

<b>DEMT - DISTRIBUTED ENERGY MANAGEMENT TOOLS IN CAMBODIA AND LAOS</b>				
				<b>PowerDev</b>
	This project is co-funded by the European Union through EC-ASEAN Energy Facility			

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

REE Management Survey - July 2005

Summary Report

EAEF contract n° 98 - 2004

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# 1. DEMT Project Details

## Full Project Title

Distributed Energy: Operational Management Tools in Cambodia and Laos (DEMT)

## Objectives

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;
- 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

## Main project data

Start:	May 2005
End:	May 2006
Total effort:	15.5 man-month
Contracting Authority:	EC-ASEAN Energy Facility
Support:	€ 196,915

## Tasks

- Task 1: Development of Improved Distributed Energy Management Tools
- Task 2: Pilot Installation and Testing
- Task 3: Training and Dissemination
- Task 4: Coordination, Management and Reporting

## 2. Objectives of Survey

The first phase of the Distributed Energy Management Tool (DEMT) project is to survey the capacity and needs of REEs, so that the software tools can be designed appropriately. The specific objectives of the survey were to:

- Determine the level of REE's computer use and ability
- Investigate the variance and characteristics of how REEs manage their business
- Determine the REEs' priorities for assistance with management issues

## 3. Questionnaire Design

The DEMT team designed a simple 3-page survey questionnaire with a total of 50 basic questions for REEs in these 4 main areas:

- a) Business characteristics including of licensed, size, operations etc;
- b) Computer ownership, skills and use;
- c) Customer management and billing operations;
- d) Management of power generation equipment and operations;
- e) Management of power distribution equipment and operations; and
- f) Reporting requirements.

The questionnaire as designed to be conducted by telephone, by relatively un-trained interviewers, but assuming that each subject had received the questionnaire previously and therefore was already quite familiar with the questions and had prepared answers to most of them. It was assumed that the telephone interviews should take no longer than about 20 minutes.

The full questionnaire can be found at Annex B.

## 4. Survey Strategy

The original strategy for conducting the survey was as follows:

- Obtain contact details for 120 REEs holding a current license from EAC (almost the total number);
- Obtain contact details for 50 unlicensed REEs with a geographic representation of approximately 2 from each province;
- Send the questionnaire to each of the selected REEs along with an official cover letter (see Annex A) from MIME to explain the survey objectives and method;
- MIME staff conduct a telephone interview with each REE (contacting them by phone within a certain period and going through the questionnaire).

The team had planned to sample 170 REEs, including 120 with an EAC license, and another 50 unlicensed REEs to represent approximately 2 from each province.

However the sample size was reduced to 87 due to various communication and timing constraints. The most common problems were as follows:

- unreliable telephone network in some areas meaning that contact could not be made with REEs in some areas despite repeated attempts;

- incorrect telephone details most commonly due to changed numbers; and
- some REEs were not willing to participate in the survey (possibly at least partly due to concern about what a government agency might do with the data about their private business).

## 5. Summary of Results

This section discusses some of the relevant outcomes from the survey, while the full statistics from the results of the survey are provided at Annex C.

### Business Characteristics

All of the 87 interviewees were from REEs with current EAC licenses. This is not statistically relevant but is explained by the fact, mentioned previously, that all the non-licensed REEs contacted for this survey were not willing to participate.

The REE owners were responsible for business records and customer billing tasks in 74% of interviewees, while for 16% the wives were responsible and for 10% these tasks were performed by other stakeholders such as children or other staff in the REE.

Of the 90% of interviewees who responded to this question, 51% responded that business was bigger than last year, 31% the same, and 10% smaller. However 44% responded that they are making the same profit as last year, while 27% answered that they are making more profit and 27% said they are making less (3% answered that they “don’t know”).

Figure 1 shows the range in the numbers of customers of the respondents. It is interesting to note that the majority of respondents have less than 500 customers, which is generally small for a rural electrification business. It can be assumed that non-licensed REEs would have a lower average size, and indeed would include some businesses with less than 50 customers.

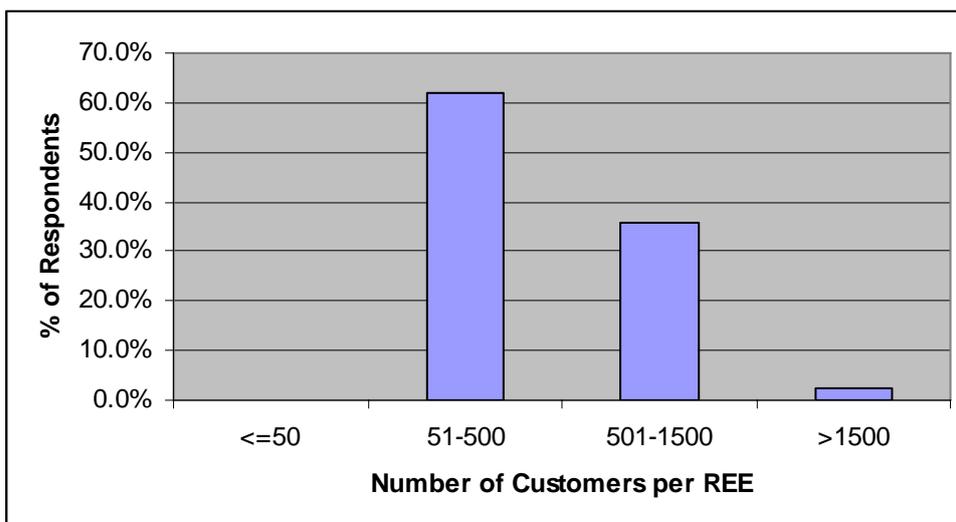


Figure 1: REE Sizes in terms of Customer Numbers

**Computer Use and Ownership**

The results in Figure 2 are particularly relevant for this project. They indicate that almost 40% of respondents currently own a computer, 30% use a computer to help their business, and 57% have someone in their business who can already use a computer.

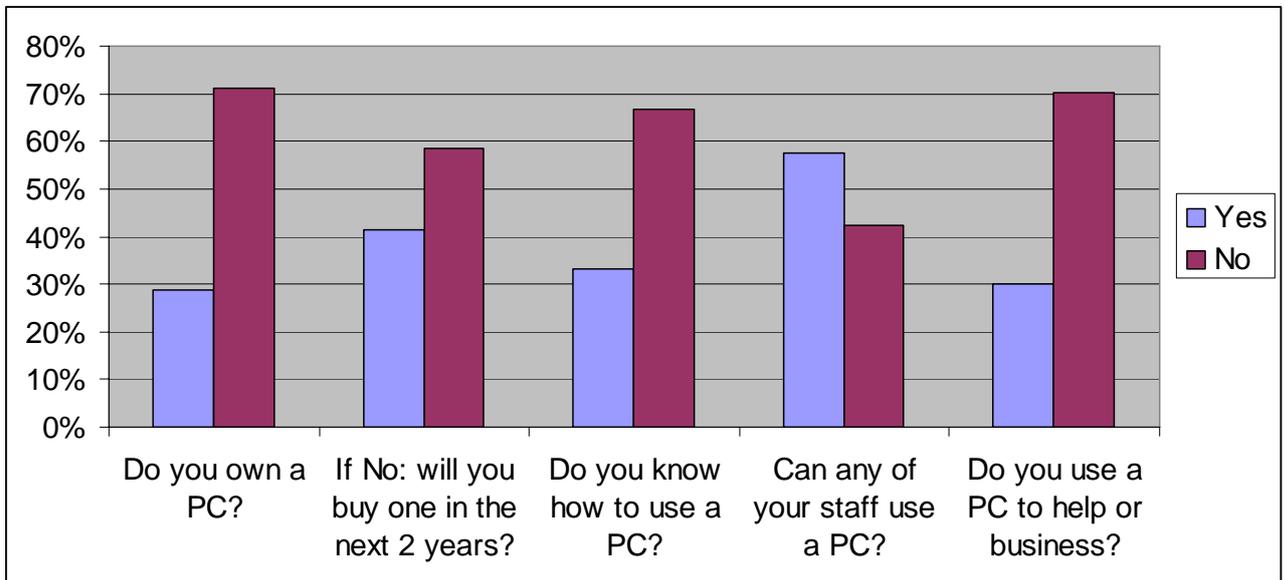


Figure 2: Computer Ownership and Use

**Customer Management and Billing Operations**

There appears to be significant diversity in the way that the respondents manage their customers. It is interesting to see such diversity in the first two indicators because these may suggest more about the attitudes of the REE and possibly also about the nature of their customers. For example an REE that keeps a waiting list of potential customers may be expected to be more ambitious or commercially-inclined than those that don't. Or alternatively it may simply indicate an area where customers have a high demand for electricity services due to higher income etc.

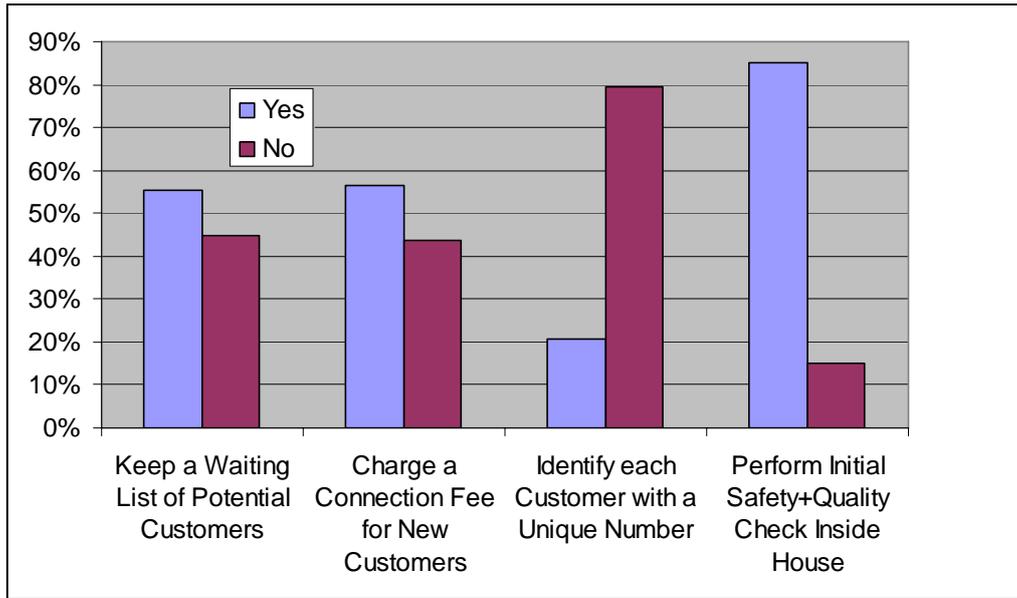


Figure 3: Customer management activities

From the 86% of respondents to a question about customer records, 15% reported that they do not record any information about each of their customers' location, while 39% record a street address and 47% record a 'general direction'. Figure 4 shows that over 60% of respondents have multiple tariff levels for different types of customers, however just 20% report offering alternative tariff structures (eg: a fixed monthly fee).

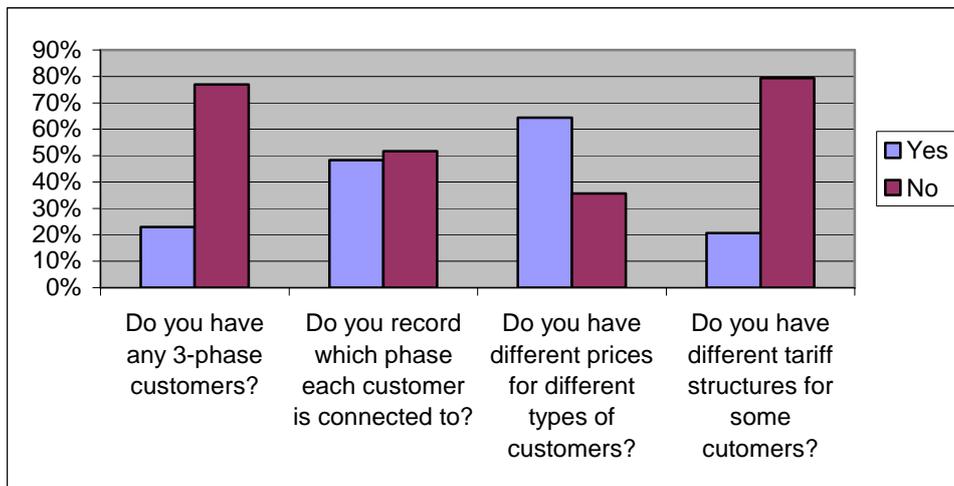


Figure 4: Customer types and tariffs

Most of the respondents (64%) issue bills to customers once per month, while 32% issue them twice per month. Just under half of respondents (46%) allow their customers to pay by installments.

Cambodian Riels are accepted for payment by 86% of respondents while 2% reported accepting US dollars, and 12% reported accepting both. What is unusual here is that no REEs accept Thai Baht, despite the fact that this is very common very most businesses operating in the West and North West of the country. This anomaly suggests that the REEs may have perceived some legal or regulatory ramifications if they admitted to accepting Thai Baht.

**Management of power generation equipment and operations**

One third of respondents own 2 generators, one third have 3, and 17% have more than 3. There was a small anomaly in the responses because although 99% of respondents claimed to have their own generators, in the next question 8% answered that they do not have generators.

The majority of respondents (57%) had a total installed capacity of between 100kW and 500kW, while just 14% had over 500kW installed. The capacity of the generators with respect to the number of customers is shown in Figure 5.

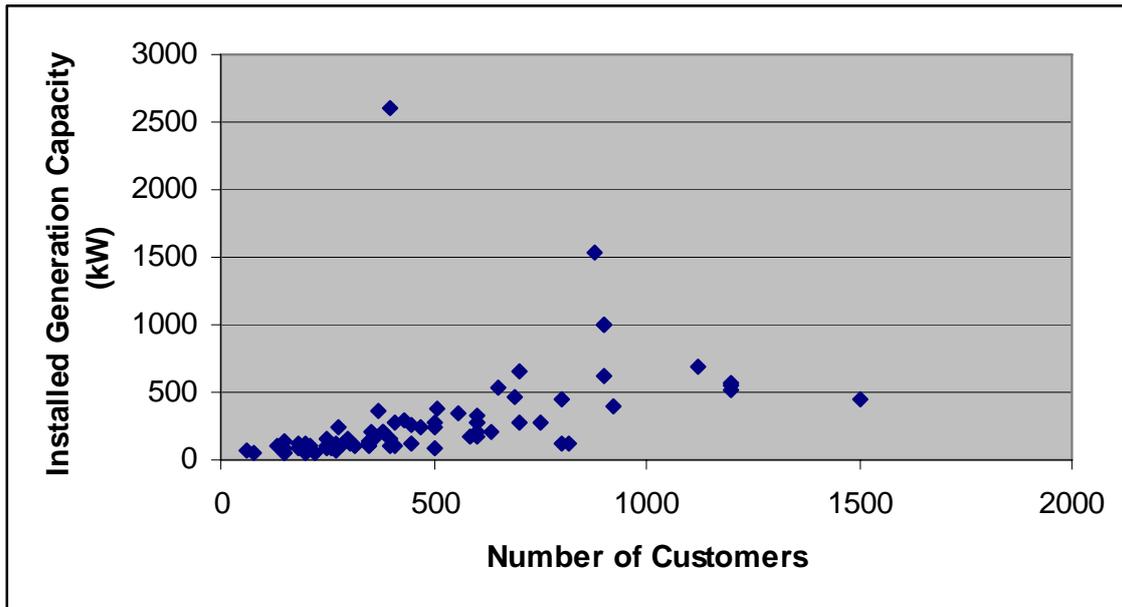


Figure 5: Installed capacity with respect to numbers of customers

It can be assumed that most of these generators use diesel fuel, however 6% of the respondents (91% if sample responded) claim to use more than just one fuel type for their generators.

Most (87%) of the respondents reported having 3 production meters connected to the output of *each* of their generators, while 14% have 2 meters connected and 8% of respondents have none. It is surprising for such a high proportion of these REEs to have 3 meters per generator, which suggests a relatively detailed level of monitoring. Anecdotal and field survey evidence would suggest that many REEs have no production meters to monitor the amount of energy sent to the network.

Other surprising results were that 39% of respondents claimed to record both the production meter readings and the fuel consumption every day, while just over 50% claimed to record it monthly. Around 80% of respondents claimed to record, every month, the consumption of lubricant and the changing of filters. Once again, these figures are surprisingly high, but if true then they indicate a relatively good level of maintenance and monitoring performed by the licensees.

**Management of Power Distribution Equipment and Operations**

Most of the respondents (80%) claimed to have a map or diagram of their REE mini-grid network, and 60% claimed to have a list of all the equipment installed. At first consideration this seems very high, but in fact EAC require this of all licensees and the EAC officers also assist licensees to prepare this information.

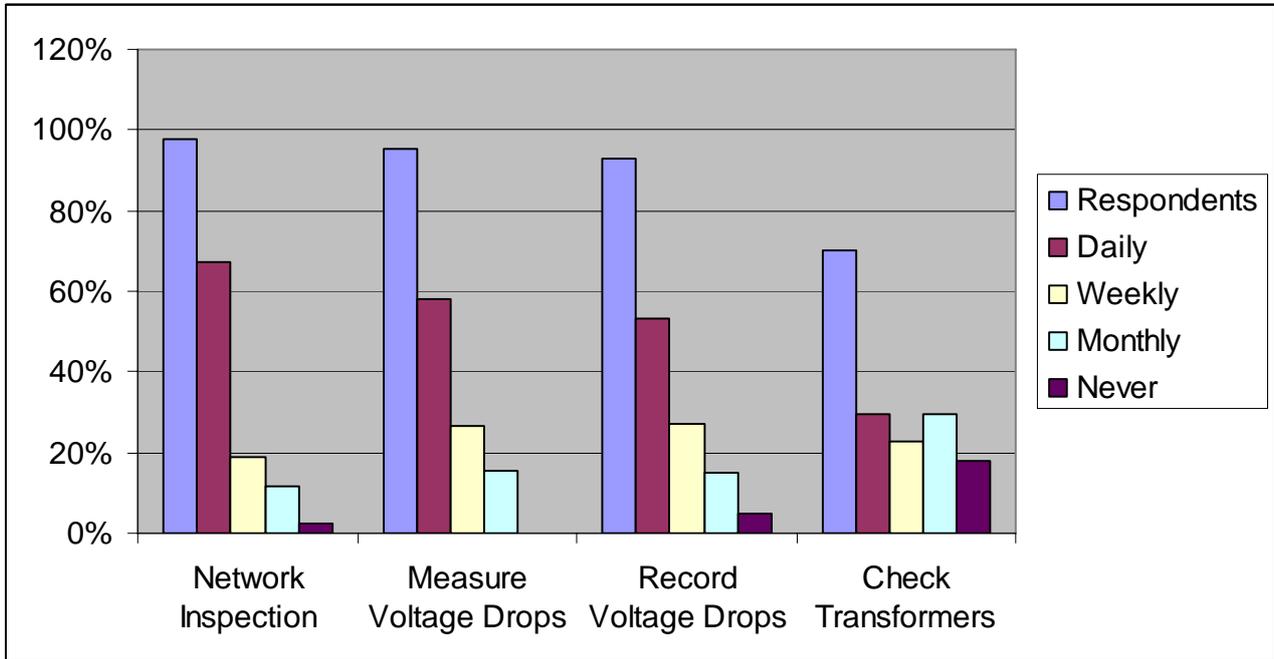


Figure 6: Frequency of Network Management Activities

The results indicated in Figure 6 suggest an unexpectedly high level of network monitoring and recording. It appears that over half of respondents inspect their network, and measure and record voltage drops throughout their network *every day*. This is almost certainly exaggerating the actually frequency of these activities and may be due to confusion about the question or concern among the respondents that their answers may prejudice them in some way.

## 6. Conclusions

This survey has provided a valuable insight into some key issues of management for Rural Electricity Enterprises in Cambodia. The sample size represented around 73% of the total number of REEs holding current licenses from the Electricity Authority of Cambodia. This is statistically valid, however some anomalies in the data suggest that for some questions the interviewees may have feared possible negative implications from their answers.

The survey was designed to also include non-licensed REEs, of which there are thought to be over 600 throughout the country (no definitive study has ever been done), however a combination of communication problems and lack of cooperation from the non-licensed REEs resulted in this group not being included in the survey.

The key results from the exercise, that are relevant for the DEMT project's objective of designing appropriate PC-based management tools could be summarized as follows:

- The non-licensed REEs appear to be very wary about sharing information with government departments;
- Over half of licensed REEs have someone in their business who can use a computer;
- Under a third currently use a computer for business management purposes;
- There is significant variation between REEs with respect to the basic information handling and management procedures used in their businesses, to the extent that any software tool should be able to handle quite different systems; and
- A very high proportion (over 90%) of REEs claim to regularly inspect their network and monitor and record voltage drops which is encouraging with respect to management practices, but the accuracy of these responses needs further confirmation.

The results of this survey should provide valuable input to any program aiming to improve existing REE management practices.

## 7. Annexes

**Annex A – MIME Cover Letter for Survey Questionnaire**

**Annex B – REE Management Survey Questionnaire**

**Annex C – Summary of Survey Results**

## Annex A – MIME Cover Letter for Survey Questionnaire

*<printed on MIME letter head>*

**To: The Owner or Manager**

**Rural Electricity Enterprise (REE)**

**Subject: REE Management Survey**

Dear Sir or Madam,

The Ministry of Industry, Mines and Energy (MIME) is interested to help REEs to improve their business and reduce costs for electricity supply in rural areas. Therefore MIME is participating in a new project called the Distributed Energy Management Tools (DEMT) project. This is being implemented over the next 8 months in both Cambodia and Laos by the IED company, from France.

This DEMT project aims to develop a simple computer system to help small REEs to manage their businesses. It is important that the project team has a good understanding of the REE business, and knows what help REEs may need to manage their business.

To help with this, MIME will conduct a short questionnaire of about 170 REE businesses in Cambodia. The questions are enclosed here for your information, but you do not need to complete this form now. To save you time and effort, our MIME staff will call you to ask your answer for each of the questions. They will call you some time in the week of Tuesday, 24 June and Tuesday 31 June, and the questionnaire should take less than 20 minutes to complete.

We would appreciate your assistance by answering the questions with our MIME staff when they call you. However if you are busy when they call you, or if it is not possible to answer the questions, then please just inform the MIME staff of a more convenient time when they should call back.

Thank you for your assistance with this project.

Yours Sincerely

H.E Khlaut Randy  
Under Secretary of State  
Ministry of Industry, Mines and Energy

Date:

## Annex B – REE Management Survey Questionnaire

<b>Interviewee Name:</b> _____ <b>Role:</b> owner / family / worker <b>REE</b> <b>Location:</b> _____	Interviewer: _____ Phone: _____ Survey Date: _____ Survey Time: _____			
<b>A. General</b>				
1. Are you licensed by EAC?	Yes	No		
2. If no, do you think you will get a licence in the next 2 years?	Yes	No		
3. Who usually does the customer billing and business records for your business?	Owner	Wife	_____	
4. Do you know how to use a computer?	Yes	No		
5. Do you own a computer?	Yes	No		
6. If yes: What version of 'Microsoft Windows' does it use?	W-98	2000	XP	Don't Know
7. If no: do you think you will buy a computer in the next 2 years?	Yes	No		
8. Do you have someone in your business who can use a computer?	Yes	No		
9. Do you currently use a computer to assist with your business management?	Yes	No		
10. If yes, what parts of the business do you use it for?	Billing	(other)		
11. How has your business changed in the past year?	Bigger	Smaller	Same	Don't Know
12. Are you making more profit this year than last year?	Bigger	Smaller	Same	Don't Know
<b>B. Customer Registration</b>				
13. How many customers do you have?	_____			
14. Do you keep a 'waiting list' of customers wanting to register?	Yes	No		
15. Do new customers have to pay you a fee for connection?	Yes	No		
16. Do you have an identification number for each of your customers?	Yes	No		
17. Do you record each customer's name?	Yes	No		
18. How do you record each customer's location?	Street Address	General Direction	None	
<b>C. Customer Connection</b>				
19. Do you check the wiring inside the house for safety + quality before connecting a new customer?	Yes	No		
20. How many different rating sizes for connections do you use? (eg: 10A connection, 25A connection etc)	_____			

21.	Do you have any 3-phase customers?	Yes	No		
22.	Do you record which phase each customer is connected to?	Yes	No		
<b>D. Customer Billing</b>					
23.	Do you have different prices for different types of customers?	Yes	No		
24.	Do you have different tariff structures for some customers (eg: fixed rate plus price per kWh)?	Yes	No		
25.	How often do you read customers' meters each month?	_____ (times per month)			
26.	How many times per month do you issue bills to customers?	_____ (times per month)			
27.	What type of payments do you accept from your customers (Riels, US Dollars, Baht, Other? ____)	Riels	\$	Baht	_____ (Other)
28.	Do you sometimes allow customers to pay by instalments (eg: small part one month and the rest next month)?	Yes	No		
29.	Do you disconnect defaulting customers?	Yes	No		
30.	Do you charge a re-connection fee?	Yes	No		
<b>E. Production</b>					
31.	Does your business have its own generators? (if No, go to part F.)	Yes	No		
32.	How many generators do you have?	x			
33.	What is the total capacity of all your generators (in kVA)?	_____ (kVA)			
34.	How many different types of fuels do you use for your generators (eg: diesel and HFO)?	1	2	More than 2	
35.	How many production meters do you have connected to the output feeder of <b>each</b> of your generators?	None	1	2	3
36.	What factor of current transformer do you have connected to the production meters (eg: 20 times reduction)?	20 times		_____ (other)	
37.	How often do you record the production meter readings?	Daily	Weekly	Monthly	Never
38.	How often do you record fuel consumption?	Daily	Weekly	Monthly	Never
39.	How often do you record lubrication oil consumption?	Daily	Weekly	Monthly	Never
40.	Do you record the changing of filters?	Daily	Weekly	Monthly	Never
41.	Do you record the timing and details of maintenance activities?	Yes	No		
<b>F. Distribution</b>					
42.	Do you have a map of your business mini-grid network?	Yes	No		
43.	Do you have a list of all the equipment installed in your business (eg: transformers, wires, poles, meters)?	Yes	No		
44.	How often do you inspect your network for problems?	Daily	Weekly	Monthly	Never

45.	How often do you measure the voltage level throughout your network?	Daily	Weekly	Monthly	Never
46.	How often do you record the voltage levels throughout your network?	Daily	Weekly	Monthly	Never
47.	Do you record information about network failures?	Yes		No	
48.	If you have some transformers, how often do you check them	Daily	Weekly	Monthly	Never
<b>G. Reporting</b>					
49.	What information would you like to be able to produce easily for your business? (eg: which customers have not yet paid their bill, ...)	x			
50.	Do you ever need to produce information about your business for other people? (eg: EAC, Tax, MIME, other)	x			

### Annex C – Summary of Survey Results

	Sample Size	87											
Qu.	Respondents												
1	licenced by EAC?	100%	87										
2	If no, do you think you will get a licence in the next 2 years?												
3	Who usually does the customer billing and business records for your business? (owner, wife, other...)	93%	Owner: 74%	Wife: 16%	Other: 10%								
4	Do you know how to use a computer?	100%	Yes 33%	No 67%									
5	Do you own a computer?	100%	Yes 29%	No 71%									
6	If yes: What version of 'Microsoft Windows' does it use?	29%	win XP 64%	win 2000 4%	win 98 28%	don't know 4%							
7	If no: do you think you will buy a computer in the next 2 years?	100%	Yes 41%	No 59%									
8	Do you have someone in your business who can use a computer?	100%	Yes 57%	No 43%									
9	Do you currently use a computer to assist with your business management?	100%	Yes 30%	No 70%									
10a	If yes, what parts of the business do you use it for?	28%	Billing 85%										
10b	if other : description of other use	90%	Report' 1										
11	How has your business changed in the past year?	90%	Bigger 51%	Same 38%	Smaller 10%								
12	Are you making more profit this year than last year?	91%	Bigger 27%	Same 44%	Smaller 27%	Don't know 3%							
13	How many customers do you have?	97%	<=50 0.0%	51-500 62%	501-1500 35.7%	>1500 2.4%							
14	Do you keep a 'waiting list' of customers wanting to register?	100%	Yes 55%	No 45%									
15	Do new customers have to pay you a fee for connection?	100%	Yes 56%	No 44%									
16	Do you have an identification number for each of your customers?	100%	Yes 21%	No 79%									
17	Do you record each customer's name?	100%	Yes 99%	No 1%									
18	How do you record each customer's location?	86%	Street Address 39%	General Direction 47%	None 15%								
19	Do you check the wiring inside the house for safety + quality before connecting a new customer?	100%	Yes 85%	No 15%									
20	How many different rating sizes for connections do you use? (eg: 10A connection, 25A connection etc)	100%	0 26%	2 60%	>2 14%								
21	Do you have any 3-phase customers?	100%	Yes 23%	No 77%									
22	Do you record which phase each customer is connected to?	100%	Yes 48%	No 52%									
23	Do you have different prices for different types of customers?	100%	Yes 64%	No 36%									
24	Do you have different tariff structures for some cutomers (eg: fixed rate plus price per kWh)?	100%	Yes 21%	No 79%									
25	How often do you read customers' meters each month?	100%	0 5%	1 72%	2 23%								

26	How many times per month do you issue bills to customers?	100%	0	3%	1	64%	2	32%					
27	What type of payments do you accept from your customers (Riels, US Dollars, Baht, Other? ____)	99%	Riels	86%	Dollars	2%	Riels + \$	12%	Baht	0%			
28	Do you sometimes allow customers to pay by instalments (eg: small part one month and the rest next month)?	100%	Yes	46%	No	54%							
29	Do you disconnect defaulting customers?	100%	Yes	87%	No	13%							
30	Do you charge a re-connection fee?	100%	Yes	40%	No	60%							
31	Does your business have its own generators? (if No, go to part F.)	100%	Yes	99%	No	1%							
32	How many generators do you have?	100%	0	8%	1	8%	2	33%	3	33%	>3	17%	
33	What is the total capacity of all your generators (in kVA)?	100%	<100	28.7%	100 - 500	57%	>500	13.8%					
34	How many different types of fuels do you use for your generators (eg: diesel and HFO)?	91%	1	95%	2	3%	>2	3%					
35	How many production meters do you have connected to the output feeder of each of your generators?	87%	1	14%	2	1%	3	76%	none	8%			
36	What factor of current transformer do you have connected to the production meters (eg: 20 times reduction)?	66%											
37	How often do you record the production meter readings?	92%	Daily	39%	Weekly	8%	Monthly	51%	Never	3%			
38	How often do you record fuel consumption?	91%	Daily	39%	Weekly	6%	Monthly	52%	Never	3%			
39	How often do you record lubrication oil consumption?	90%	Daily	14%	Weekly	6%	Monthly	77%	Never	3%			
40	Do you record the changing of filters?	89%	Daily	6%	Weekly	6%	Monthly	81%	Never	6%			
41	Do you record the timing and details of maintenance activities?	100%	Yes	67%	No	33%							
42	Do you have a map of your business mini-grid network?	100%	Yes	80%	No	20%							
43	Do you have a list of all the equipment installed in your business (eg: transformers, wires, poles, meters)?	100%	Yes	60%	No	40%							
44	How often do you inspect your network for problems?	98%	Daily	67%	Weekly	19%	Monthly	12%	Never	2%			
45	How often do you measure the voltage level throughout your network?	95%	Daily	58%	Weekly	27%	Monthly	16%	Never	0%			
46	How often do you record the voltage levels throughout your network?	93%	Daily	53%	Weekly	27%	Monthly	15%	Never	5%			
47	Do you record information about network failures?	100%	Yes	57%	No	43%							
48	If you have some transformers, how often do you check them	70%	Daily	30%	Weekly	23%	Monthly	30%	Never	18%			
49	What information would you like to be able to produce easily for your business? (eg: which customers have not yet paid their bill, ...)	23%	<see list>										
50	Do you ever need to produce information about your business for other people? (eg: EAC, Tax, MIME, other)	38%	<see list>										