(Newspaper "Mmegi", 7-13, September 2001)

Japan International Cooperation Agency

Energy Affairs Division, Ministry of Minerals, Energy and Water Affairs

Botswana Power Corporation

Invitation to Tender

The Botswana Government submitted an official request to the Government of Japan for the Master Plan Study on Photovoltaic (PV) Rural Electrification. Subsequently, the Scope of Work (S/W) was agreed upon between the Energy Affairs Division, Ministry of Minerals, Energy and Water Affairs (EAD) and The Japan International Cooperation Agency (JICA).

1. The Japan International Cooperation Agency JICA/JOCV Botswana Office invites sealed Tenders for the supply and installation of equipment for the PV Dissemination Project in the selected 3 villages for the Master Plan Study on PV Rural Electrification in accordance with the S/W.

2. EAD will coordinate and supervise the Project implementation.

3. Botswana Power Corporation (BPC) will be designated to supervise the works for the Project.

4. Tender documents are available after 10:00 hours on September 7, 2001 from the JICA Botswana Office at the address indicated below.

5. Each tenderer shall have the following qualifications:

   1) To be a PV contractor, established and registered in Botswana under the laws of Botswana. Consortium formation by up to 3 PV contractors will be acceptable.

   2) To have sufficient experience for the past five (5) years in design, supply and installation of at least fifty (50) PV sets in total of PV systems (50 Wp or larger systems).

6. Sealed Tenders shall be submitted to the JICA Botswana Office at the address indicated below by 16:00 hours (Botswana Standard Time) on September 28, 2001. The sealed Tenders only of certificates, etc. and the technical tenders (Envelope "A" and "C") so received will be opened in the presence of the duly authorized representative of JICA, EAD and BPC at the above mentioned place immediately after 16:00 hours (Botswana Standard Time) on September 28, 2001. (Envelope "B" Commercial tenders) will be opened for those who have fulfilled technical evaluation in the presence of EAD, BPC and the relevant tenderers.

The Japan International Cooperation Agency
JICA/JOCV Botswana Office
Plots 896/7 Kaunda Road, Gaborone
Private Bag 00369, Gaborone, BOTSWANA
(Telephone No. +678-267-312176)

1. Program Management

1.1 Revenue Collection

(1) Realization of predicted revenue streams requires active and effective collection processes.

Historically, remote and rural electrification collection practices have proven inadequate. This one factor can lead more quickly than any other to the failure of rural electric utilities, whether they use conventional or renewable energy technologies.

(2) Establish collection cycles in consultation with the local community.

Frequency of payment is best established in conjunction with community and local experts. Income in local communities is often tied to the land and harvests. Timely collection may be achieved in communities by making it possible to reduce the number of payments to meet the availability of income. Such real world accommodations have helped consumers develop regular payment habits lessening the possibility of default. Pre-payment meters are installed in users' PV systems. The agent should be prepared so that people can buy tokens whenever they can pay and utilize them to accumulate usable dates.

(3) System Removal Policy

The objective of the system removal policy is to collect delinquent payments, not to punish consumers.

Establish procedures for nonpayment.

Although pre-payment meter is installed for each consumer, system removal policy is required. Consumers are requested to continue to pay fixed fee-for-service agreed upon with ESCO buying token for pre-payment meter, regardless they use the PV systems or not. The systems are owned by ESCO and fee-for-service is require for ESCO to operate the project. In order to ensure the payment and to prepare costs for repair or substitute the parts of system due to misuse by users, deposit of 3 month fee is requested. When consumers are unable to pay their tokens for next month's use, service may need to be removed. At such times, clear standards and procedures for system removal are essential to minimize or prevent political interference. An

individual's status in the community can affect the collector's willingness to penalize that individual for not meeting his financial obligation. Such practices undermine the integrity of the remote and rural electrification effort and shift the financial burden to consumers in good standing.

The objective of the system removal policy is to collect delinquent payments, not to punish consumers. The swiftness and severity of the system removal process should be determined by local leadership. Delay in initiating collection enforcement may be misinterpreted as a lack of seriousness of the payment requirement. Furthermore, delay allows past debt to build, and may result in debt accumulation to such a degree that repayment is impossible.

Prudent management suggests that a system removal process begin as soon as payment is more than one payment period past due (*i.e.,* if paying on a monthly basis, when one payment is more than 30 days past due). In such a case, the consumer cannot utilize electricity, but system removal process start a staged process affording adequate notice to the delinquent consumer. The process begins with a warning which include one month fee deduction from the deposit.

A second warning includes further one month deduction from the deposit.

A third warning may result in removal of the PV panel and no refund for the deposit will be paid for system removal.

(4) Flow Charts for handling Procedures

1) Detailed procedures in case of non-payment of deposit money and monthly payment

a) Flow Chart for Handling of Deposit Money

Deposit money was collected to prepare costs for repair or substitution and to ensure monthly payment. Figure 1.1-1 shows how to handle deposit money and system removal in various cases. End-users who paid deposit money are given one month free charge token and after expiration of the free use period, they shall pay monthly fee continuously. In case non-payment of monthly fee payment, non-paid amount is deducted from his deposit and in the event deposit becomes zero, removal procedure of system starts.

Flow Chart for Handling of Deposit Money

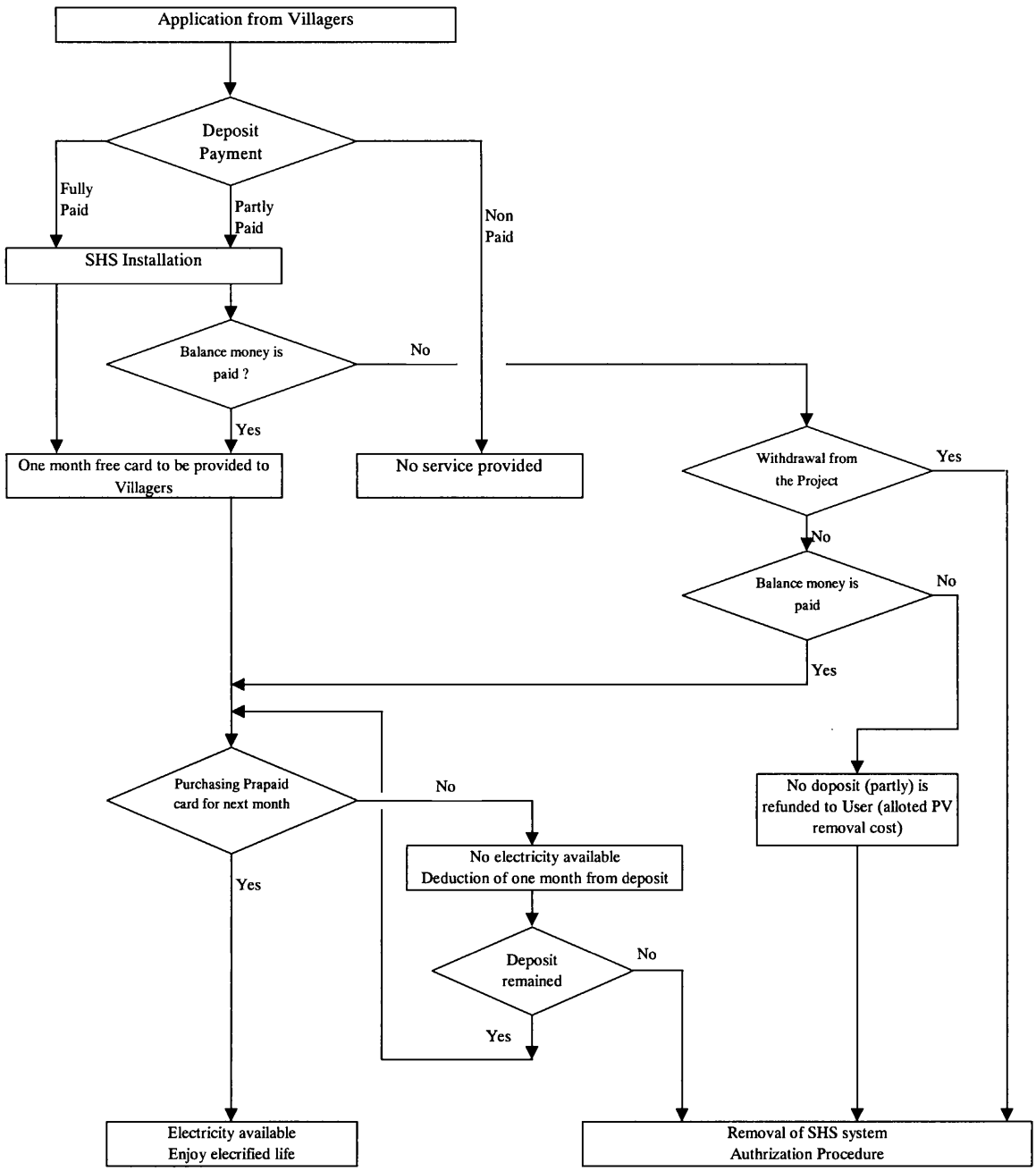


Figure 1.1-1 Flow Chart for Handling of Deposit Money

b) System removal procedure

In case removal of system is required, the procedure shown in Figure 1.1-2 should be followed.

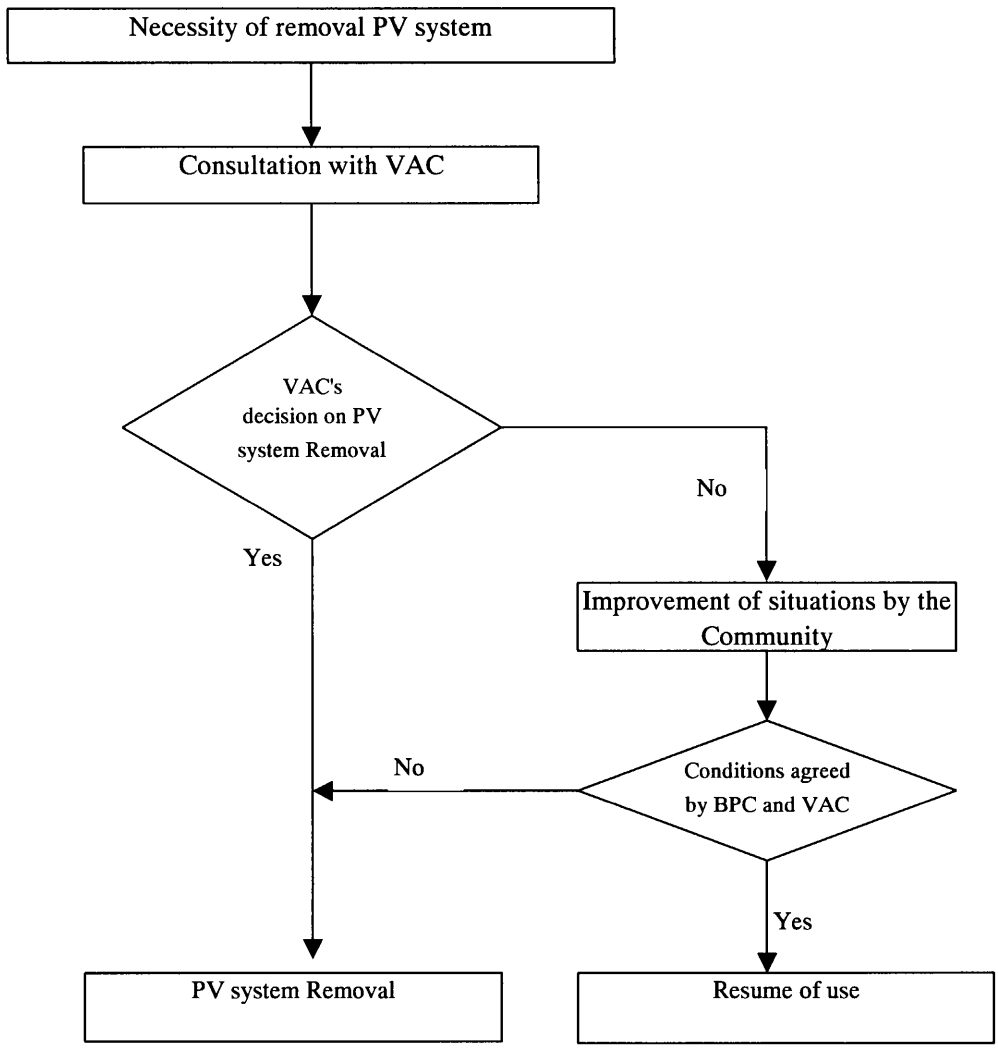


Figure 1.1-2 Flow Chart for Authorization of PV System Removal

c) Cancellation of End-user Contract

In case end-user intend to cancel to use PV system, the following procedures should be followed as shown in Figure 1.1-3.

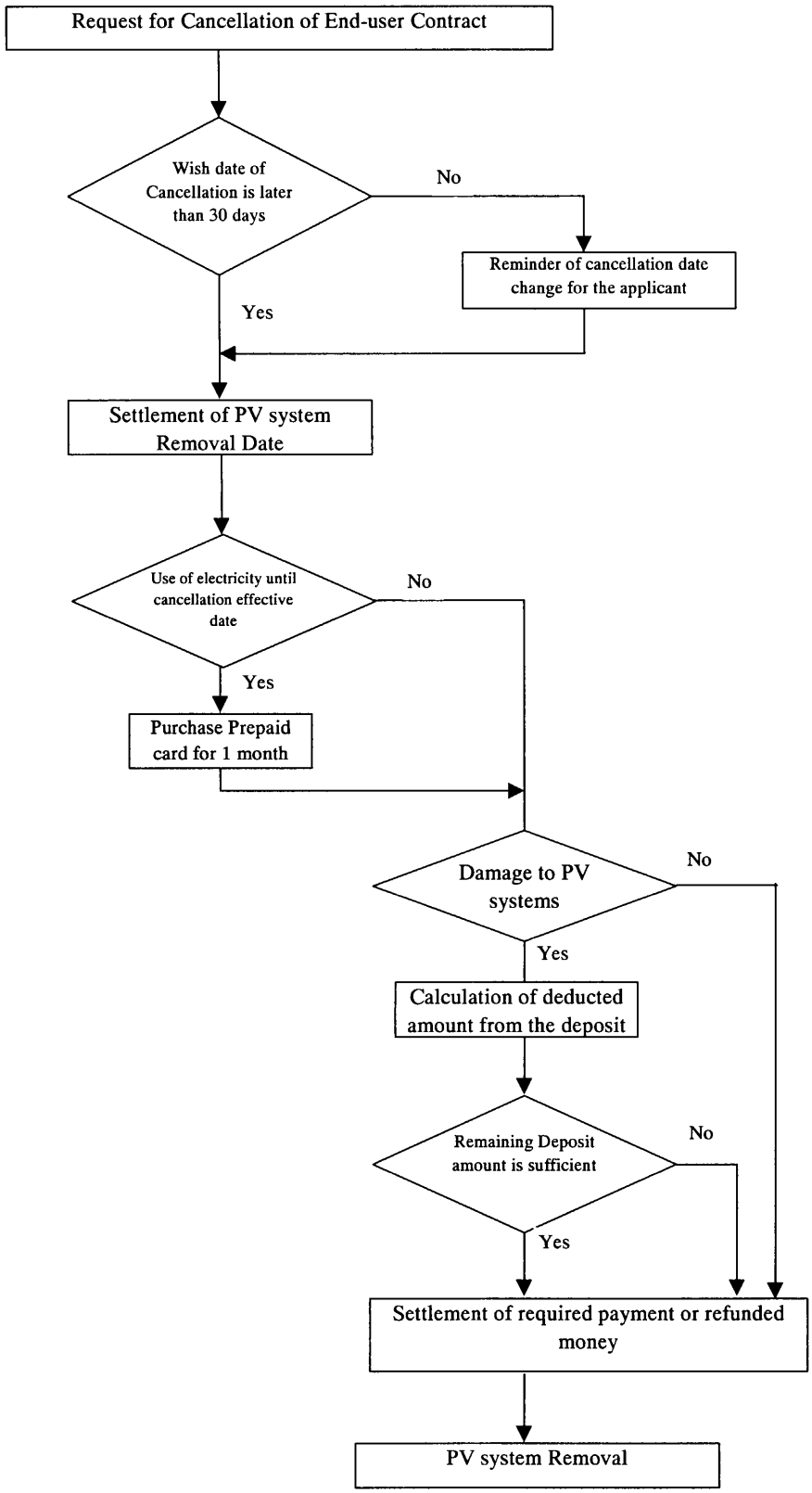


Figure 1.1-3 Flow Chart for Cancellation of End-user Contract

d) Detailed Operation Procedure on Deposit Money in case of arrear and cancellation

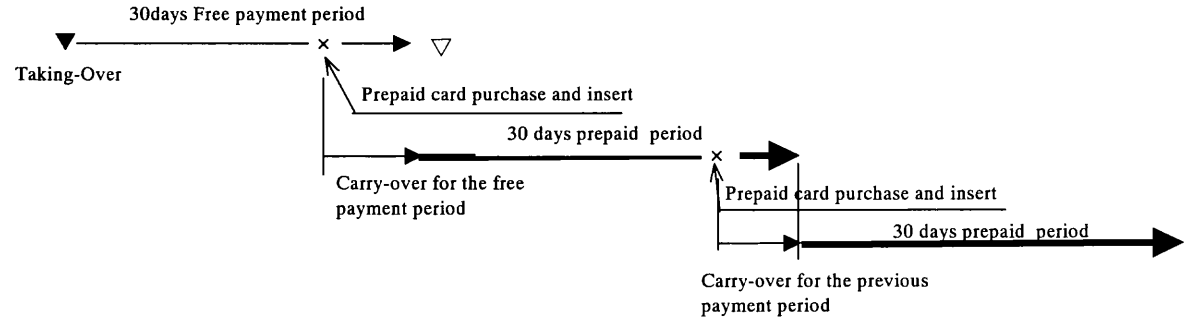
Detailed operation procedures in case of arrear and cancellation are shown in Figure 1.1-4, for SHS users case A to Case E and for battery charge station users form Case F to Case H.

The concept of free payment period for SHS users is shown the following Figure 1.1-4-5.

1. SHS User

Case A
(Good users)

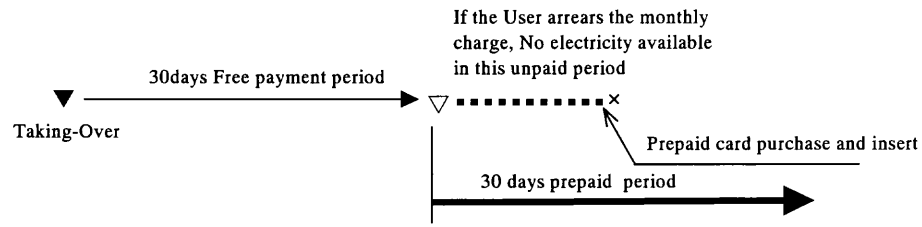
Monthly Charge



Deposit Money

Case B
(Users paid late)

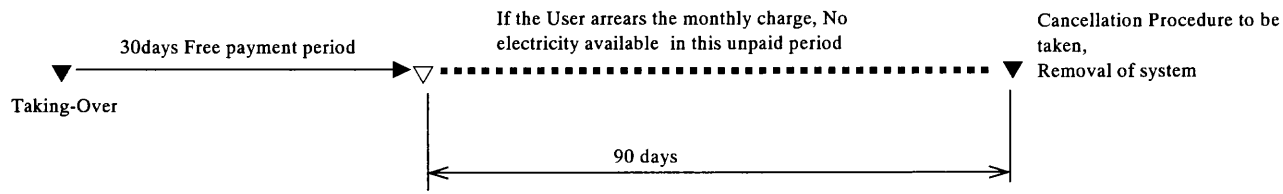
Monthly Charge



Deposit Money

Case C
(Users unpaid for 3 months)

Monthly Charge



Deposit Money

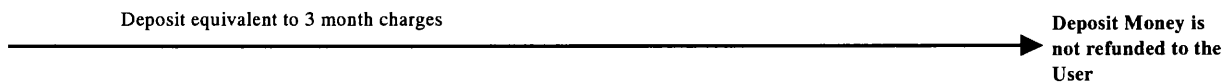
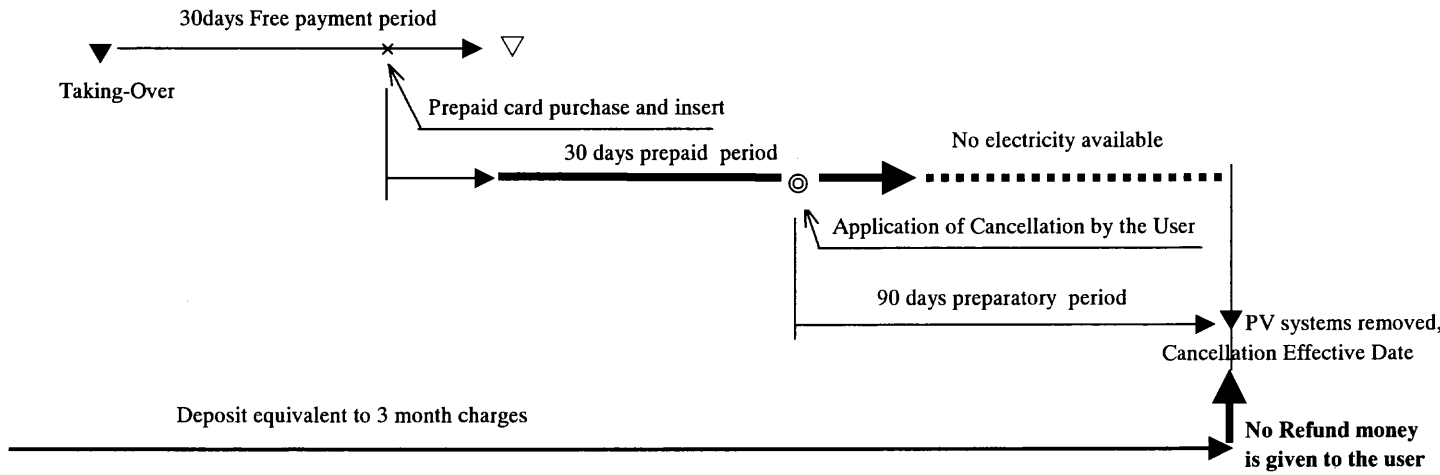


Figure 1.1-4-1 Operation Procedure on Deposit Money in case of arrears and cancellation from the Users

Case D-1
(Users who wants to cancell)
Monthly Charge



Case D-2
(Users who wants to cancell)
Monthly Charge

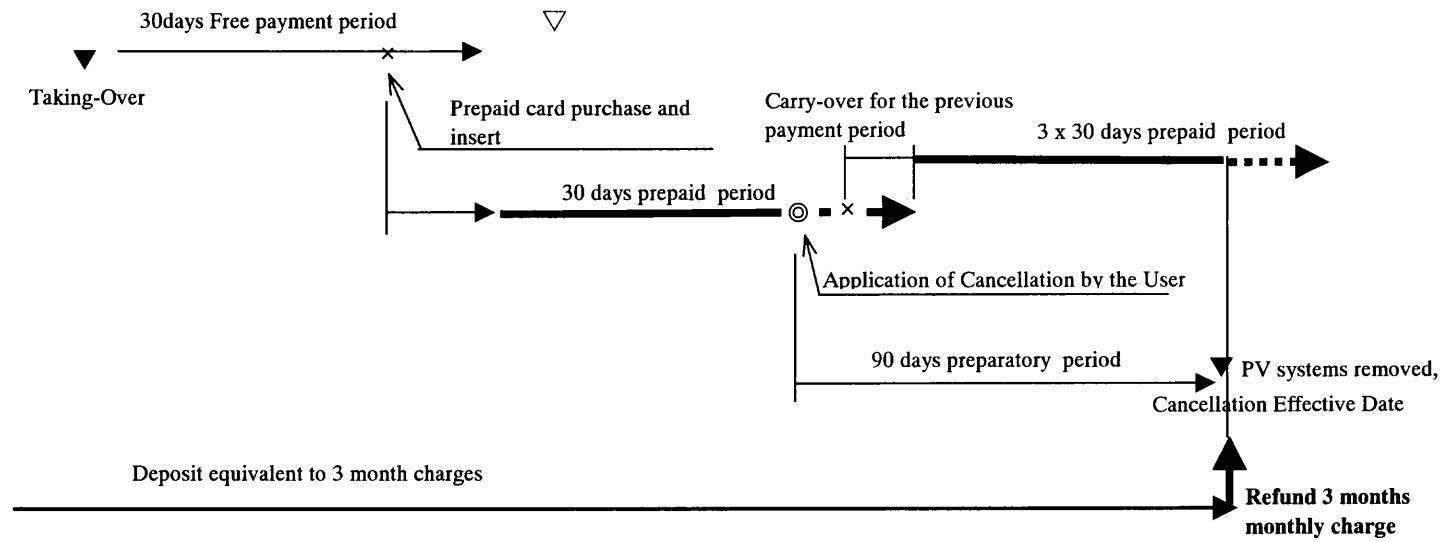


Figure 1.1-4-2 Operation Procedure on Deposit Money in case of arrears and cancellation from the Users

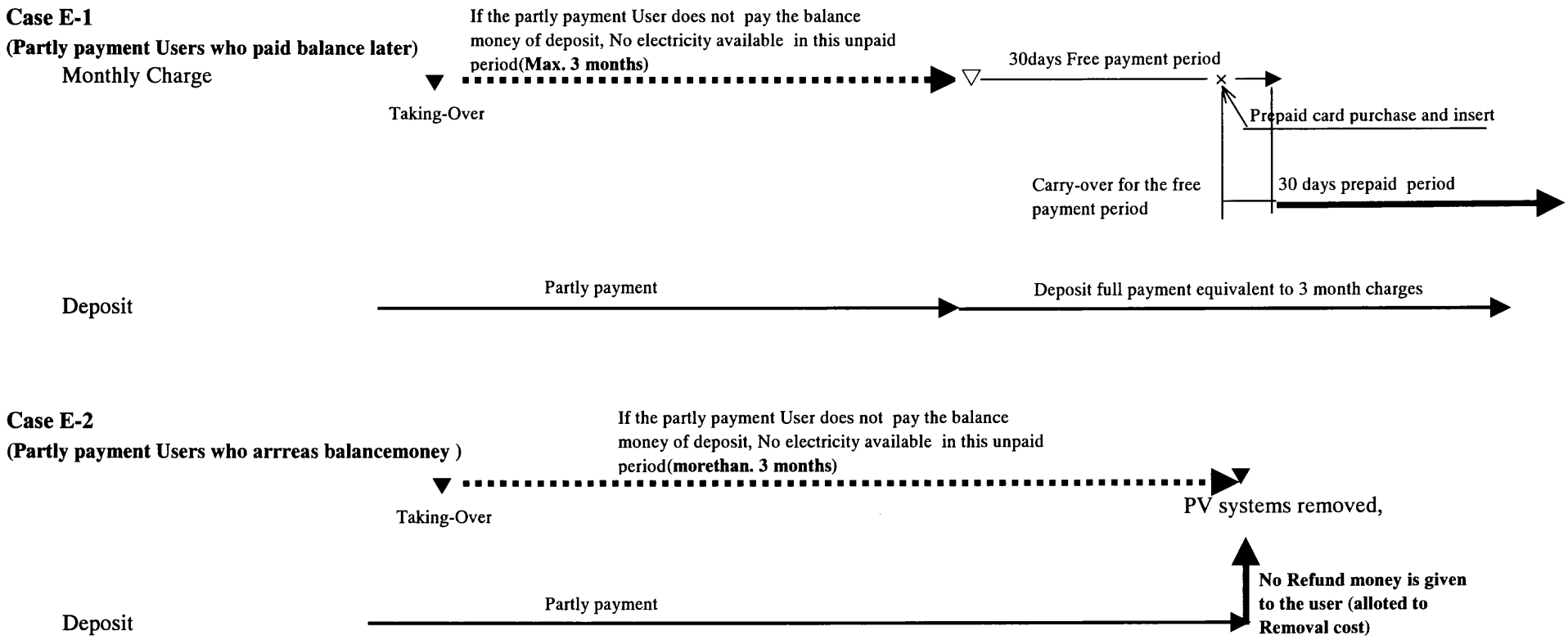
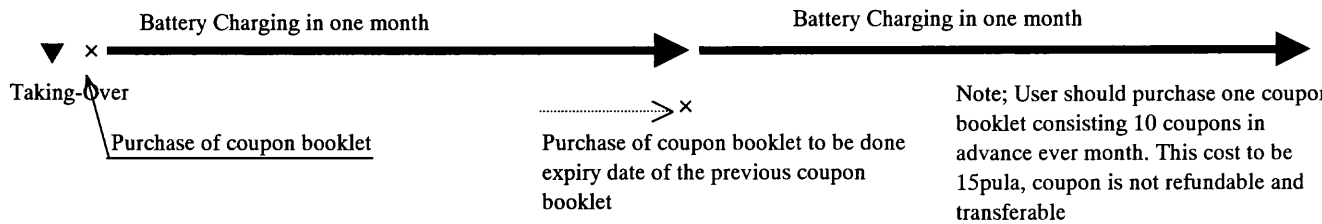


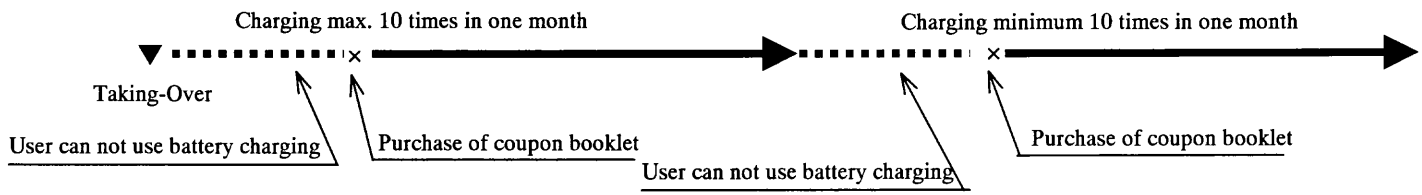
Figure 1.1-4-3 Operation Procedure on Deposit Money in case of arrears and cancellation from the Users

2.Battery User

Case F
(Good User)



Case G
(User who purchases coupon later)



Case H
(User unpaid for 1month)

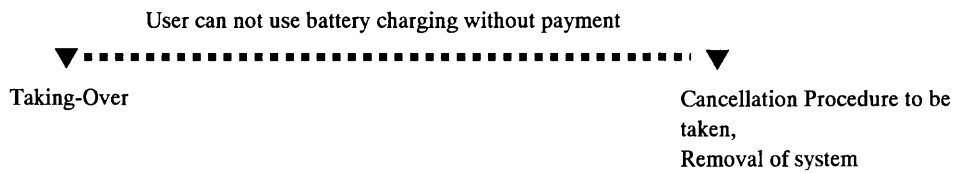
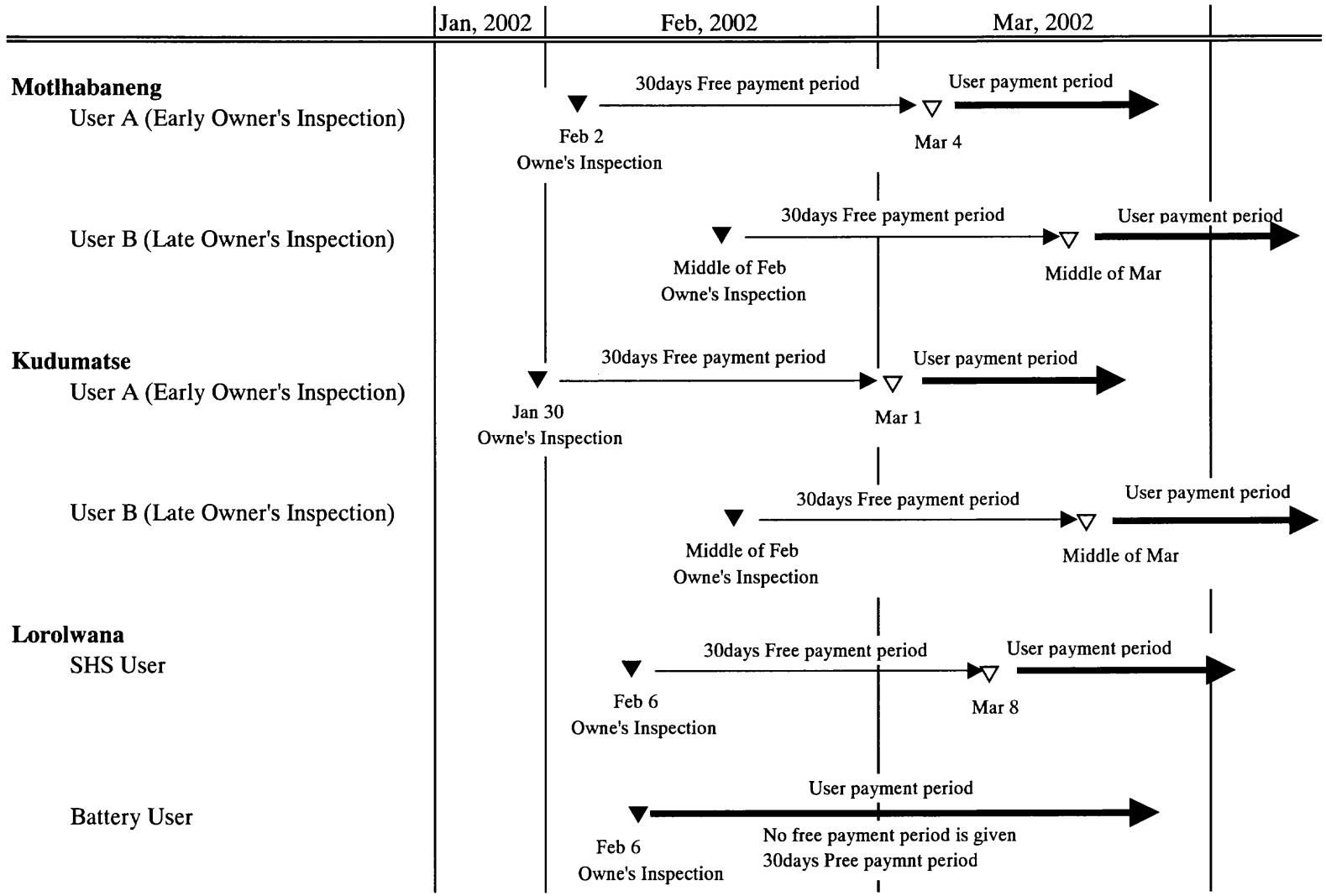


Figure 1.1-4-4 Operation Procedure on Deposit Money in case of arrears and cancellation from the Users



Note: Price of coupon booklet is 15pula consisting 10 coupons, however price for the first month(Feb, 2002) to be 10Pula at the same conditions, taking into account that the users can start this project from Feb 6

Figure 1.1-4-5 Concept of Free Payment Period for SHS Users and Battery Users in conjunction with Owner's Inspection date

e) Operation of Battery Charge Station

Operation of battery charge station is schematically shown in Figure 1.1-5.

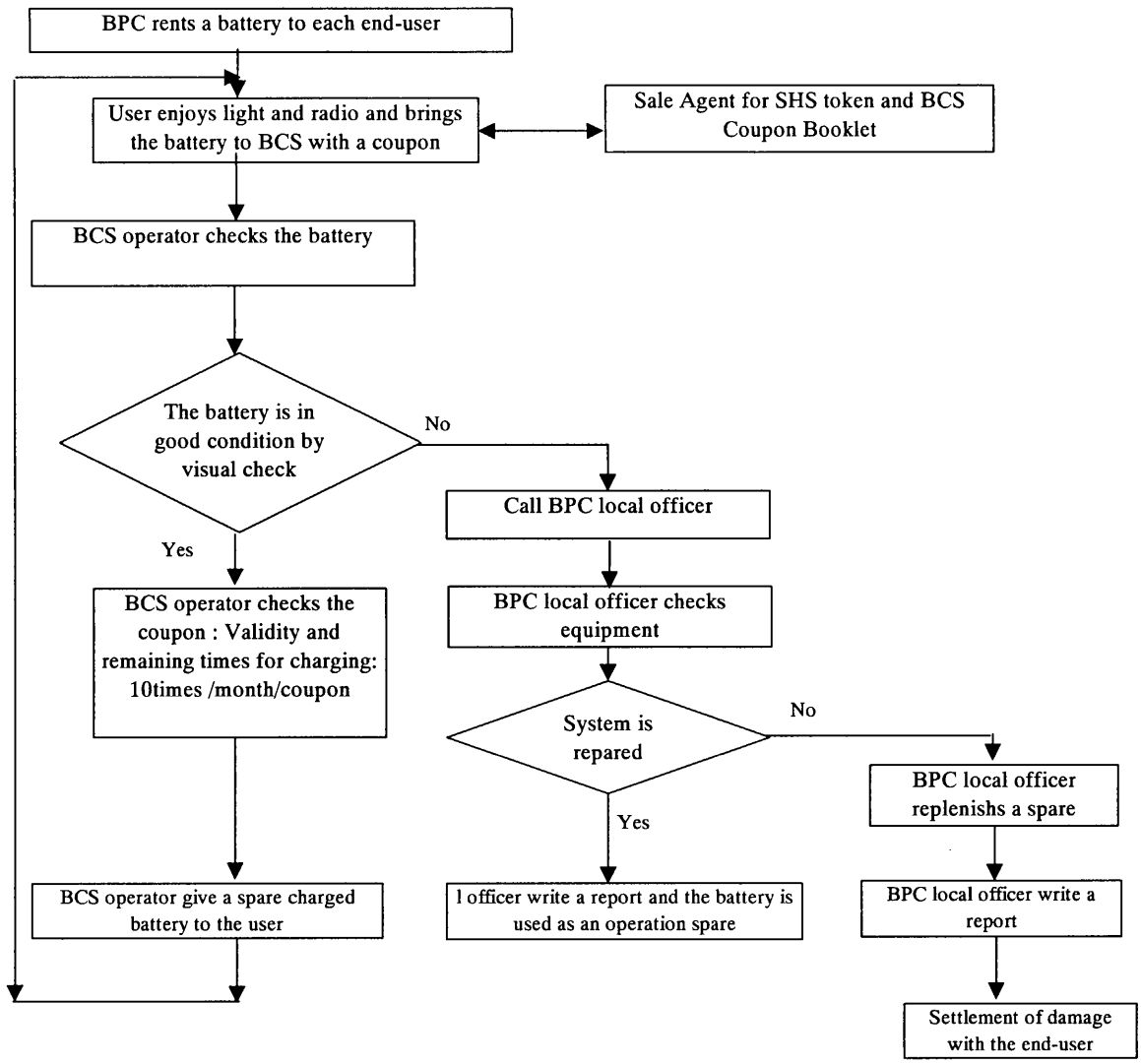


Figure 1.1-5 Operation of Battery Charge Station

1.2 Accountability

1.2.1 General Rrequirement

"Accountability" means that the managers of a project who have the day-to-day, decision-making authority also have the responsibility to be answerable for their actions. Being "answerable" in this context means not merely in the sense of preparing statements concerning the assets, liabilities and operating results of the

project, but also in the sense of being responsible for obtaining the objectives established for the project. The effectiveness of any accountability system depends on both the local managers and their reporting supervisors having a clear understanding of, and agreement on, the objectives established for a project. Commercial businesses have learned that objectives established at the operating level are more often achieved than objectives mandated from above. The same lesson is applicable in remote and rural electrification projects.

Communicating on-going results is essential to effective monitoring.

Regularized reporting forces the operating level to collect and assimilate results on an on-going basis and allows early course-correction by both operators and supervisors. Achieving such on-going communication may require overcoming numerous hurdles. Many local groups and villages have little experience with record keeping and little time or incentive to maintain extensive records. In many isolated areas, literacy deficiencies and lack of writing skills are a fact of life. Mail, telephone and telegraph may be slow or non-existent. An over-zealous bureaucracy can impose unrealistic and burdensome demands on the resources of a manager in a remote area. By limiting the number of reporting requirements, greater accuracy can be expected of the reports delivered. For example, if managers require only an original of a report, rather than duplicates or copies in even greater multiples, limited local resources will not be overtaxed. Effective monitoring is equally essential. Communicating is a two-way exercise. Furthermore, an unanswered or unacknowledged report is a lost opportunity to encourage success or provide guidance.

The challenge to the policy strategist is to identify the minimum information required to ensure accountability and to devise mechanisms for its accurate dissemination. Such minimum information requirements may include:

- general financial and operating information;
- account delinquency rates;
- system performance measures; and
- customer satisfaction measures.

How may ESCO establish sound local administration?

Knowing who has paid and who has not paid their bills is the primary function of a rural electricity record-keeping system. No organization can survive without an accurate picture of its finances, yet this is often the case in remote and rural electrification installations. Local communities often are not familiar with record keeping techniques. Since many have never been required to make regular payments of any type, they have no knowledge of what is required to track those

payments. National, state or local governments usually must exercise primary responsibility to provide the training, infrastructure and oversight of the records management process. This process requires creating uniform procedures and forms and then mandating their use.

Sound practice suggests centralized record keeping, and institutionalizing the payment of bills by individuals.

Without centralization, payment information can be easily lost or neglected. If payments are made collectively (*i.e.,* by a neighborhood or village in a cooperative) it may be administratively unwieldy, if not impossible, to determine who within that village has actually paid. As a check to the collection process, it is good practice to provide consumers with receipts for their payments which they should be instructed to keep and, in case of disputes, use as proof of payment.

The challenge is to identify the minimum information required to ensure accountability and to devise mechanisms for its accurate dissemination.

Maintenance plans may be created with the assistance of the vendor and product manufacturer and tailored to the specific circumstances and means of a project site.

Regular audits ensure adherence to policies and procedures.

Regular audits of the records ensure that the policies and procedures are being met. Without oversight, there is little incentive on the part of local communities to comply with records management requirements.

1.2.2 Monitoring

Monitoring during the Dissemination Project shall be conducted in accordance with the Table 1.2-1 Monitoring Items.

Item No.	Monitoring items		to be done by	Frequency
	Categories	Monitoring Items		
1	Demand sector	No. of arrears and its reasons	BPC	every month
2		No. of cancellations and its reasons	BPC	every month
3		Client satisfaction on using PV	Study Team	6th, 7th Survey
4		Change in requirement for system size	Study Team	6th, 7th Survey
5		User claims	BPC	every month
6		Additional No. of households willing to pay for PV	Study Team	6th, 7th Survey
7		Situation of community participation and their opinions	Study Team	6th, 7th Survey
8		Existence of a project champion in community	Study Team	6th, 7th Survey
9		Level of knowledge improvement about PV in users	Study Team	6th, 7th Survey
10		No. of systems stolen and its reasons	BPC	every month
11	Supply sector	Situations of revenue collection	BPC	every month
12		Situations of procedures for non-payment	BPC	every month
13		Situations of accountability, record keeping	BPC	every month
14		Maintenance requirement	BPC	every month
15		Performance and quality of maintenance	BPC	every month
16		Trouble shooting of installed equipment	BPC	every month
17	Institutional Framework	Performance of project management committee	Study Team	6th, 7th Survey
18		Performance of BPC's central management	Study Team	6th, 7th Survey
19		Performance of BPC's local service setup	Study Team	6th, 7th Survey
20		Performance of VAC's and local authority's activities	Study Team	6th, 7th Survey
21		Effectiveness of information and communication	Study Team	6th, 7th Survey
22	Manpower development	Effectiveness of local staff training	Study Team	6th, 7th Survey
23		Effectiveness of first-line maintenance training	Study Team	6th, 7th Survey
24		Effectiveness of user training	Study Team	6th, 7th Survey
25	Technical	Adequacy of system design (sizing, equipment combination, etc.)	Study Team	6th, 7th Survey
26		Adequacy of equipment installed (quality standards, vendor service)	Study Team	6th, 7th Survey
27		Quality of system installation including wiring	Study Team	6th, 7th Survey
28		Environmental considerations (Method of disposal of used batteries)	Study Team	6th, 7th Survey
29		Theft prevention (Prevention built-in through design, manner of	Study Team	6th, 7th Survey
30		Maintenance and management (Measures for use at time of breakdown; method of periodic check-up)	Study Team	6th, 7th Survey
31	Financial	Entry and Account	BPC	every month
32		(1) Entry of daily income and monthly total.	BPC	
33		(2) Entry of daily expenses and monthly total.	BPC	
34		(3) Calculation of monthly salaries and wages.	BPC	
35		(4) Calculation of administration and other operating expenses.	BPC	
36		Preparation of Financial Statements: For the month when monitoring will end, prepare Financial Statements including the	BPC	every 6 month
37		(1) Income Statement	BPC	
38		(2) Balance Sheet	BPC	
39		(3) Cash Flow Statements	BPC	
40		(4) Notes to the Financial Statements	BPC	

Table 1.2-1 Monitoring Items

1.3 Maintenance

1.3.1 General Requirement

How may ESCO provide for adequate maintenance?

Although PV technologies require less maintenance than conventional forms of electricity generation, they are not immune to equipment or parts failure. Ensuring

reliable electricity supply is key to customer satisfaction and, ultimately, to the success of a rural electrification effort.

Preventative maintenance and tracking records minimize system failure.

A preventative maintenance and testing program is the best method for minimizing system failures and maintaining a reliable supply. Maintenance plans may be created with the assistance of the vendor and product manufacturer and tailored to the specific circumstances and means of a project site. Preventative maintenance programs will reduce the number of system failures, but they can not eliminate them entirely. A standardized record system for tracking maintenance and repair records is also an essential part of such a maintenance plan, thus a repair and replacement program will be required.

Maintenance plans begin with the consumer.

Consumers are closest to the individual units and can be trained to spot minor problems before they become too severe. Additionally, consumers can be instructed in basic maintenance of their systems - keeping them dean, lubricated, etc. As an incentive to follow a maintenance regime, consumers may be offered a small discount for their efforts. Such programs can significantly extend the life of installed systems and favorably impact both the financial and social bottom line.

Test prior to installation.

Test to identify equipment problems before installation. Testing programs can be as simple as a visual check for obvious unit defects or component-based testing with appropriate testing equipment.

Formal maintenance programs are essential to sustainable programs.

A formal maintenance program with supporting infrastructure is essential to a sustainable program. Such a formal maintenance program includes:

- a job request system for initiating and tracking service orders;
- access to system manuals, training programs, and testing and diagnostic equipment;
- ready access to spare parts and replacement equipment;
- access to maintenance and repair records; and
- a mechanism for evaluating the success and longevity of repairs.

1.3.2 Maintenance

(1) Maintenance Report Route

Maintenance in the villages shall be done as schematically shown in Figure 1.3-1.

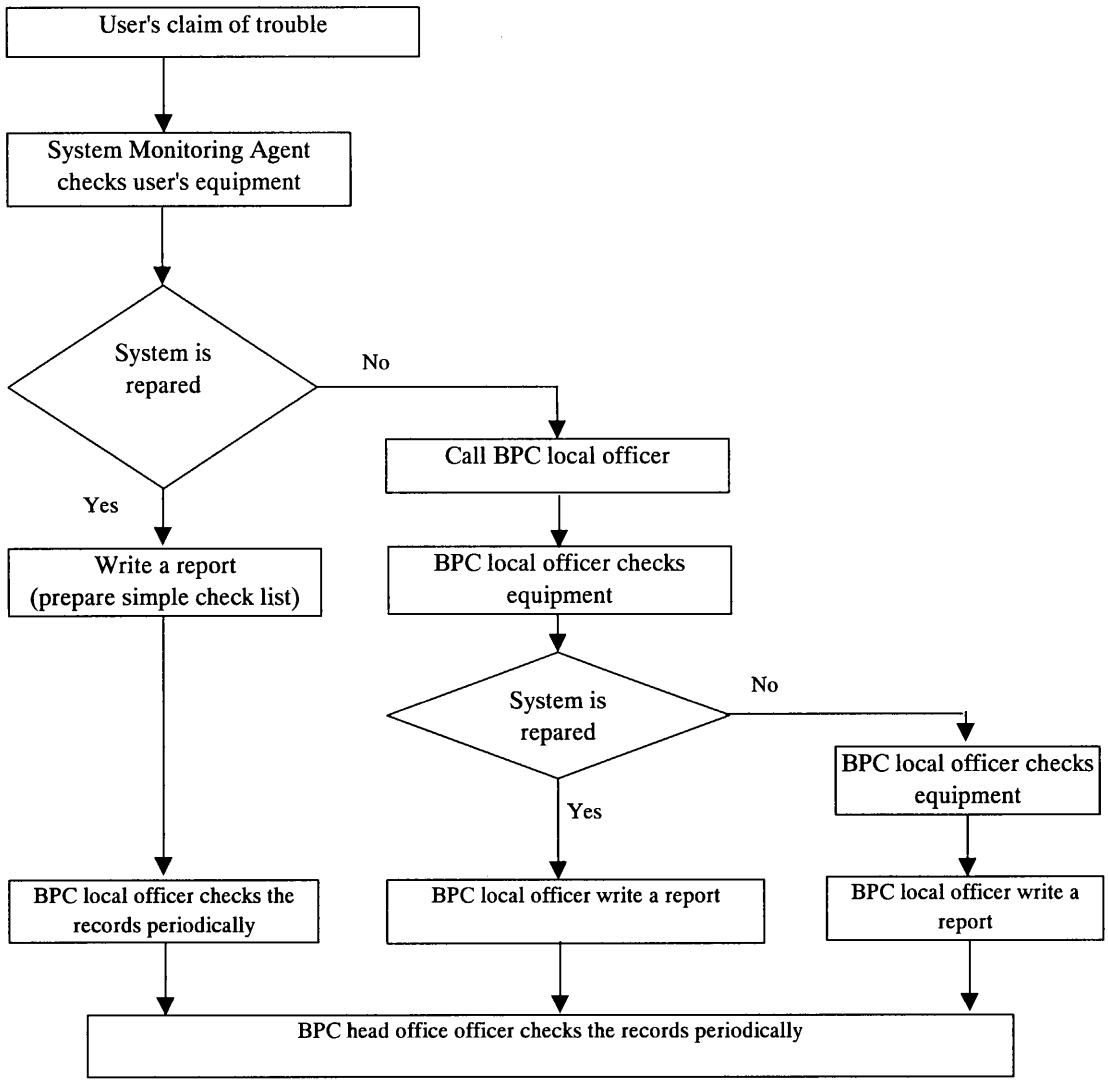


Figure 1.3-1 Maintenance Report Route

(2) Spare Parts Control and Management

JICA hands over BPC spare parts for PV systems including battery charge station. BPC shall control and manage them, storing the in BPC's appropriate warehouses.

1.4 Record Keeping

All project information should be kept recording. For the Dissemination Project the database was proposed by JICA Study Team based on the Microsoft Access. The manual for record keeping using the software is attached as Appendix Document 15.6-1-2.

2. SOCIAL FACTORS

2.1 Community Involvement

Development of rural and remote electrification projects requires a major level of community involvement

In the past, those projects with a high level of community involvement - consensus, support, and participation - have been the ones which have proven the most successful.

Community participation creates ownership, and ownership leads to success.

Even the best crafted energy plan and the best funded rural electrification project ultimately may be frustrated if the local community is not brought fully into the process. Urban programs or experiences can not be easily replicated in a remote and rural setting. The dynamics and reference points are just too different. Local community members are in the best position to assess their willingness to support electrification efforts and to choose the best options for generation once those options have been explained to them. Participation creates ownership, and ownership leads to success.

Local village structures and interpersonal relationships are complex and involved. Remote villages are microcosms of a country, and like a country, are made up of many groups and subgroups, often acting at odds with one another. But villages are more sensitive than large population centers to small disruptive elements. Policy planners seeking electrification for remote areas have found that by enlisting the involvement and support of groups and sub-groups within villages, they can better ensure that such electrification programs are perceived as equitable and are not resisted as favoring one group over another.

From the private-sector perspective, ***local ownership,*** **a** ***project champion,*** and ***affordability*** are key issues:

Focus on projects with a high level of community involvement.

• ***Requirement of local ownership.*** Local ownership is important for project sustainability; and provides a link between the project and the community. It increases the communication between the villagers and project developers and allows a project to be seen as more of a local response to local needs than a government-imposed, top-down development.

• ***Need for a project champion.*** Related to the local ownership issue is the identification of a project champion. A project champion is someone who lives in the village (such as the acknowledged leader of the community) and who actively

supports the project. This person could also be the owner or the operator (or both) of the system. They would be available on a day-to-day basis for the interface (social and technical) that is required for village power projects.

• ***Need to match local needs while assuring affordability.*** Matching local needs to project development and design is important. For example, projects based on an economic agenda (*i.e.,* few grants or subsidies included in the financing) should ensure that services offered correspond to the local ability to pay.

Local ownership, a project champion and affordability builds a high level of community involvement. Community involvement entails consensus, support and participation - necessary elements found in the great majority of successful electrification programs.

On what basis may governments select areas for electrification?

Define the criteria for participation in an electrification program.

Frequently, a nation cannot electrify its rural areas all at once, so some method of selection and prioritization must be decided upon. Selection of villages or households for electrification can be a highly politicized process. Choosing who receives access to electricity and who does not confers a lot of power on the individual making that decision. Without a clearly defined plan and criteria for participation, electrification can become a tool of political patronage, leading to discontent and inefficient distribution of product. Criteria may properly reflect the ability to pay as well as the need and appropriateness of the area for installation or connection.

Depoliticize the selection process.

Enlist the involvement and support of groups and sub-groups within villages to ensure that electrification programs are perceived as equitable and are not resisted as favoring one group over another.

Selecting communities to receive electricity has often been a highly politicized process. With privatization of state-owned systems, central planning is becoming a thing of the past. Universal electrification, however, may be one area in which integrated resource planning remains a valid government tool. Otherwise, particularly if the State continues to be involved in co-financing projects, the decision errors of the past could be repeated in the future. To safeguard against these tendencies, either integrated resource planning or some alternative, pragmatic methods of planning seem prerequisite to a national universal electrification program. At a minimum, such planning should incorporate criteria such as the needs of communities, costs and benefits, productive uses and the environment.

Establish an objective review board.

The selection process requires more than merely establishing standards; it requires the establishment of an impartial review board to apply those standards. The most effective review boards are ones that represent a cross-section of the community, not just one faction or class. Diversity of representation however, should fit the cultural requirements of the local community and seek to support (not supplant) the local governing structure. The board should be provided with the necessary training and support to execute their responsibilities and should develop models for resolving disputes. In cases where the demand for access outweighs supply, a lottery system for qualified applicants may be an effective method for choosing recipients.

3 INFORMATION AND IMPLEMENTATION

3.1 Education and Training

Education and training make remote and rural electrification possible. Once the project manager formulates the objectives of such an educational and training program, the policy implementer will establish an educational and training plan that enables these objectives to be met.

In a universal electrification program, ***"education"*** implies imparting information sufficient to allow rational decision making, and ***"training"*** implies instructing the recipient how to perform a specific task. ***"Demand-side management"*** - the planning implementation and monitoring of utility activities designed to influence customer use of electricity in ways that will produce desired changes in a utility's load shape - is related to training but is a little different and includes the perception of the local communities about the project.

Electrification is an information and knowledge-driven process.

Electrification is an information and knowledge-driven process, from the establishment of policy to the day-to-day operation of generation equipment. Project manager will become familiar with the capabilities and operational requirements of different renewable technologies, comprehend the vagaries and nuances of national energy law and policy, and master basic financial analysis and administration techniques. This basic knowledge is equally important to local governments, local developers, and consumers.

Decision makers in countries with large populations without electricity may not have access to accurate information on the appropriateness of various generation

options. Often they have no information either regarding user willingness and ability to pay or the local availability of renewable natural resources. In such an environment, policies and planning tend to be politically based rather than prioritized on an economic or financial rationale.

Communicate realistic expectations of electricity availability and project performance to users before project implementation. Education is a two-way communication.

At the national level, planners are often unaware of the potential for the utilization of the PV, wind, biomass, mini-hydro and geothermal technologies. They may also be unaware of the existence of these technologies as viable options to meet the basic electricity needs of isolated communities and to assist in reducing CO_2 emission. Such unawareness results in these technologies being left out of the energy planning process. Consequently, policy strategists need to act not only to promote awareness of the potential for utilizing such technologies, but to assist, wherever possible, with their integration in the sectoral-planning process.

Education is a two-way communication.

The project developer must become aware of the needs of the community and the community must learn about the project and take part in its development. It is important that realistic expectations of electricity availability and project performance are communicated to users before project implementation. For this knowledge to be properly communicated, training programs must be infused into every aspect of the process.

Once the decision to electrify is made, the training process begins.

Training is a key social issue. The policy planner responsible for ensuring that everyone associated with a project becomes familiar with their particular responsibilities and obligations will need to identify the whole spectrum of potential trainees and establish the objectives for each trainee group: **administrators, technicians,** and **consumers.**

- ***Administrators*** ***(system owners and operators)*** - Train to understand and apply the rules for selecting participant households, for collecting and recording payments, for dealing with delinquent accounts, and for communicating with consumers and regulators.
- ***Technicians*** ***(maintenance people)*** - Train to install and maintain the generation systems, to diagnose and repair problems and to respond to customer requests in a courteous and timely manner.
- ***Consumers*** - Train to use electricity efficiently and train to operate and perform the basic upkeep on their systems.

Infuse training programs into every aspect of the process.

Establish, test and recognize proficiency levels.

Regular skill and competency testing, especially of technicians, allows project managers both to evaluate the general effectiveness of training programs and to provide a reasonable degree of quality control. A certification program for technicians can be useful for ensuring a minimum degree of competency and improving work quality. Certification confers status on the individual and can improve productivity and encourage compliance.

A sound training program is both stable and dynamic.

Economies of scale as well as elementary management requirements usually dictate the standardization of educational and training programs for electrification. Standardization does not, however, mean that these programs are frozen or immutable. Since the training requirements will be on-going, training programs will evolve to reflect changing circumstances. Consequently, these on-going training programs should be flexible and adaptive to meet the changing needs and patterns of the community.

Educate local communities on the benefits of electrification.

In an education program designed to explain the practical applications of electricity (how it can be used efficiently) and the financial implications and obligations of each household, adult students learn not only about electricity but also about what it means to be a consumer.

Consider gender issues, cultural practices and local customs.

Sensitivity to gender issues, cultural practices and local customs ensure that educational and training efforts target the proper individuals. For example, in many countries, household tasks ripe for electrification (including illumination) may be the responsibility of women. In this instance, instruction targeted at male consumers may prove ineffective.

Educate local communities on the benefits of electrification and familiarize communities with generation options.

Familiarize communities with generation options.

Few communities or individuals will opt for a technology about which they know little. An informed choice requires information. An education program which introduces local communities to the different generation technologies and promotes a unbiased discussion of the advantages and disadvantages of each technology: (*i.e.,* costs, reliability, maintenance, output, resource requirements) allows those local communities to make sound decisions. A community which is

knowledgeable about generation options can participate in choosing the most appropriate technology for their location and situation.

Energy strategists should be alert to identify misconceptions that serve as a deterrent to facilitating the utilization of renewable energy systems. For example, planners in many developing countries still mention the high investment cost of PV compared to diesel generators, instead of comparing these two technologies on a life-cycle costing basis. In this example, were the planner to consider both life-cycle costing and undistorted (unsubsidized) conventional fuel prices, PV systems would compete on an equal economic footing with diesel generators in view of the minimal maintenance needed for upkeep; the lack of fuel requirements for electricity generation and the positive impacts created on the environment.

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