUTION PLANT KM Low Voltage KLV: 3
No.Meters: 130 Feeders: 3 Meters per KM: 43.33

OPERATIONS

Hours operations HSummer: 5 HWinter: 5
Peak load kW PSummer: PWinter:

Rate Min.Month: 2.9 JDs for First: 15
fil perkWh: 50 IS per kWh:

Fuel cost per liter IS: 0.54

Comment1: Unit 1 burning .5 liter oil a day

Comment2:

47

Electric Cooperatives

NAME OF COOP: Sa´er Electric Coop

GENERAL

Alt. Name: Saier
YrBegun: 9/09/73
Israel Reg: 537
Jordan Reg:
Region: Hebron
District:
Village: Sa´er
Telephone:

Status: active
Secretary- Manager:
Dir: 7
Memb: 767
Emp: 2

FINANCIAL

Rept Date: 3/01/85
Total Assets: 36,207.00
Reserves: 14,819.00
Memb Invest: 5,901.00
Memb Equity: 24381
Profit: 3,661.00
%Equ: 0.67

GENERATION PLANT

Capacity
Installed:: 381
Operating: 381

Unit 1 1kW: 256 1Make: Cummins8 1Year inst: 1984
1No. OH: 0 1Model:
Unit 2 2kW: 125 2Make: RR 6 2Year inst: 1974
2No. OH: 3 2Model:
Unit 3 3kW: 3Make: 3Year inst:
3No.OH: 3Model:
Unit 4 4kW: 4Make: 4Year inst:
4No.OH: 4Model:

COS: Y
SYN:
kW per con: 0.49

DISTRIBUTION PLANT
KM Low Voltage KLV: 20
No.Meters: 767
Feeders: 2
Meters per KM: 38.35

OPERATIONS

Hours operations
HSummer: 9
HWinter: 7
Peak load kW
PSummer: 380
PWinter: 380

Rate
Min.Month: 2
JDs for First: 10
fil perkWh: 50
IS per kWh:

Fuel cost per liter IS: 0.54

Comment1: Rate drops to 30 fils/kWh after 100 kWh

Comment2: ANERA Grant -1984, Network in very poor condition

Electric Cooperatives

NAME OF COOP: Sourif Electric Coop

GENERAL

Alt. Name:
Israel Reg: 550
Region: Hebron
District:
Village: Sourif

YrBegun: 1/26/75
Jordan Reg:

Telephone: 962-011

Status: active
Dir: 7

Secretary- Manager: Ahmad Mostafa Soboa
Memb: 742
Emp: 2

FINANCIAL

Rept Date: 3/01/85
Total Assets: 64,322.00
Memb Invest: 25,661.00
Profit: (6,139.00)

Reserves: 31,770.00
Memb Equity: 51292
%Equ: 0.79

GENERATION PLANT

Capacity Installed:: 350 Operating: 350

Unit 1 1kW: 350 1Make: G.M. 12 1Year inst: 1980
1No. OH: 0 1Model:
Unit 2 2kW: 2Make: 2Year inst:
2No. OH: 2Model:
Unit 3 3kW: 3Make: 3Year inst:
3No.OH: 3Model:
Unit 4 4kW: 4Make: 4Year inst:
4No.OH: 4Model:

COS: Y SYN: kW per con: 0.47

DISTRIBUTION PLANT KM Low Voltage KLV: 8
No.Meters: 742 Feeders: 4 Meters per KM: 92.75

OPERATIONS

Hours operations HSummer: 7.5 HWinter: 7.5
Peak load kW PSummer: 333 PWinter: 350

Rate Min.Month: 2.7 JDs for First: 10
fil perkWh: IS per kWh: 0.4

Fuel cost per liter IS: 0.54

Comment1: Unit 1 not operating 11/13/86. VEC looking at 400 kW unit

Comment2: 90% consumer have refrig, 10% washing machines. Next to grid

Electric Cooperatives

NAME OF COOP: Tarkumia Electric Coop

GENERAL

Alt. Name:
Israel Reg: 541
Region: Hebron
District:
Village: Tarkumia

YrBegun: 7/12/74
Jordan Reg:

Telephone:

Status: active
Dir: 7

Secretary- Manager: Ahmad Salim
Memb: 708
Emp: 2

FINANCIAL

Rept Date: 3/01/85
Total Assets: 61,127.00
Memb Invest: 33,854.00
Profit: (8,570.00)

Reserves: 851.00
Memb Equity: 33176
%Equ: 0.54

GENERATION PLANT

Capacity Installed:: 546 Operating: 380

Unit 1 1kW: 286 1Make: Dorman6 1Year inst: 1985
1No. OH: 0 1Model:
Unit 2 2kW: 150 2Make: Dorman6 2Year inst: 1977
2No. OH: 2 2Model:
Unit 3 3kW: 110 3Make: Dorman6 3Year inst: 1974
3No.OH: 2 3Model:
Unit 4 4kW: 4Make: 4Year inst:
4No.OH: 4Model:

COS: Y SYN: kW per con: 0.53

DISTRIBUTION PLANT KM Low Voltage KLV: 10
No.Meters: 768 Feeders: 4 Meters per KM: 76.8

OPERATIONS

Hours operations HSummer: 11 HWinter: 11
Peak load kW PSummer: 235 PWinter: 235

Rate Min.Month: 3.5 JDs for First: 15
fil perkWh: 50 IS per kWh:

Fuel cost per liter IS: 0.54

Comment1: Operate from 12 - 2PM - fully loaded

Comment2: Higher rate for non-members

Electric Cooperatives

NAME OF COOP: Zabouba Electricity Coop

GENERAL

Alt. Name:
Israel Reg: 613
Region: Nablus
District: Jenin
Village: Zabouba

YrBegun: 8/03/80
Jordan Reg:

Telephone:

Status: active
Dir: 9

Secretary- Manager: Ahmad Yousef
Memb: 140
Emp: 0

FINANCIAL

Rept Date: 12/31/83
Total Assets: 42,521.00
Memb Invest: 2,600.00
Profit: (4,518.00)

Reserves:
Memb Equity: -1918
%Equ: -0.04

GENERATION PLANT

Capacity Installed:: 64 Operating: 64

Unit 1 1kW: 64 1Make: Lister6 1Year inst: 1980
1No. OH: 0 1Model:
Unit 2 2kW: 2Make: 2Year inst:
2No. OH: 2Model:
Unit 3 3kW: 3Make: 3Year inst:
3No.OH: 3Model:
Unit 4 4kW: 4Make: 4Year inst:
4No.OH: 4Model:

COS: SYN: kW per con: 0.45

DISTRIBUTION PLANT KM Low Voltage KLV: 1.5
No.Meters: 140 Feeders: Meters per KM: 93.33

OPERATIONS

Hours operations HSummer: 6 HWinter: 6
Peak load kW PSummer: 64 PWinter: 64

Rate Min.Month: 3 JDs for First: 12
fil perkWh: 75 IS per kWh:

Fuel cost per liter IS: 0.54

Comment1: No Balance Sheets since VEC did not want to pay accountant

Comment2: Two employees work for free electricity

Electric Cooperatives

NAME OF COOP: Aneen Electricity Coop

GENERAL

Alt. Name:
Israel Reg: 629
Region: Nablus
District: Jenin
Village: Aneen

YrBegun: 5/10/81
Jordan Reg:

Telephone:

Status: non-active
Dir: 7

Secretary- Manager:
Memb:
Emp:

FINANCIAL

Rept Date:
Total Assets:
Memb Invest:
Profit:

Reserves:
Memb Equity: 0
%Equ: ERROR

GENERATION PLANT

Capacity Installed:: 0 Operating:

Unit 1 1kW: 1Make: 1Year inst:
1No. OH: 1Model:
Unit 2 2kW: 2Make: 2Year inst:
2No. OH: 2Model:
Unit 3 3kW: 3Make: 3Year inst:
3No.OH: 3Model:
Unit 4 4kW: 4Make: 4Year inst:
4No.OH: 4Model:

COS: SYN: kW per con: ERROR

DISTRIBUTION PLANT KM Low Voltage KLV:
No.Meters: Feeders: Meters per KM: ERROR

OPERATIONS

Hours operations HSummer: HWinter:
Peak load kW PSummer: PWinter:

Rate Min.Month: JDs for First:
fil perkWh: IS per kWh:

Fuel cost per liter IS:

Comment1:

Comment2:

52

Electric Cooperatives

NAME OF COOP: Asira Kibliyeh Electricity Coop

GENERAL

Alt. Name:
YrBegun: 5/22/79
Israel Reg: 605
Jordan Reg:
Region: Nablus
District: Nablus
Village: Asira Kibliyeh
Telephone:

Status: active
Secretary- Manager: Hafez Mohd. Ahmed
Dir: 7
Memb: 146
Emp: 1

FINANCIAL

Rept Date: 12/31/85
Total Assets: 16,385.00
Reserves: 20.00
Memb Invest: 5,410.00
Memb Equity: 5325
Profit: (105.00)
%Equ: 0.32

GENERATION PLANT

Capacity
Installed:: 44
Operating: 44

Unit 1 1kW: 44
1Make: Dorman6
1Year inst: 1978
1No. OH: 0
1Model:
Unit 2 2kW:
2Make:
2Year inst:
2No. OH:
2Model:
Unit 3 3kW:
3Make:
3Year inst:
3No.OH:
3Model:
Unit 4 4kW:
4Make:
4Year inst:
4No.OH:
4Model:

COS:
SYN:
kW per con: 0.30

DISTRIBUTION PLANT
KM Low Voltage
KLV: 2
No.Meters: 140
Feeders:
Meters per KM: 70

OPERATIONS

Hours operations
HSummer: 5
HWinter: 7
Peak load kW
PSummer:
PWinter:

Rate
Min.Month: 2
JDs for First: 15
fil perkWh: 50
IS per kWh:

Fuel cost per liter
IS: 0.54

Comment1: Diesel needs overhaul

Comment2:

Electric Cooperatives

NAME OF COOP: Asira Shamaliya Coop for Electricity

GENERAL

Alt. Name:
Israel Reg: 345
Region: Nablus
District: Nablus
Village: Asira Shamaliya

YrBegun: 1/06/62
Jordan Reg:

Telephone: 053-72448

Status: active
Dir: 7

Secretary- Manager: Saleh Ragheb Abdul Rahman
Memb: 500
Emp: 6

FINANCIAL

Rept Date: 3/31/86
Total Assets: 119,407.00
Memb Invest: 9,940.00
Profit: 12,863.00

Reserves: 2,094.00
Memb Equity: 24897
%Equ: 0.20

GENERATION PLANT

Capacity Installed:: 580 Operating: 580

Unit 1 1kW: 230 1Make: Dorman6 1Year inst: 1986
1No. OH: 0 1Model:
Unit 2 2kW: 200 2Make: Dorman6 2Year inst: 1984
2No. OH: 0 2Model:
Unit 3 3kW: 150 3Make: Dorman6 3Year inst: 1979
3No.OH: 0 3Model:
Unit 4 4kW: 4Make: 4Year inst:
4No.OH: 4Model:

COS: SYN: Y kW per con: 1.16

DISTRIBUTION PLANT KM Low Voltage KLV: 18
No.Meters: 650 Feeders: Meters per KM: 36.11

OPERATIONS

Hours operations HSummer: 16 HWinter: 16
Peak load kW PSummer: 320 PWinter: 320

Rate Min.Month: 4 JDs for First: 20
fil perkWh: 80 IS per kWh:

Fuel cost per liter IS: 0.54

Comment1: Non-members pay 100 fil/kWh. Unpaid account= 10% 5 Freezers in village

Comment2: 100% Refrig., 87% Washing machines. Operator has 2 years training

Electric Cooperatives

NAME OF COOP: Ateel Coop for Electricity

GENERAL

Alt. Name:
Israel Reg: 399
Region: Nablus
District: Tulkarem
Village: Ateel

YrBegun: 3/08/63
Jordan Reg:

Telephone:

Status: active
Dir: 12

Secretary- Manager: Mohd. Hudrub
Memb: 825
Emp: 5

FINANCIAL

Rept Date: 3/31/86
Total Assets: 140,307.00
Memb Invest: 17,494.00
Profit: 15,257.00

Reserves: 1,900.00
Memb Equity: 34651
%Equ: 0.24

GENERATION PLANT

Capacity Installed:: 744 Operating: 744

Unit 1 1kW: 264 1Make: Rolls Royce8 1Year inst: 1976
1No. OH: 0 1Model:
Unit 2 2kW: 200 2Make: Cummins6 2Year inst: 1983
2No. OH: 0 2Model:
Unit 3 3kW: 100 3Make: D.A.F.6 3Year inst: 1983
3No.OH: 0 3Model:
Unit 4 4kW: 180 4Make: D.A.F.6 4Year inst: 1986
4No.OH: 0 4Model:

COS: SYN: Y kW per con: 0.90

DISTRIBUTION PLANT KM Low Voltage KLV: 35
No.Meters: 850 Feeders: Meters per KM: 24.28

OPERATIONS

Hours operations HSummer: 24 HWinter: 24
Peak load kW PSummer: 350 PWinter: 270

Rate Min.Month: 3 JDs for First: 10
fil perkWh: 40 IS per kWh:

Fuel cost per liter IS: 0.54

Comment1: Recently dropped rate from 70 fils

Comment2: Want to expand to agricultural loads

Electric Cooperatives

NAME OF COOP: Barta Electricity Coop

GENERAL

Alt. Name: Bart'ah
Israel Reg: 576
Region: Nablus
District: Jenin
Village: Barta

YrBegun: 9/01/76
Jordan Reg:

Telephone:

Status: active
Dir: 11

Secretary- Manager: Rashi'd Yosef Mostafa
Memb: 300
Emp: 1

FINANCIAL

Rept Date: 3/31/86
Total Assets: 26,000.00
Memb Invest: 22,000.00
Profit: (17,000.00)

Reserves:
Memb Equity: 5000
%Equ: 0.19

GENERATION PLANT

Capacity Installed:: 110 Operating: 110

Unit 1 1kW: 110 1Make: Dorman6 1Year inst: 1979
1No. OH: 1 1Model:
Unit 2 2kW: 2Make: 2Year inst:
2No. OH: 2Model:
Unit 3 3kW: 3Make: 3Year inst:
3No.OH: 3Model:
Unit 4 4kW: 4Make: 4Year inst:
4No.OH: 4Model:

COS: SYN: kW per con: 0.36

DISTRIBUTION PLANT KM Low Voltage KLV: 13
No.Meters: 300 Feeders: Meters per KM: 23.07

OPERATIONS

Hours operations HSummer: 6 HWinter: 6
Peak load kW PSummer: 80 PWinter: 110

Rate Min.Month: 3 JDs for First: 15
fil perkWh: 50 IS per kWh:

Fuel cost per liter IS: 0.54

Comment1: 3000 in village. Could supply water pump - 50 kW and Olive press coop

Comment2: Want to expand grid. Add 50 poles

Electric Cooperatives

NAME OF COOP: Bazariyeh Electric Coop

GENERAL

Alt. Name:
Israel Reg: 600
Region: Nablus
District: Nablus
Village: Bazariyeh

YrBegun: 1/01/79
Jordan Reg:

Telephone:

Status: active
Dir: 7

Secretary- Manager: Fami Abdallah
Memb: 128
Emp: 2

FINANCIAL

Rept Date: 3/31/86
Total Assets: 16,521.00
Memb Invest: 9,478.00
Profit: (1,574.00)

Reserves: 0.00
Memb Equity: 7904
%Equ: 0.47

GENERATION PLANT

Capacity Installed:: 56 Operating: 56

Unit 1 1kW: 56 1Make: Ford6 1Year inst: 1976
1No. OH: 0 1Model:
Unit 2 2kW: 2Make: 2Year inst:
2No. OH: 2Model:
Unit 3 3kW: 3Make: 3Year inst:
3No.OH: 3Model:
Unit 4 4kW: 4Make: 4Year inst:
4No.OH: 4Model:

COS: SYN: kW per con: 0.43

DISTRIBUTION PLANT KM Low Voltage KLV: 5
No.Meters: 128 Feeders: Meters per KM: 25.6

OPERATIONS

Hours operations HSummer: 4 HWinter: 5
Peak load kW PSummer: PWinter:

Rate Min.Month: 2.5 JDs for First: 15
fil perkWh: 80 IS per kWh:

Fuel cost per liter IS: 0.54

Comment1: Want to expand system

Comment2:

Electric Cooperatives

NAME OF COOP: Beit Awa Electric Coop

GENERAL

Alt. Name:
Israel Reg: 575
Region: Hebron
District:
Village: Beit Awa

YrBegun: 7/21/76
Jordan Reg:

Telephone:

Status: non-active
Dir: 7

Secretary- Manager:
Memb: 326

Emp:

FINANCIAL

Rept Date: 3/01/80
Total Assets: 14,319.00
Memb Invest: 11,103.00
Profit: (819.00)

Reserves: 4,113.00
Memb Equity: 14397
%Equ: 1.00

GENERATION PLANT

Capacity Installed:: 240 Operating:

Unit 1 1kW: 110 1Make: G.M.4 1Year inst:
1No. OH: 1Model:
Unit 2 2kW: 72 2Make: Dorman6 2Year inst:
2No. OH: 2Model:
Unit 3 3kW: 58 3Make: Dorman6 3Year inst:
3No.OH: 3Model:
Unit 4 4kW: 4Make: 4Year inst:
4No.OH: 4Model:

COS: SYN: kW per con: 0

DISTRIBUTION PLANT KM Low Voltage KLV:
No.Meters: Feeders: Meters per KM: ERROR

OPERATIONS

Hours operations HSummer: HWinter:
Peak load kW PSummer: PWinter:

Rate Min.Month: JDs for First:
fil perkWh: IS per kWh:

Fuel cost per liter IS:

Comment1: actually run by local village committee

Comment2:

Electric Cooperatives

NAME OF COOP: Burkein Coop for Electricity

GENERAL

Alt. Name:
Israel Reg: 534
Region: Nablus
District: Jenin
Village: Burkein

YrBegun: 7/25/75
Jordan Reg:

Telephone:

Status: dissolved
Dir: 5

Secretary- Manager:
Memb: 360

Emp:

FINANCIAL

Rept Date: 3/31/86
Total Assets: 1,379,152.00
Memb Invest: 98,018.00
Profit: 280,767.00

Reserves: 54,635.00
Memb Equity: 433420
%Equ: 0.31

GENERATION PLANT

Capacity

Installed:: 355

Operating:

Unit 1 1kW: 230
1No. OH:
1Make: G.M.8
1Model:
1Year inst:

Unit 2 2kW: 125
2No. OH:
2Make: G.M.6
2Model:
2Year inst:

Unit 3 3kW:
3No.OH:
3Make:
3Model:
3Year inst:

Unit 4 4kW:
4No.OH:
4Make:
4Model:
4Year inst:

COS:

SYN:

kW per con: 0

DISTRIBUTION PLANT

KM Low Voltage KLV:
No.Meters:
Feeders:
Meters per KM: ERROR

OPERATIONS

Hours operations
Peak load kW

HSummer:
PSummer:

HWinter:
PWinter:

Rate Min.Month:
fil perkWh:

JDs for First:
IS per kWh:

Fuel cost per liter IS:

Comment1:

Comment2:

APPENDIX C -- DAILY SCHEDULE

Date	Activity
Oct. 14	Arrived in Jerusalem, 7:30 PM
Oct. 15	Introductions Attended meeting to review CDP implementation plan Read background reports
Oct. 16	Met with Adnan Obeidat, JCO Coordinator, West Bank Met with Mohammed Hamsza, Manager, Jenin Marketing Cooperative and Manager of Tan'ok village electric system
Oct. 17	Met with Nick Burns, American Consulate Designed electric cooperative database
Oct. 18	Day off Attended wedding in Tan'ok
Oct. 19	Day off
Oct. 20	Visited JCO office in Hebron Visited Sa'er and Chyoukh electric cooperatives
Oct. 21	Met with CRS staff, reviewed village electric projects Modified electric cooperative database and entered data Met with John Evavold, CDP Management Consultant
Oct. 22	Visited Abu Eid & Brothers diesel repair shop, Hebron Visited Fawar Camp Electric Co-op Visited Rihieh Electric Co-op Re-visited Sa'er Electric Co-op
Oct. 23	Visited JCO office in Nablus Visited Ateel Electric Co-op and collected load data
Oct. 24	Met with Adnan Obeidat, JOC coordinator Started report writing
Oct. 25	Met with Ali Taha, Chief Engineer, Jerusalem District Electricity Company Wrote follow-up letter and meeting notes
Oct. 26	Day off
Oct. 27	Visited Ittihad Majd & Sikka Electric Co-op in Hebron area Visited Tarkumia Olive Press Co-op

Oct. 28	Visited Zabuba and Bart'a VECs and the Bart'a Water Supply and Olive Co-ops in the Nablus area
Oct. 29	Visited Korza and Dirayha, locations of disbanded electric cooperatives Met with Abdul Hamid El-Zeir, Electrical Engineer, Hebron Municipality Met with Mahmood Qawasmi, Engineer, Hebron Technical Engineering College Return visit to Fawar Camp Electric Co-op
Oct. 30	Visited Bazariyeh and Rama Electric Co-ops, Nablus area Met with Mohammed Hamsza in Jenin
Oct. 31	Met with Peter Gubser, President, American Near East Refugee Aid Wrote on report
Nov. 1	Collected data from Fawar Electric Co-op Met with M. Sultan, Electric Engineer, Hebron Municipality Met with staff engineers from Hebron Technical Engineering College
Nov. 2	Day off Visited agricultural and bee cooperatives in Jericho
Nov. 3	Office -- wrote sections of report and drafted course outline Graphed Fawar load data
Nov. 4	Visited Tarkumia VEC with Nizar Amr, Electrical Engineer, Hebron Technical College
Nov. 5	Visited Ziad Sa'adeddin, General Manager, Electrical Department, Nablus Municipality Visited Nablus powerplant Visited Aira Shamaliya VEC
Nov. 6	Visited El Moreq, and Raqa Village Electrification Committees with Issa Barakat, Project Supervisor, Rural Development, CRS
Nov. 7	Developed course content
Nov. 8	Visited Sourif VEC and Dura Municipality electric plant Prepared course charts
Nov. 9	Day off
Nov. 10	Presented course on "Economic Operations of Electric Power Systems" in Nablus area
Nov. 11	Wrote on report Revised database format Prepared course charts for Mohammed Hamsza
Nov. 12	Presented course in Hebron area

Nov. 13	Wrote on report Met with Mr. Sporn, Chief Engineer, Israeli Electric Company
Nov. 14	Wrote on report Presented initial draft to CDP
Nov. 15	Day off
Nov. 16	Day off
Nov. 17	Revised draft report Debriefed Nick Burns, American Consulate, and Adnan Obeidat, JCD Coordinator
Nov. 18	Departed Tel Aviv 5:45 AM

APPENDIX D -- COURSE PLANS

Title: Economic operations of electric power systems

Objective: To provide the VEC management teams with an awareness of the criteria used to assess and plan for economic operations. Hopefully, this awareness will encourage the boards and managers to start taking steps to improve their operations and economic performance.

Audience: Secretary of Board, active board members, and managers

Priority: Immediate

Sequence: Along with management training and before technical and accounting training given to VEC staff

Main Training Points: When assessing the economic performance of an existing electric power system or proposed new facilities, the following types of questions are usually raised:

1. Is the existing equipment used to its fullest ability, or is proposed new equipment really needed?

   Often, it appears that the additional loads on the system could be served with the existing unit by extending the hours of service and educating members to use electricity during off-peak hours. Other options such as using smaller generators for off-peak load and change-over switches should be addressed.

2. Is the system allowing economic development of the service area?

   Economic development takes place when people can use the energy to improve their productivity. Although lighting can help quality of life and make minor productivity improvements, it is the use of motors, such as pumps and washing machines, which produces increases in productivity and gives consumers time for other economic activity. This generally means providing daylight hours of service.

3. Is the system paying for itself?

   Rates that reflect the full cost of service demonstrate that the community can afford electricity. Full cost of service includes major overhauls of diesel units and networks, plant depreciation, system losses, bad debts, and repayment of loan interest. If projects cannot pay for themselves, then who will pay the difference?

4. Is the system being operated efficiently?

   Records of losses along with system maps can illustrate how much of the energy generated is being used by the members. Operating records

can show the amount of phase unbalance and the diesel efficiency. System maps with conductor size and KW loading indicate the amount of line losses to expect. A program to calibrate meters illustrates the effort to have each member pay his fair share.

Proposed Length: 4 hours

Optimum Number of Trainees: 10-15

Facilities Needed: Classroom environment
One location in Nablus region and one in Hebron region

Instructor Qualifications:

1. Knowledge of electric system operations
2. Knowledge of electric power project assessments
3. Knowledge of power system economics

Mohammed Hamsza translated two training sessions of this course and is now able to present this course.

Additional Information: Provide each attendee with blank copies of:

1. Daily load curve
2. Operating record

Title: Rate design

Objective: To make VEC Board directors and managers aware of the cost of service and appropriate rate structures.

Audience: VEC directors and managers

Priority: In sequence

Main Training Points:

1. Cost components:
   - variable costs
   - fixed costs
   - consumer costs
2. Rate structure
3. Load forecast
4. Cash flow analysis
5. Obtaining membership approval

Proposed Length: 4 hours

Optimum Number of Attendees: 10 - 20

Facilities: Classroom environment

Instructor Qualifications:

1. Electrical Engineer - power systems
2. Understanding of economic analysis

Additional Information:

Title: VEC policies

Objective: To teach VEC Board directors and managers the need for written policy and provide them standard guidelines.

Audience: VEC directors and managers

Priority: In sequence

Main Training Points:

1. Importance of written policies for:
   - protection of directors
   - guidance for manager
   - information for consumers
   - financial stability of VEC
2. Guidelines for standard policies such as:
   - area coverage
   - unpaid accounts
   - service quality and hours of operation
   - board representation
   - cash management

Proposed Length: 1 day

Optimum Number of Attendees: 10 - 20

Facilities: Classroom environment

Instructor Qualifications:

1. Management trainer
2. Electric system management background

Additional Information: Technical assistance will be needed to develop the model guidelines for conditions in the West Bank.

Title: Minor repair and maintenance of diesel generator units

Objective: To teach local operators how to better maintain and repair their diesel units.

Audience: VEC operators and managers
Operators from olive cooperatives, water supply, irrigation and other cooperatives with diesel units

Priority: Soon

Main Training Points:

1. Importance of maintenance
2. Development and use of a maintenance schedule
3. Diesel operation
4. Use of common tools for minor repairs

Proposed Length: 2 days

Optimum Number of Attendees: 8 - 12

Facilities: Diesel shop with classroom space
Examples of damaged parts (head gaskets, bearings, etc.)
Common hand tools (torque wrench, wheel puller, etc.)

Instructor Qualifications:

1. Certified mechanic
2. At least 2 years of technical training
3. At least 10 years in diesel repairs

Suggested Instructor: Abu Eli & Brothers

Additional Information: Try to get a copy of the operating manual for each trainee's diesel unit and assist him to develop a maintenance schedule.

Title: LV standards and conductor selection

Objective: To inform VECs of recommended LV standards, the need to follow standards, and how to select the most economic conductor size.

Audience: VEC secretaries, managers, and electric repairmen

Priority: Soon

Sequence: After technical assistance to select and adopt LV standards and economic conductor sizes

Main Training Points:

1. Importance of standards for:
   - grounding
   - safety
   - economical construction
2. Network protection
   - short current study
   - circuit breakers
   - fuses
3. Guidelines for economic conductor selection based upon:
   - fuel cost
   - future load
   - hours of operation
   - cost of conductor and installation
   - break-even period

Proposed Length: 6 hours

Optimum Number of Attendees: 10 - 15

Facilities: Classroom environment

Instructor Qualifications:

1. Electrical Engineer
2. LV design experience
3. Understanding of economic analysis

Suggested Instructor: Sai'd Zaaddin

APPENDIX E - SCOPE OF WORK -- DIRAYHA

Background

The community of Dirayha lies approximately 10 km to the south of Hebron (see Fig. 1). It operated the largest VEC in the West Bank serving over 1200 meters until it was dissolved in early 1985.

When it was operating the VEC's LV lines extended beyond 3 km to serve several village "hamlets" or extended families. Consumers on the end of these lines bitterly complained that their service was so "weak" that they could not operate common appliances. This poor service generally affected the outlying hamlet. All the VEC Board Directors were voted "at large" and these same hamlets never obtained representation on the Board. Community anger grew over this and other issues until groups were cutting each other's service entrances. After a membership meeting to resolve the issues failed, all of the directors resigned and the cooperative stopped functioning.

During the ensuing 1.5 years the cooperative facilities have remained idle. The condition of the generating plant is uncertain. Now there are over 300 small privately operated diesel units in the community. Residents are frustrated over the problems of operating and maintaining these small units and are ready to discuss other arrangements to obtain electric service.

It is assumed that the electric facilities are still owned by the VEC or that the donor agencies have some claim to the assets.

Proposal

It is recommended that the CDP sponsor a feasibility of re-establishing the VEC. If found to be feasible the study would be used to seek financing, guide the organizing, design, and start-up of the VEC. The study would address the institutional, technical, and economic aspects of the proposed system. Institutional aspects would include the possibility of getting needed permits and authorizations, board composition, and management of the potential VEC. Technical aspects would consider the power supply options, potential load, network rehabilitation, and the cost of facilities. The economic studies would consist of an economic rate of return, revenue requirements, rates, and cash flow analyses.

The procedures and methodology used in the study would be turned over to the CDP and local counterparts so they would be able to perform future feasibility studies. Computer programs would be compatible with the CDP's hardware and software.

Period

It is estimated that two outside consultants with one professional counterpart could complete a draft study in three weeks.

Issue

If the best method to supply the proposed VEC is through a grid connection, then the CDP and the regional Cooperative Office should be ready to support

IEC-supplied distribution systems or able to identify who is willing to pay the difference in cost.

APPENDIX F -- Training Materials

The following books, publications, and bulletins will be provided to the CDP as reference and training materials under the consultancy contract.

1. ----------"Electric Set Installation," Detroit Diesel Allison, October 1980

2. ----------"Electric Set System Planning," Detroit Diesel Allison, October 1982

3. ----------"Uniform System of Accounts," REA Bulletin 181-1, U.S. Department of Agriculture, January 1, 1978

4. ----------"The Planning, Installation and Maintenance of Low-Voltage Rural Electrification Systems and Subsystems for Peace Corps Volunteers," VITA, April 1969

5. ----------"Operating Report-Power Supply Borrowers and Distribution Borrowers with Generating Facilities," REA Bulletin 108-2, U.S. Department of Agriculture, December 4, 1979

6. ----------"REA Borrowers Accounting Guide," U.S. Department of Agriculture, January 1980

7. ----------"Understanding Basic Accounting and Financial Statements for a Rural Electric Cooperative," McNair, McLemore, Middlebrooks & Co., 1986

8. ----------National Electrical Code 1984, National Fire Protection Association, 1984 edition

9. Richter, H.P. Practical Electrical Wiring: Residential, Farm and Industrial, Park Publications, Inc.

10. Kurtz, Edwin B. and Thomas M. Shoemaker. The Lineman's and Cableman's Handbook. 7th Edition, McGraw-Hill Book Company, 1986