DEMT - DISTRIBUTED ENERGY MANAGEMENT TOOLS IN CAMBODIA AND LAOS

IED	ELECTRICITE DU CAMBODGE		**MIH** Lao PDR	**Power Dev**

Supported by the ACE through the EC – ASEAN Energy Facility

ASEAN CENTRE FOR ENERGY - ACE

Distributed Energy Management Tools (DEMT Project) for Cambodia and Lao PDR

Specification of Stakeholder Requirements for PESCO Management Tool

August 2005

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1. Introduction

The Distributed Energy: Operational Management Tools in Cambodia and Laos (DEMT) Project is funded by the European-ASEAN Energy Facility (EAEF) and is being implemented by:

a) Innovation Energie Developpement (IED);

b) Ministry of Industry, Mines and Energy (MIME) in Cambodia

c) Electricite du Cambodge (EDC); and

d) Ministry of Industry and Handicrafts (MIH) in Lao PDR.

This project was launched in May 2005 and is scheduled to conclude in May 2006. The main objective of the project is to help improve access to quality and reliable energy services to rural populations, by:

a) providing Laos and Cambodia with tailor made software tools to ensure the sustainable operations of local mini grids and / or renewable energy systems.
b) ensuring the long term sustainable operation (technical and managerial) of distributed renewable energy systems outside the main grid in Laos and Cambodia – hence increasing their penetration rate and acceptance;
c) increasing the efficiency of distributed energy systems (technical and managerial) through loss reduction (technical and non technical), improved maintenance and operation thus improving the economic viability of these systems;
d) contributing to the emerging of professional and well trained local – private – operators capable of efficiently running distributed renewable energy systems; and
e) developing institutional capability at the Ministerial / regulators level to formulate, implement and monitor the performance of private rural SMEs involved in distributed - renewable energy electrification.

In the rural areas of Cambodia and Lao PDR the generation and distribution of electricity is mainly left to small private entrepreneurs because the governments need to focus limited resources on urban areas. Consequently this important rural service is usually provided by small family businesses with very limited technical and managerial capacity, with no access to support services or advice, and with very limited access to financial services needed to upgrade their operations. In Cambodia these businesses are called Rural Electricity Entrepreneurs (REEs), and in Lao PDR they are Provincial Electricity Supply Companies (PESCOs).

The environment in which these small businesses operate is increasingly difficult due to rising fuel prices (imported diesel fuel), and increasing pressure from government to improve standards and reduce prices. The concept behind this project is that the profitability and quality of service provided by these rural entrepreneurs should be improved with the use of an appropriate software tool that simplifies and reduces the time and cost of standard functions; while also providing the entrepreneur with better information for business decision making.

The methodology and main activities of the project can be summarised in the following four phases:

A. **Needs Assessment –** to determine the requirements of the target user groups, with activities including site visits, survey, stakeholder interviews and analysis of existing systems;

B. **Development of Improved Tools –** creating a tool to meet the specified requirements of the users;

C. **Pilot Installation and Testing –** providing the tool and training to a sample group of users, and monitoring their use and experience of it over a 3 month period; and

D. **Training and Dissemination –** selecting and training a group of around 20 trainers, suitably qualified and in an appropriate institution, then these new trainers will train groups of REEs and PESCOs in the use of the new tool.

In Lao PDR the Southern Provinces Rural Electrification (SPRE) project, supported by the World Bank, has implemented the first phase of a Village Off-Grid Program (VOP) which has succeeded in providing electricity services to over 5,000 households in the 5 initial provinces. These households are mainly supplied by either individual solar home systems or village pico-hydro units. PESCOs were identified and licensed in each of the 5 provinces, then trained and tasked with identifying eligible villages and then facilitating their involvement in the program. The number of PESCOs will soon greatly expand with commencement of the second phase of the SPRE project which will extend the VOP to the rest of the 17 Lao provinces.

Each PESCO plays a key role in a sophisticated process that includes:

- initial assessments of village household needs,
- applying to the Off-Grid Promotion and Support Office (OPS) within MIH,
- ordering the required system equipment,
- installing it for the householders with the help of the local VEM, and
- then processing regular payments for a period up to 10 years.

The DEMT partners in Lao PDR have requested that the DEMT project develop a management tool for PESCOs to help them manage their business activities including the network of installed solar home systems (SHS) and village hydro generating systems (VHGS – pico-hydro mini-grids), and meet the requirements of VOPS.

In Cambodia this project will develop a management tool for REEs, most of whom operate diesel-based mini-grids. A separate specifications document has been prepared for the REE Management Tool. The DEMT project will also conduct some activities with Electricite du Cambodge (EDC), the state-owned utility, with the aim of improving some of their management software tools already used for rural electricity services.

The lessons and experiences will be freely shared between the stakeholders in both countries, as will the final software tools once they are developed, in order to maximise the future shared benefits of this project.

2. Aim and Purpose of this Document

The aim of this document is to specify the requirements of the target stakeholders of this project with respect to the design of a tool that would help improve the management of Provincial Energy Service Companies (PESCOs).

The specific purpose of this document is to accurately convey these requirements to a software programmer who is tasked with designing an appropriate PESCO Management Tool to meet the users' needs as far as possible. This document plays an important role in the project by documenting the proposed and agreed outcomes of the first phase, and then steering the direction and outputs of the second phase.

These specifications will, as far as possible, be produced without consideration of any pre-determined design solutions or pre-existing software. However since in reality only one tool will be developed, these specifications must represent the majority of potential users while making note of any known special needs or differences.

The draft version of this document was reviewed by the DEMT stakeholders at a Specification Review Workshop in Phnom Penh on July 25th and 26th, 2005.

All stakeholders were encouraged to provide relevant comments at the Review Workshop, or else in writing or over the telephone to the following contact. Following the workshop this specifications document was updated to incorporate the feedback provided during the workshop plus some comments received afterwards. Any further comments or queries should be directed to:

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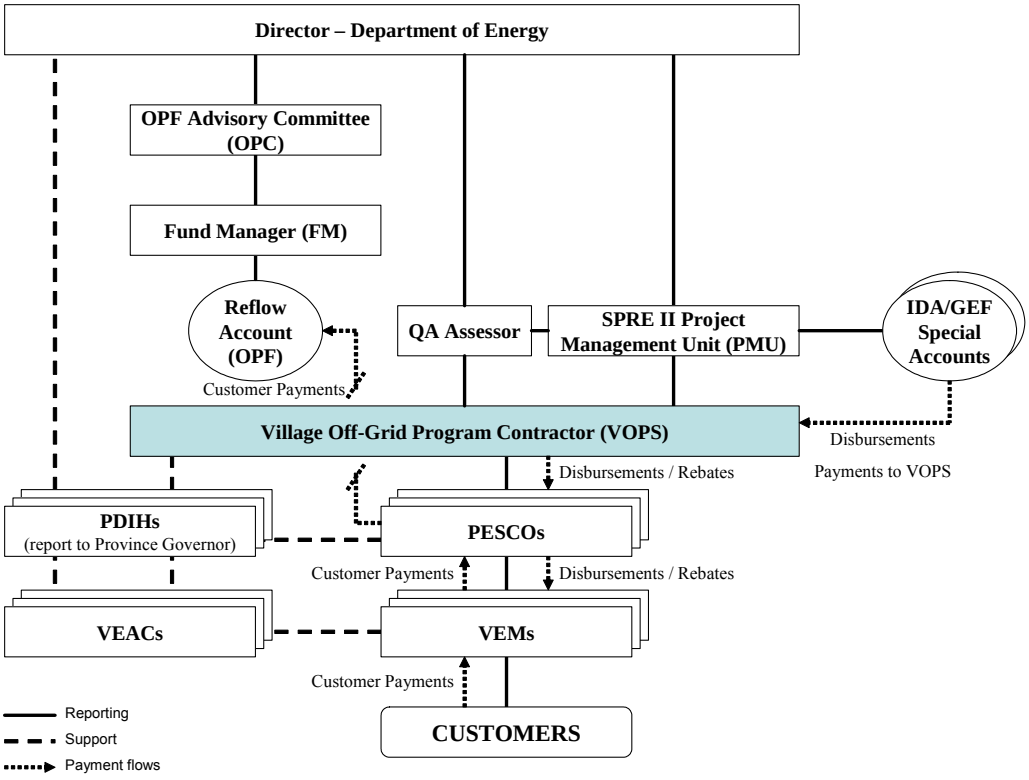
3. Defining Target Users

The Village Off-Grid Project is based on a sophisticated structure of stakeholders, each with very specific responsibilities, incentive structures and reporting requirements. This structure is represented in the following diagram (sourced from the VOP Operations Manual, March 2005):



The target users of the PESCO Management Tool are the small number of existing PESCOs, plus the large number of new PESCOs that are expected to be established when the second phase of the World Bank's (SPRE2) project commences. The VOP Operations Manual (MIH, March 2005) defines PESCOs as:

a) either companies or individuals;

b) had previously been awarded PESCO trainee status;

c) have been awarded a PESCO concession contract by the Village Off-Grid Promotion and Support office (VOPS); and

d) have obtained a business licence from the relevant Provincial Department of Industry and Handicrafts (PDIH).

There are currently 5 PESCOs registered and active under the first phase of SPRE1:

- Luang Namtha Electric Service Company
- Diamond Electric Service Company
- S.Inthavan Off-Grid Service Company

- Alek Electricity Company
- Champassak Off-Grid Company

These PESCOs are the initial target users of the PESCO Management Tool, and the new PESCOs that will be licensed soon under the second phase of VOP will form the rest of the target users.

4. PESCO Business Functions

The business functions common to all PESCOs can be summarised into the six main categories listed below.

1. **Planning –** identification of new clusters of 3 to 10 potential villages to participate in the VOPS program, and following the procedure required by the program including submission of a cluster plan, plus identifying potential private customers outside of the VOPS program.
2. **Procurement –** of all balance of system components (including battery boxes, frames etc) for VOPS customers, and other equipment for private customers; monitoring and control of stock levels.
3. **Installation –** delivery of equipment to customer site for installation by VEM and facilitating inspection of VOPS systems by PDIH.
4. **Operations –** support of the VEM in the day-to-day operation and maintenance of the installed systems, including appropriate training for these activities; monitor and resolve any issues regarding unsatisfied customers or disputes with the VEAC and VEM, as well as providing support to private customers.
5. **Reporting –** collection and review of monthly logs from each VEM, regular management reports as needed by the PESCO, and submission of monthly report to the VOPS, plus general management reports for the PESCO's own purposes.
6. **Payments –** collect customer payments and monthly report from the VEMs; prepare and submit monthly invoice to VOPS; pay to the VEMs any rebates for which they are eligible; give the VEMs any VEAC payments due, as well as collecting payments from private customers.

The detailed PESCO activities required for each function are described in the following table.

PESCO Functions and Activities

Function and Activity	Description	Relevant VOPS Documents
1. Planning		
a. Identify Cluster	▪ When the PESCO finds a potential new cluster of villages for electrification by VOPS he checks that all the villages are on the Zoning Brief prepared by VOPS, indicating they are eligible.	▪ Zoning Brief
b. Planning Announcement	▪ When the PESCO has confirmed that an identified VOPS cluster is eligible then he sends a formal letter of notification to the District Governor, and also a letter to each Village Chief to propose a date to visit and hold a planning meeting, and informs the PDIH.	▪ Cluster Plan Guidelines
c. Planning Meeting	▪ When the planning meeting is held the PESCO determines the technology preference for the village: solar home system(SHS), village hydro (VH), diesel gen-set (GS), or gen set and village hydro (VHGS).	▪ Planning Meeting Report ▪ Environmental Management Plan (EMP)
d. Selecting a VEAC	▪ During the visit to the village for the Planning Meeting, the PESCO shall elect 4 VEAC candidates and record their details and motivations on the VEAC Constitution Form, which is approved and signed by the new VEAC members and Village Chief.	▪ VEAC Constitution Form
e. Selecting a VEM	▪ During the visit to the village for the Planning Meeting, the PESCO shall identify VEM candidates and evaluate them using a standard form with 3 criteria (technical skill + experience, investment capacity, management experience + skill), and then the successful candidate signs the evaluation form along with the VEAC members and Village Chief.	▪ Choosing a VEM (in the Cluster Plan Format) ▪ PESCO-VEM Contract

f. New Customer Registration	▪ Customer details recorded on the Solar Electricity Registration Sheet (Village Name, District, province, House number, name, system size (20,30,40,50W), Installation Fee, Monthly purchase charge for X years, Number of extra lamps, Total price for extra lamps) and signs a customer contract with each of them, after explaining the terms.	▪ Registration Sheet (for Solar Electricity or VHGS as appropriate) ▪ VEM-Customer Contract ▪ Tariffs Leaflet
g. Submission of Cluster Plan	▪ After the planning meeting, design period and customer registration, the PESCO completes the cluster plan and submits it to the PDIH (they review it and confirm it only covers eligible villages, then forward it to the VOPS for review and approval)	▪ Cluster Plan Guidelines ▪ Cluster Plan
h. Registration of Customers for Waiting List	▪ When a new potential customer in a village where a VEM is already active expresses interest in receiving a system, the VEM registers the new customers by adding them to the Registration Sheet which is given to the PESCO and forms the basis of a new Cluster Plan proposal once there are sufficient new customers. *(Registration sheet contains same parameters as for the initial registration sheet, plus the date of registration)*. In the case of private customers, the PESCO will keep a list of potential new customers.	▪ Registration Sheet (for Solar Electricity or VHGS as appropriate)
2. Procurement		
a. Receive stocks from VOPS	▪ When VOPS delivers the equipment requested in an approved Cluster Plan, or in a new order for extra equipment in a monthly report then the PESCO records the details of the equipment (description, serial number, condition, shipment date, shipping code) and stores it at the PESCO storage site	▪ VOP Operations Manual ▪ Technical Specifications ▪ PESCO Monthly Report
b. Procure balance of system components or 'extra equipment' and	▪ When a Cluster Plan has been approved, or a VEM needs more equipment or supplies, the PESCO will directly procure all other components required for the installations that are not procured by VOPS	▪ Cluster Plan ▪ VEM Monthly Log

supplies for VEMs	(such as batteries, cables etc). This wil be done either by placing an order with a supplier or direct purchase at a market. All equipment for private customers must be procured wholly by the PESCO through private suppliers.	
c. Receive stocks from Suppliers	▪ When suppliers deliver the equipment ordered (or when PESCO brings back from market) then the PESCO records the details of the equipment (description, serial number, condition, delivery date) and stores it at the PESCO storage site.	▪
d. Delivery of Equipment	▪ After the PESCO takes delivery of some VEM stock or supply items, he will arrange to deliver it to the VEMs as necessary and record all relevant details (description, shipping date, condition, destination)	▪ VEM Monthly Log
3. Installation		
a. VEM training	▪ After the VEM has been appointed, and before the customer installations, the PESCO trains the VEM on how to install, operate and maintain the systems according to the technical Specifications, and also on the monitoring and reporting procedures.	▪ Technical Specifications ▪ VEM Monthly Log
b. Delivery of equipment to VEM	▪ When the VEM is ready to install customer systems in a village, the PESCO delivers all necessary equipment from the PESCO storage to the VEM in the village, recording details of equipment as it is taken from the PESCO storage site (description, serial number, condition, shipping date, VEM destination)	▪ Cluster Plan
c. Inspection by PDIH	▪ After the VEM has installed systems for all VOPS customers registered in the Cluster Plan, the VEM informs the PESCO who notifies the PDIH. The PDIH then inspects the systems and completes a Installation Inspection Form and if satisfactory the PDIH gives the PESCO a	▪ Installation Inspection Form ▪ Installation Completion Certificate

	certificate which the PESCO forwards to VOPS.	
4. Operations		
a. Check VEMs' stocks	▪ Every month the PESCO reviews the levels of spare parts and supplies reported by each VEM in their monthly report and notes any procurements necessary (which will be done under function 2).	▪ VEM Monthly Log
b. System repairs	▪ When a VEM notifies the PESCO of a technical problem that the VEM is unable to fix then the PESCO fixes the problem and instructs the VEM on the procedure at the same time.	▪
c. Warranty repairs and replacements	▪ When the VEM notifies the PESCO of the failure of any equipment item that is still under the mandatory 1 year on-site warranty	▪
d. Dispute resolution	▪ When the VEAC or VEM notifies the PESCO of a dispute that requires their attention the PESCO meets the parties concerned to resolve the issue reporting procedure	▪ *Exceptional form, not defined*
e. Customer Default	▪ When a VEM notifies a PESCO that a customer has defaulted on payments, even after appropriate grace period and discussions with the customer and VEAC, then the PESCO instructs the VEM to re-possess all relevant equipment and submits a report to VOPS.	*Exceptional form, not defined*
f. Customer Moving	▪ When a VEM notifies a PESCO that a VOPS customer is planning to leave the village then the PESCO checks if the customer has fully paid for their system already and then either: a) if yes then the customer can take it with them and the PESCO simply changes the status of the customer in his records and informs VOPS of this; or b) if it is still being paid-off then the PESCO will repossess the system for sale to another customer	*Exceptional form, does not exist?*

5. Reporting		
a. VEM Monthly Log	▪ Every month each VEM delivers to the PESCO a log describing the status and activities of the VEM and VEAC that month, and duly signed by the VEAC. The PESCO reads the log, takes action on any apparent issues, and stores the log.	▪ VEM Monthly Log
b. Monthly PESCO Report	▪ Every month the PESCO prepares a report according to the required format which includes: customer payments, installation inspection sheets, stock control information, VEM and VEAC activity including VEM Monthly Logs.	▪ PESCO Monthly Report Format
c. PESCO Management Information	▪ At any time during each month the PESCO may generate a variety of management information in order to monitor business performance and make appropriate decisions.	▪
6. Payments		
a. Collection of Customer Payments	▪ Every month each VEM delivers to the PESCO, along with their Monthly Log, the customer payments. The PESCO checks to ensure the payments are correct and deposits the VOPS-related payments into the Off-Grid Repayment Account.	▪ VEM Monthly Log ▪ PESCO Guide to Incentives
b. Monthly Invoicing	▪ Every month the PESCO prepares and submits to the VOPS an invoice that requests the payment of relevant rebates for the month that may consist of a Planning Fee, Customer Installation Fee, and Post-Installation and Reporting Fee.	▪ PESCO Report
c. Payment to VEMS and VEACs	▪ After the requested rebate payments are received from the VOPS, the PESCO pays all relevant rebates to each VEM according to the rates in	▪ PESCO Guidelines to Incentives

	the PESCO Guidelines to Incentives.	

Notes:

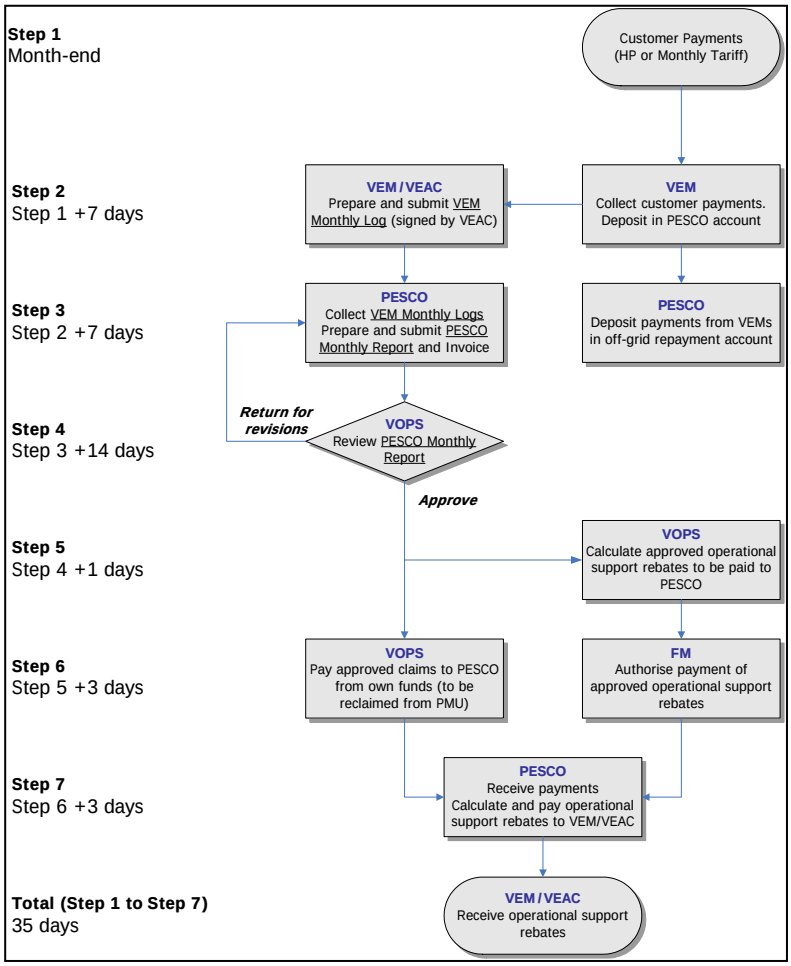
- It is assumed that the PESCO is a single proprietor and is either directly involved in every business activity or else directly monitors it and so no distinction is made between the PESCO owner and PESCO staff.

5. PESCO Stakeholders and Information Flows

The main external stakeholders in the PESCO businesses are as follows:

External PESCO Stakeholders	
MIH	The Ministry officers
VOPS	The VOPS staff and management
PDIH	The local PDIH officers for a particular PESCO
VEMs	Each of the VEMs managed by a particular PESCO
VEACs	Each of the VEACs managed by a particular PESCO
Customers	Each of the customers supplied by a particular PESCO
Suppliers	Suppliers of small system equipment and supplies to the PESCO

The specific program reporting requirements for VEMs and PESCOs is illustrated in the flow diagram below (sourced from VOPS Operations Manual, March 2005), and the general flow of information between the external PESCO stakeholders is represented in the matrix on the next page.



From \ To	PESCO	MIH	VOPS	PDIH	VEMs	VEACs	Customers	Suppliers
PESCO			▪ Planning Meeting Reports ▪ Installation Certificates ▪ Monthly Report ▪ Invoice ▪ Customer Payments	▪ Planning Meeting Invitation ▪ Cluster Plans ▪ Inspection Request	▪ Training ▪ PESCO-VEM Contract ▪ Tariffs Leaflet			▪ Equipment Orders
MIH								
VOPS	▪ PESCO Concession Contract ▪ PESCO Guide to Incentives ▪ Zoning Brief ▪ Tariffs Leaflet ▪ Technical Spec's ▪ Rebate Payments ▪ Cluster Plan Approval							
PDIH	▪ Business Licence ▪ Installation Reports + Certificate							
VEMs	▪ Monthly VEM Log						▪ VEM-Customer Contracts ▪ Tariffs Leaflet	
VEACs					▪ Signature on VEM Log ▪ Issue notification			
Customers					▪ Customer Contracts ▪ Customer Payments			
Suppliers								

6. Specific Design Considerations

During the needs assessment activities a number of specific requirements and design considerations have been identified that should be incorporated into the PESCO Management Tool if possible. These are described in the following table.

PESCO Management Tool Interface	
Language	Lao language throughout (using Lao script), but using suitable icons wherever possible to reduce the need for text
General Appearance	The appearance of forms and windows should be as simple and uncluttered as possible by minimising unnecessary text and hiding advanced features etc on additional windows
Complexity	The general logical flow and process should be as simple as possible and designed specifically for a typical PESCO that knows their business well but has very low computer skills and experience.
Help Functions	On-screen help should be available for every function in the form of brief descriptions of items that appear when the mouse is rolled over them, plus a single button on each page that takes the user to a more detailed description or help menu.
Error Checking	The tool should check all data as it is entered and compare it with pre-defined expected data ranges and types, and should prompt the user to confirm any unusual or non-compliant data values.
PESCO Management Tool Output	
VOPS Requirements	The output forms shall comply with the latest requirements and standards established by VOPS.
Production Costs	All output forms, and especially the customer bills, shall be designed to minimise the amount of paper and ink required, while still clearly providing all the required information, in order to reduce the PESCO's operating costs.
Digital Outputs	The user should be given the option to save the output of VOPS Reports as a digital file in an appropriate format such as Microsoft Excel spreadsheet or Microsoft Access data table. This would be useful for PESCOs with access to email, and would simplify the VOPS' task of capturing the data.
Saving Forms for Printing Elsewhere	The user should be given the option with any output form to save to disk in a printer-ready format, rather sending it directly to a printer. This will allow PESCOs to generate the forms on any computer, then take them on disk to a place

	with a suitable printer (eg internet café) for printing, without needing to take the entire database between computers.
Customising PESCO Management Tool	
Initial Set-up	The user should be clearly prompted to define standard parameters and preferences during the first use of the tool. These would include: the PESCO owner's name, business name, concession area, address, contract start date etc).
Changing Parameters	Once the initial set-up has been performed by the user, usually after the first session, the user will only be prompted for further set-up information if it is essential for a particular function, however the set-up functions will still be accessible by the user to confirm or modify the parameters at any time.
Customising Output Forms	Part of the initial set-up parameters will be the definition of standard text, logo, and any standard messages to appear on forms (eg: payment terms to appear on the customer bills). The user should also be provided an option to insert an additional customised message on customer bills at the time of bill production (eg: promotional information, or new instructions for bill payment etc).

7. Units, Abbreviations and Acronyms

This section defines the standard units of measurement, terms, acronyms and abbreviations that should be used throughout the PESCO Management Tool in order to avoid confusion and maintain consistency. Where there is more than one commonly used item then the user should be offered the option to choose which one they would prefer to use.

Units of Measurement	Unit	Abbreviation
Electrical Potential	Volts	V
Electrical Current	Amperes	A
Active Power	Watts	W
	Horsepower	HP
Apparent Power	Kilo-volt Amperes	kVA
Reactive Power	Kilo-volt Amperes Reactive	kVAr
Energy	Kilowatt-Hours	kWh
Electrical Power Phase	Phase	Φ
Power Factor	cosφ	<none>
Currency	Kip	K
	US Dollars	$
Liquid Volume	Litres	l
	Gallons	G
Temperature	Degrees Celsius	°C
Distance	Metres	m

Acronym	Term
DEMT	Distributed Energy Management Tools
DO	Diesel Oil
EMP	Environmental Management Plan
GS	Generator Set
MIH	Ministry of Industry and Handicrafts
PDIH	Provincial Department of Industry and Handicrafts
PESCO	Provincial Electricity Supply Company
REE	Rural Electricity Enterprise
SHS	Solar Home System

SPRE	Southern Provinces Rural Electrification
VEAC	Village Electricity Advisory Committee
VEM	Village Energy Manager
VH	Village Hydro
VOP	Village Off-Grid Program
VOPS	Off-Grid Promotion and Support Office

Annex A – Specification of Reports and Forms

List of Reports

A. Customer Details Reports *20*

A.1 Customer Summary Report <see reports A26 and A27 in Annex B> 20

B. Payment Reports *21*

B.1 Customer Payments Status Report <see report A321 in Annex B> 21

B.2 Payment Collection Performance Report <see report A33 in Annex B> 22

C. Stock and Sales Reports *23*

C.1 Stock Report 23

C.2 Sales Report 24

D. Maintenance and Incident Reports *24*

D.1 Maintenance and Incident Report 24

E. VOPS Reports *25*

E.2 Customer Installation Payments Report 25

E.3 Customer Re-Payments Summary Report 26

F. VEM Monitoring Forms *27*

F.1 Payments Collection Form <see report A31 in Annex B> 27

F.2 Maintenance and Incident Recording Form 28

A. Customer Details Reports

A.1 Customer Summary Report <see reports A26 and A27 in Annex B>	
Format	▪ Header: “Customer Summary Report for “ <insert name of PESCO> ▪ Single table listing all customers that match the criteria selected by the user (as many pages as necessary) ▪ This report is produced for the current period by default, but the user will be prompted to select a different period (eg: the user may need to prepare last months’ reports for VOPS, or else they may wiah to analyse the current month’s figures) ▪ Footer: <page number>, <current date>
Parameters	a. Summary Table (with a row for each village plus a totals row, and columns as follows:)

	▪ Total number of Villages serviced by the PESCO ▪ Total Number of installed customers ▪ Total Number of waiting customers ▪ Penetration Rate (number of installed / total villagers) b. Village Totals (single row that appears above each group of customers from a new village, with the following details): ▪ Village name ▪ VEM Name ▪ Total Number of installed customers in village ▪ Total Number of waiting customers in village ▪ Penetration Rate in village (number of installed / total villagers) c. Detailed Listing (a single table with a row for each customer entry, sorted by village location and with columns as follows:) ▪ Customer Name ▪ House number ▪ System Type (size in Watts) ▪ Extra equipment description ▪ Installation Status ▪ Date Registered or Installed ▪ Existing household appliances
Options	▪ User will be prompted to select the location of systems to display: a) All Villages, b) Select Villages from a list of those in PESCO area, or c) Select from a list of VEMS in the PESCO's area. ▪ User will be prompted to select which type of systems to display: a) Only VOPS Customers, b) Only Non-VOPS Customers (hide the last 4 columns) c) All Customers (only calculate the last 4columns based on VOPS customers) ▪ The user will be prompted to select a single search criteria from the following list (default sort will be by village): ▪ Currently Installed – sorted by Village, then System Size ▪ Currently Installed – sorted by System Size, then Village ▪ Registered but not yet installed (waiting) ▪ Newly Installed (in current period) ▪ Newly Removed (in current period) ▪ Currently Removed

B. Payment Reports

B.1 Customer Payments Status Report <see report A321 in Annex B>	
Format	▪ Header: "Customer Payments Status Report for " <insert name of PESCO> ▪ Single table listing payment status for all unpaid customers that match the criteria selected by the user (as many pages as necessary) ▪ This report is produced for the current period by default

	▪ Footer: <page number>, <current date>
Parameters	a. Village Totals (single row that appears above each group of customers from a new village, with the following details): ▪ Village name ▪ Total Amount Currently Owing by Village ▪ Total Amount Collected in Village (so far this period) ▪ Total Amount Still to be Collected in Village b. Customer Payment Status (a single table with a row for each customer entry, and columns as follows:) ▪ Customer Name ▪ Address ▪ Total Amount Currently Owing ▪ Total Amount Collected (so far this period) ▪ Total Amount Still to be Collected
Options	▪ User will be prompted to select the location of systems to display: a) All Villages, b) Select Villages from a list of those in PESCO area, or c) Select from a list of VEMS in the PESCO's area. ▪ User will be prompted to select which type of systems to display: a) Only VOPS Customers, b) Only Non-VOPS Customers (hide the last 4 columns) c) All Customers (only calculate the last 4columns based on VOPS customers)

B.2 Payment Collection Performance Report <see report A33 in Annex B>	
Format	▪ Header: "Payment Collection Performance Report for:" <insert Name of PESCO>; ▪ Brief summary figures, then two simple bar charts as described below, with the content of the second bar chart depending on user selected preferences. ▪ Footer: <page number>, <current date>
Parameters	a. Summary of Collection Performance (single text box / tale) ▪ Total amount to owing this period ▪ Total amount collected already ▪ Total amount outstanding ▪ Number of installed customers ▪ Number of customers with amounts still owing this month b. Average Monthly Collection Rates ▪ Single Bar chart that shows the average collection rate for all of the villages separately ▪ Each village as a separate series along x-axis, Average Collection Rate (%) on y-axis (For each village: Sum of monthly collection rates divided by total number of months) c. Monthly Village Collection Rate Trends ▪ Single Bar chart with a separate series for each selected village displaying full history of monthly collection rate

	▪ Months along x-axis, Collection Rate (%) on y-axis (Total Monthly amount Due divided by Total Amount Collected for the month) ▪ Displays as many villages as selected by the user (perhaps need a maximum for clarity?) ▪ Ensure each village is clearly labelled as a separate series (for non-colour printers) and add a trend line for each series.
Options	▪ User will be prompted for the period to be displayed ▪ User will be prompted to select the location of systems to display: a) All Villages, b) Select Villages from a list of those in PESCO area, or c) Select from a list of VEMS in the PESCO's area. ▪ User will be prompted to select which type of systems to display: a) Only VOPS Customers, b) Only Non-VOPS Customers c) All Customers

C. Stock and Sales Reports

C.1 Stock Report	
Format	▪ Header: "PESCO Stock Report for: " <insert name of PESCO>, "Date": <insert Date> ▪ Single table listing all equipment that has been delivered to PESCO, with description and location. The user will be prompted to choose how to sort and what to display. Blank space for data entry will be provided for each item so the sheet can also be used as a stock-taking form. ▪ Report will be prepared for current period by default ▪ Footer: <insert page number>, <insert current date>
Parameters	a. Table with 7 columns and entry for each customer that matches the user-selected criteria (see below): ▪ Equipment Category (eg: battery, controller, etc) ▪ Equipment Description (eg: 30W Solar Panel) ▪ VOPS Equipment? (Tick box: yes or no) ▪ Equipment Manufacturer (eg: Siemens) ▪ Price per unit (in Kip) ▪ Quantity ▪ Location (PESCO, VEM Name or Other) Comments (Blank space for data entry, so the form can be used for stock-taking also)
Options	▪ User will be prompted to select the location of equipment to display: a) Only PESCO site, or b) Select from a list of VEMS in the PESCO's area, or c) All equipment locations ▪ User will be prompted to select which type of equipment to display: a) Only VOPS Equipment, b) Only Non-VOPS Equipment c) All Equipment ▪ User will be prompted for which field to sort by (from all fields in table)

C.2 Sales Report	
Format	▪ Header: “Sales Report for: “ <insert name of PESCO>, ”Date”: <insert Date> ▪ Single table listing all equipment that has been sold in current period. The user will be prompted to choose how to sort and what to display. ▪ Report will be prepared for current period by default ▪ Footer: <insert page number>, <insert current date>
Parameters	a. Sales Summary (single table with following data): ▪ Total number of all items sold ▪ Total value of all items sold for period b. Listing of each item sold this period (single table with following data to match user-selected criteria, over as many pages as needed): ▪ Equipment Category (eg: battery, controller, etc) ▪ Equipment Description (eg: 30W Solar Panel) ▪ VOPS Equipment? (Tick box: yes or no) ▪ Equipment Manufacturer (eg: Siemens) ▪ Price per unit (in Kip) ▪ Quantity ▪ Comments (Blank space for data entry, so the form can be used for stock-taking also)
Options	▪ User will be prompted to select which type of equipment to display: a) Only VOPS Equipment, b) Only Non-VOPS Equipment c) All Equipment ▪ User will be prompted for which field to sort by (from all fields in table)

D. Maintenance and Incident Reports

D.1 Maintenance and Incident Report	
Format	▪ Header: “Maintenance and Incident Report Form for“ <insert PESCO Name> ▪ Summary figures for current period, chart of incident types and chart showing trend of incidents ▪ Footer: <insert page number>, <insert current date>
Parameters	a. Summary figures: ▪ Period ▪ Total Number of Incidents Reported ▪ Total number of Maintenance Activities Performed ▪ Average time between date of incident occurring and maintenance being performed

	b. Chart of Incident Types ▪ Bar chart ▪ Single series for each type of equipment along x-axis ▪ the number of incidents for the period reported along y-axis c. Chart of Incident Trends ▪ Bar chart ▪ Each period along x-axis and the total number of incidents along y-axis
Options	▪ User will be prompted to select which type of customers to display: a) Only VOPS Customers, b) Only Non-VOPS Customers c) All Customers

E. VOPS Reports

E.2 Customer Installation Payments Report	
Format	▪ Standard VOPS format (see page 2 of standard PESCO Monthly Report format) ▪ Header: "Customer Installation Payments (CIP) Report for Month:" <insert Month of report period>; "Year" <insert Year of report period> "Submitted By:" <insert PESCO Name>; "Area:" <insert PESCO area name>, "Province:" <insert PESCO province> ▪ This report is produced for the current period by default, but the user will be prompted to select a different period (eg: the user may need to prepare last months' reports for VOPS, or else they may wiah to analyse the current month's figures) ▪ Footer: <page number>, <current date>
Parameters	Single table following VOPS format (difficult to describe here), with 8 columns: ▪ Village Name ▪ *(label that subdivides each row into "1. Number of Installations" and "2. Amount Collected")* ▪ Panel Sizes (sub-columns for 10W, 20W, 30W, 40W, 50W) ▪ Totals (to sum each of the sub-rows: Number of Installations and Amount Collected for each village) ▪ Portion VEM (K40,000 multiplied by the number of Installations) ▪ Sumnet VEM (Total of the Amount Collected, less the Portion VEM from above) ▪ Portion ESCO (K20,000 multiplied by the number of Installations) ▪ Amount Deposited (Sumnet VEM less the Portion ESCO) Each of the rows is for a particular village, as many as needed, plus one last row that totals the numbers of installations and payments for each size of system across all villages.

Options	▪ User will be prompted for the period to be displayed ▪ User will be prompted to select the location of systems to display: a) All Villages, b) Select Villages from a list of those in PESCO area, or c) Select from a list of VEMS in the PESCO's area. ▪ User will be prompted to select which type of systems to display: a) Only VOPS Customers, b) Only Non-VOPS Customers (hide the last 4 columns) c) All Customers (only calculate the last 4columns based on VOPS customers)

E.3 Customer Re-Payments Summary Report	
Format	▪ Standard VOPS format (see page 4 of standard PESCO Monthly Report format) ▪ Header: "Hire Purchase Re-Payments Report for Month:" <insert Month of report period>; "Year" <insert Year of report period> "Submitted By:" <insert PESCO Name>; "Area:" <insert PESCO area name>, "Province:" <insert PESCO province> ▪ This report is produced for the current period by default, but the user will be prompted to select a different period (eg: the user may need to prepare last months' reports for VOPS, or else they may wish to analyse the current month's figures) ▪ Footer: <page number>, <current date>
Parameters	Format is very similar to A.2: Single table following VOPS format (difficult to describe here), with 9 columns: ▪ Village Name ▪ *(label that subdivides each row into "1. Connections Registered", "2.Number of Repayments", and "3. Amount Collected")* ▪ Panel Sizes (sub-columns for 10W, 20W, 30W, 40W, 50W) ▪ Totals (to sum each of the sub-rows: Number of Installations and Amount Collected for each village) ▪ Operational Rebates VEM (K3,000 multiplied by number of repayments) ▪ Operational Rebates VEAC (K1,000 multiplied by number of repayments) ▪ Operational Rebates PESCO (K3,000 multiplied by number of repayments for first 500 customers, then K2,000 multiplied by number of repayments for second 500 customers, then K1,000 multiplied by number of repayments for over 1000 customers) ▪ Total Operational Rebate (Sum of the Op Rebates to VEM+VEAC+PESCO) ▪ Amount Deposited (Total Amount Collected less the Total Op Rebate) Each of the rows is for a particular village, as many as needed, plus one last row that totals each of the 3 sub-rows across all villages.
Options	▪ User will be prompted for the period to be displayed ▪ User will be prompted to select the location of systems to display: a) All Villages, b) Select Villages from a list of those in PESCO area, or c) Select from a list of VEMS in the PESCO's area. ▪ User will be prompted to select which type of systems to display:

	a) Only VOPS Customers, b) Only Non-VOPS Customers (hide the last 5 columns) c) All Customers (only calculate the last 5 columns based on VOPS customers)

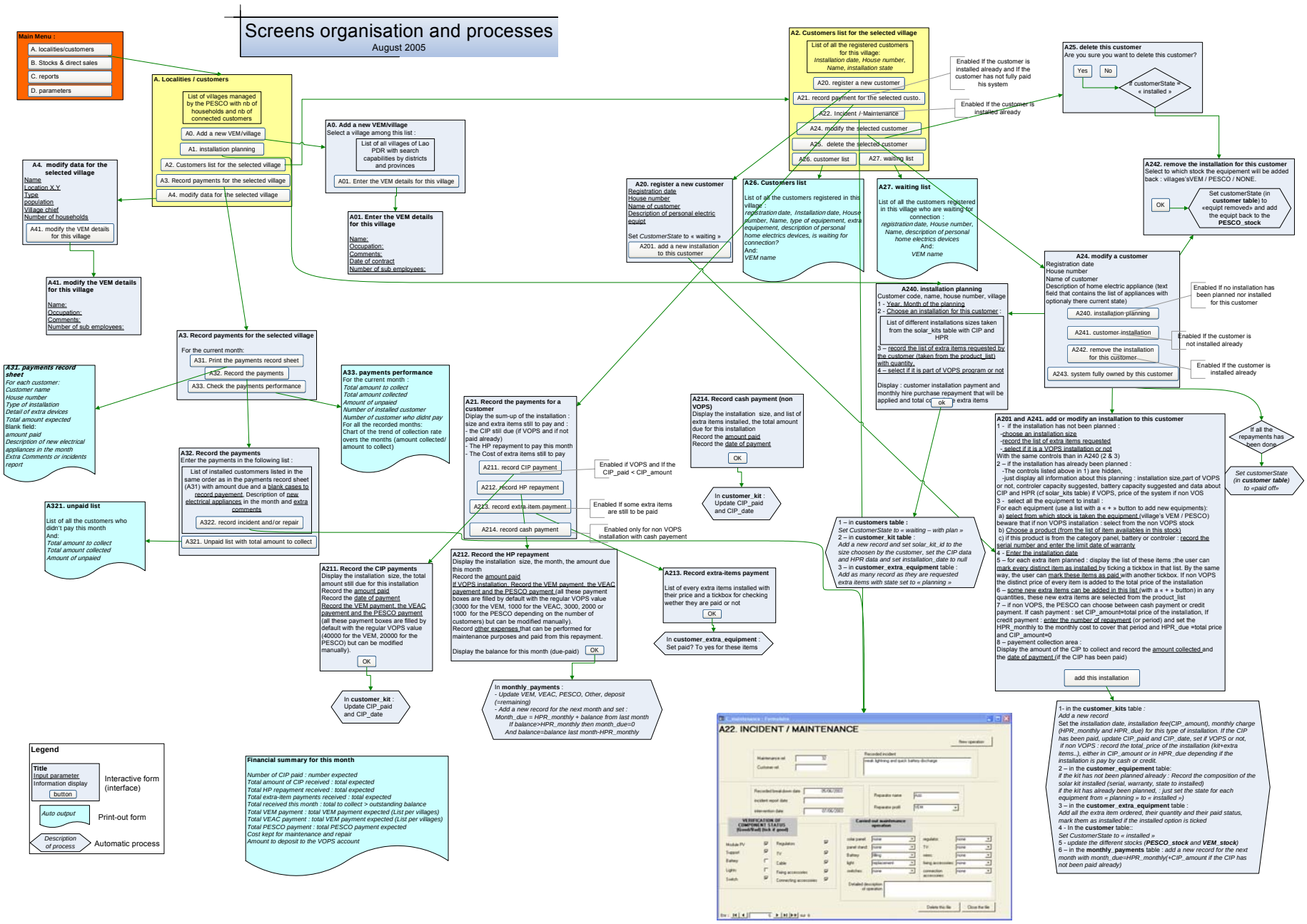
F. VEM Monitoring Forms

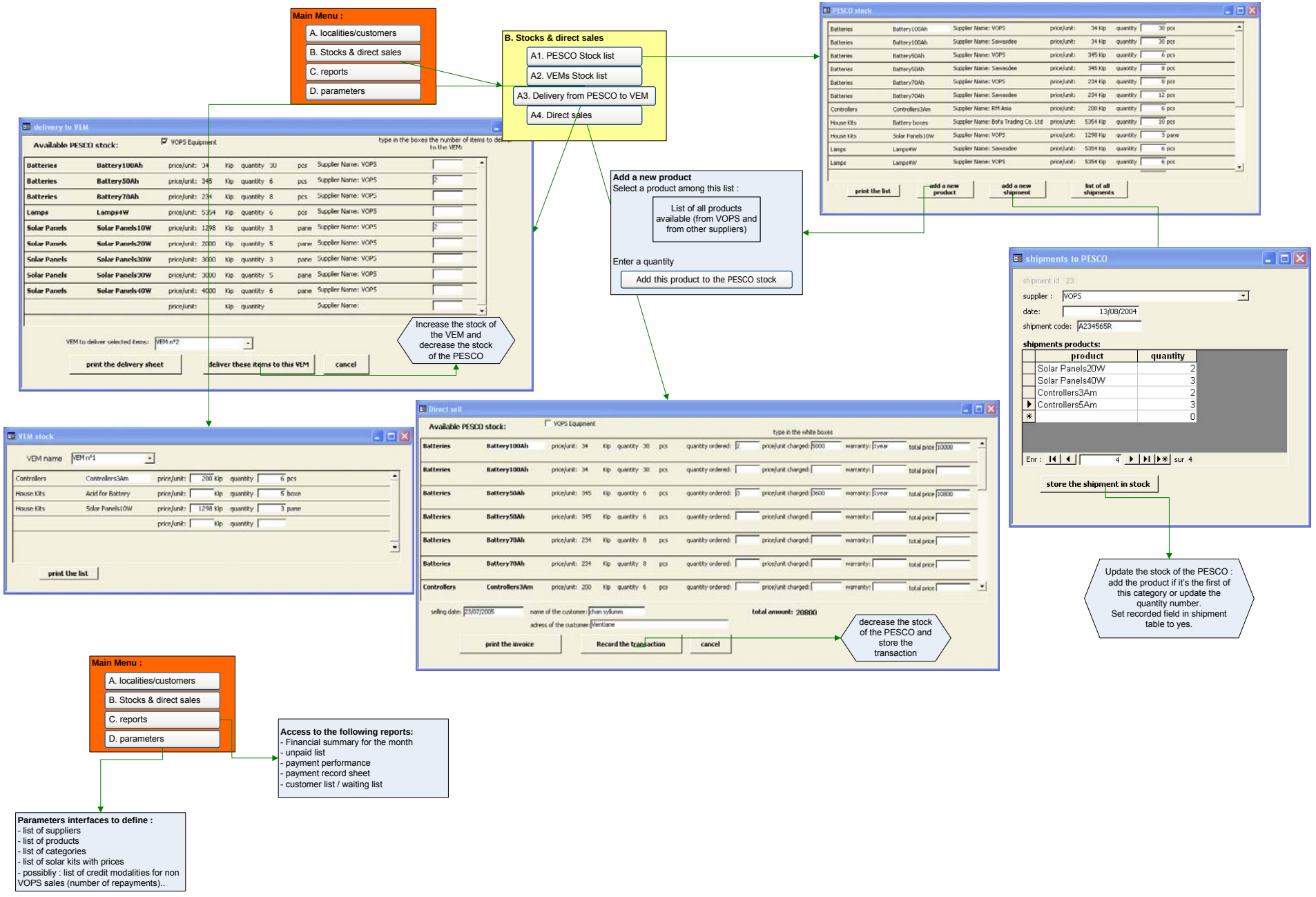
F.1 Payments Collection Form <see report A31 in Annex B>	
Format	▪ Header: “Payments Collection Form for: “ <insert name of VEM>, ”Payment Period”: <insert current payments period> ”Meter Reader”: <leave space for employee to enter his/her name> ▪ Single table of customer details with blank space for data entry (user selects which VEM/customers are displayed) ▪ Banner printed at bottom of each page (above footer): ”**Instructions:** Please perform these maintenance activities for **every** household. If you find any problems, please report them in the space provided. Then tick box once completed. **Maintenance Tasks:** 1. Check that the Solar Panel front surface is clean and unobstructed 2. Check that the Panel Stand is sturdy and still facing optimal direction 3. Check Battery for sufficient fluid levels, terminals free of corrosion, stored in ventilated area 4. Check that all lamps are working 5. Check that all switches are working 6. Check that all regulators are working and are not by-passed 7. Check that all wires in the appropriate (standard) size, in good condition “ ▪ Footer: <insert page number>, <insert current date>
Parameters	a. Table with 8 columns and entry for each customer that matches the user-selected criteria (see below): ▪ Customer Name ▪ House Number ▪ Type of Installation (size in Watts) ▪ Payment Due ▪ Payment Received (blank space for data entry) ▪ Date of Collection (blank space for data entry) ▪ Any new appliances in household? (blank tick box: Yes/No, with instructions to insert details into section b.) ▪ SHS Maintenance Check Completed? (blank tick box: Yes, with instructions to insert details into section b.) ▪ Customer Comments (blank tick-box: yes/no, with instructions to insert details into section b.) b. Detailed data from section a (a blank table printed on separate page with 3 generic columns labelled Customer Name, Customer Address, Comments, and left blank) for VEM to complete with any of the following items as appropriate: ▪ Details of new appliances (space for details to be entered) ▪ Maintenance Issues Identified (space for details to be entered)

	▪ Customer Comments (space for details to be entered)
Options	▪ User will be prompted for the period to be displayed ▪ User will be prompted to select which customers to display: a) Select Villages from a list of those in PESCO area, or c) Select from a list of VEMS in the PESCO's area.

F.2 Maintenance and Incident Recording Form	
Format	▪ Header: "Maintenance and Incident Report Form " "VEM Name": <leave space for VEM to enter his/her name> ▪ Single table, in 3 clear sections, with blank fields for staff to enter appropriate data. Limit to 1 page with instructions to use additional blank pages if needed. ▪ Footer: <insert page number>, <insert current date>
Parameters	a. Customer Details: ▪ Customer Name (blank space for data entry) ▪ House Number (blank space for data entry) ▪ Type of Installation (blank space for data entry) ▪ Any new appliances in household? (blank space for data entry) b. Details of Incident ▪ Description of Incident (blank space for data entry) ▪ Main Equipment Fault (prompt user to tick any relevant box for each type of equipment: battery, Solar panels, wiring, regulator, appliances, lamps, other) ▪ Date of the customer noticing Incident (blank space for data entry) ▪ Status of Equipment (blank space for data entry) c. Details of Maintenance or Repairs Performed ▪ Description of Maintenance or Repairs (blank space for data entry) ▪ Date of Maintenance or Repairs (blank space for data entry) ▪ Description of any New Equipment installed (blank space for data entry) ▪ Description of any Consumables or Other Expenses (blank space for data entry) ▪ Customer Signature (blank space for signature)
Options	None

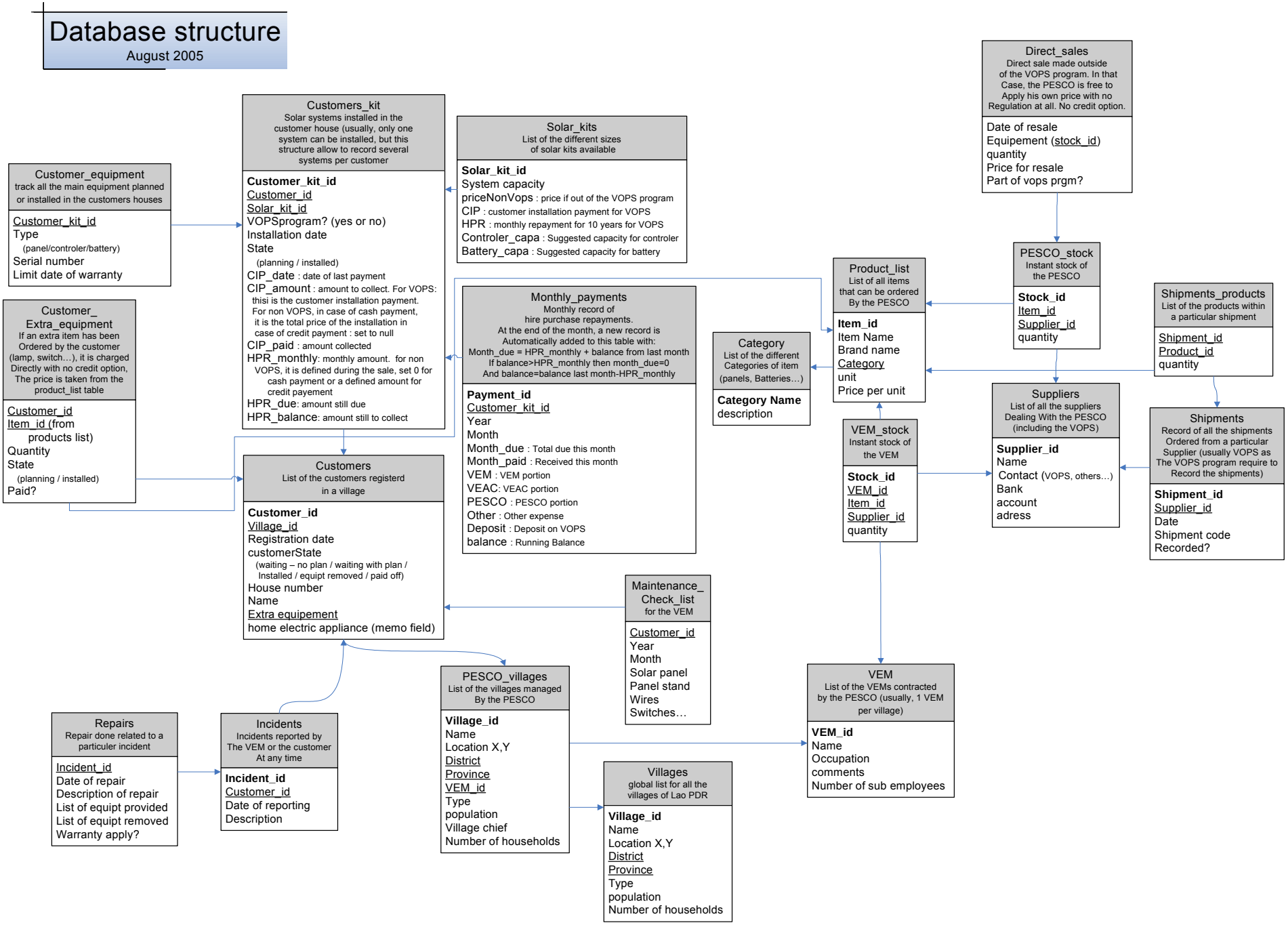
Annex B – Structure and Design of Tool




Main Menu :
A. localities/customers
B. Stocks & direct sales
C. reports
D. parameters
B. Stocks & direct sales
A1. PESCO Stock list
A2. VEMs Stock list
A3. Delivery from PESCO to VEM
A4. Direct sales
PESCO stock
print the list
add a new product
add a new shipment
list of all shipments
delivery to VEM
Available PESCO stock:
VOPS Equipment
type in the boxes the number of items to deliver to the VEM:
VEM to deliver selected items:
print the delivery sheet
deliver these items to this VEM
cancel
Increase the stock of the VEM and decrease the stock of the PESCO
Add a new product
Select a product among this list :
List of all products available (from VOPS and from other suppliers)
Enter a quantity
Add this product to the PESCO stock
shipments to PESCO
shipment id 23
supplier :
VOPS
date:
13/08/2004
shipment code:
A234565R
shipments products:
product
quantity
Solar Panels20W
Solar Panels40W
Controllers3Am
Controllers5Am
store the shipment in stock
Update the stock of the PESCO : add the product if it's the first of this category or update the quantity number.
Set recorded field in shipment table to yes.
VEM stock
VEM name
print the list
Direct sell
Available PESCO stock:
VOPS Equipment
type in the white boxes
selling date:
name of the customer:
adress of the customer:
total amount: 20800
print the invoice
Record the transaction
cancel
decrease the stock of the PESCO and store the transaction
Main Menu :
A. localities/customers
B. Stocks & direct sales
C. reports
D. parameters
Access to the following reports:
- Financial summary for the month
- unpaid list
- payment performance
- payment record sheet
- customer list / waiting list
Parameters interfaces to define :
- list of suppliers
- list of products
- list of categories
- list of solar kits with prices
- possibliy : list of credit modalities for non VOPS sales (number of repayments)..

Database structure

August 2005



Annex C – VOPS PESCO Guidelines to Incentives (GI)

As at 22 December 2004 (Source: VOP Operations Manual, March 2005)

		Amount	Basis	Amount	Basis	Amount	Basis
Payments to PESCOs by VOPS							
Planning and installation							
Planning Fee	IDA credit	$2	per registration in approved cluster plan	$2	per registration in approved cluster plan	$2	per registration in approved cluster plan
Hardware/Transport/ Assurance Allowance	IDA credit	$13 (box/frame) $31 (with battery)	for components procured by PESCO	$50/Unit (1 Unit ≈ 15W)	for components procured by PESCO	$20/Unit (1 Unit ≈ 15W)	for components procured by PESCO
Customer Installation Fee	Customer installation payment	Kip 60,000	per certified installation	Kip 50,000	per certified installation	Kip 50,000	per certified installation
Post-Installation and Reporting Fee	IDA credit	$4	per certified installation. Paid 6 months after installation	$5	per certified installation. Paid 6 months after installation	$5	per certified installation. Paid 6 months after installation
Operational							
Operational Support Rebate	Customer HP payments	Kip 7,000	per connection making HP payments	50%	share of monthly HP repayments deposited in repayment account	50%	share of monthly HP repayments deposited in repayment account
Start-up							
Start-Up Supplementary Rebates	IDA credit	$2 (max $4,000 total per PESCO)	per monthly repayment. Only paid for first year	$2 (max $4,000 total per	per household receiving supply. Only paid for	$2 (max $4,000 total per	per household receiving supply. Only paid for

		Amount	Basis	Amount	Basis	Amount	Basis
				PESCO)	first year	PESCO)	first year
Payments to VEMs by PESCOs[a]							
Planning and installation							
Initial Installation/ Transportation Fee	PESCO (from Customer Installation Fee)	Kip 20,000	per certified installation	Kip 15,000	per certified installation	Kip 15,000	per certified installation
Post-Installation and Reporting Payment	PESCO (from Post-Installation and Reporting Fee)	Kip 20,000	per certified installation. Paid 6 months after installation	Kip 10,000	per certified installation. Paid 6 months after installation	Kip 10,000	per certified installation. Paid 6 months after installation
Operational							
Operational Support Rebate	PESCO (from Operational Support Rebate)	Kip 3,000	per connection making HP payments	20%	share of monthly HP repayments deposited in repayment account	20%	share of monthly HP repayments deposited in repayment account
Payments to VEACs by PESCOs[a]							
Operational							
Operational Support Rebate	PESCO (from Operational Support Rebate)	Kip 1,000	per connection making HP payments	10%	share of monthly HP repayments deposited in repayment account	10%	share of monthly HP repayments deposited in repayment account

Notes:

a These payments are made from the payments to the PESCO. For example, for an SHS system, the PESCO would receive an operational support rebate of Kip 7,000 per connection. Of this, the PESCO would pay Kip 3,000 to the VEM and Kip 1,000 to the VEAC, retaining Kip 3,000 for itself. Similarly, for a VHGS system, the PESCO would receive an operational support rebate equivalent to 50% of all HP payments deposited by the PESCO in the repayment account. Of this, the PESCO would pay sums equivalent to 20% of the deposited HP payments to the VEM and 10% to the VEAC, retaining the equivalent of 20% for itself.

Annex D – VOPS Tariffs Leaflet (simplified)

As at 22 December 2004 (Source: VOP Operations Manual, March 2005)

Size of connection	Customer Installation Payment (includes cost of house kit[a])	Hire Purchase Payments (SHS) Monthly Tariff (VHGS)		Notes
SHS				
		5-years	**10-years**	
20W	Kip 160,000	Kip 20,000/month	Kip 10,000/month	Customer pays costs of replacement batteries and of controllers following expiry of one-year warranty period
30W	Kip 190,000	Kip 30,000/month	Kip 15,000/month	
40W	Kip 220,000	Kip 40,000/month	Kip 20,000/month	
50W	Kip 250,000	Kip 50,000/month	Kip 25,000/month	
VHGS				
1 Night Unit	Kip 150,000	Kip 16,000 – D *D = Kip 0 – 4,000 depending on village investment and operating costs. It will usually be Kip <2,000*		A Night Unit represents a supply of one Unit from 18:00-06:00 hours for VH installations and from 18:00-21:00 hours for GS installations One Unit is generally sufficient to supply about 15W. It is the amount of the intake box fuse for the connection
2+ Night Units	Kip 150,000	[Kip 16,000 + Kip 6,000 * (No of Night Units – 1)] – D *D = Kip 0 – 4,000 depending on village investment and operating costs. It will usually be Kip <2,000*		
Day Units	negotiation between VEM and customer	negotiation between VEM and customer		A Day Unit represents a limited supply outside Night Unit hours. Only business customers may be supplied under the Day Unit tariff