

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

Specification of Stakeholder Requirements For REE Management Tool

Cambodia, 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.
- 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;
- 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. 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 REEs should be improved with the use of an appropriate software tool that simplifies and reduces the time and cost of standard REE functions; while also providing the REE with better information for business decision making.

The methodology and main activities of the project can be summarised in the following 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 in the use of the new tool.

In Cambodia this 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.

This project is being implemented simultaneously in Lao PDR where the partner is the Ministry of Industry and Handicrafts (MIH). The situation of rural electricity service provision in Lao PDR has some differences to that in Cambodia, most significantly the absence of a large number of privately owned diesel mini-grids. There are however a large number of rural communities that are supplied by individual solar home systems or village pico-hydro units. A new World Bank funded project will soon greatly expand the number of such communities, and the private operators that manage them.

Consequently for Lao PDR the partners have agreed to develop a management tool focussed on the needs of the small Provincial Energy Service Companies (PESCOs) that provide these services.

The lessons and experiences will be 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 Rural Electricity Enterprises (REEs).

The specific purpose of this document is to accurately convey these requirements to a software programmer who is tasked with designing an appropriate REE 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:

> Mr Andrew Williamson DEMT Team Leader Telephone: +855 (0) 12 564 085 Email: <u>wil@mobitel.com.kh</u> Post: P.O Box 920 Phnom Penh, CAMBODIA

3. Defining Target Users

In Cambodia target users of the REE Management Tool are Rural Electricity Enterprises (REEs), that can be defined as private businesses operating in rural areas of Cambodia whose main business activity is the generation and, or, distribution of electricity. There is a wide range of sizes amongst REEs, from small single proprietor businesses operating in small rural villages, up to relatively large commercial operations with thousands of customers and large modern generators. There is no accurate and current data on Cambodia's REEs, however some reports have estimated that there may be over 600 REEs in total.

The Electricity Authority of Cambodia (EAC) is responsible for licensing REEs and ensuring their compliance with various licence conditions. EAC reports that there are currently 120 REEs that hold a valid licence for generation, distribution, or both (a consolidated licence).

The primary target users for the REE Management Tool will be REEs that meet the following criteria:

- a) Privately-owned businesses;
- b) hold a valid Generation, Distribution or Consolidated licence from EAC;
- c) have more than 100 customers and less than 2000 customers;
- d) have a staff member available to learn and use the tool who can read and write in Khmer and is familiar with basic use of a computer; and
- e) are interested to implement a new tool to try to improve the management of their business.

It is considered important for the target REEs to be already licensed because the tool is expected to provide them the most benefit. In addition the EAC tariff regulations should

help to ensure that the benefits of any efficiency improvements achieved through the use of the tool will be shared with rural electricity customers. There are 120 licensed REEs (in June 2005) and it is expected that at least one third of these meet the above criteria.

A group of secondary target users for the REE Management Tool consists of those REEs that met the same criteria as above, but are not licensed by EAC. These are considered an important user group because they represent the majority of REEs and are expected to become licensed in the near future. There is no accurate estimate available for the number of REEs in this group, but it is likely to be around 500.

4. **REE Business Functions**

The business functions common to all REE businesses can be summarised into the five main categories listed below. Note that this list assumes both generation and distribution activities, but is also partly relevant for REEs that only either generate or distribute power.

- 1. **Customer Registration** adding a new customer to the REE business and recording their status (eg: some REEs register as soon as they express interest, and are placed on a waiting list until they are physically connected to the REE's distribution system.
- 2. **Power Generation** operating the generators to supply the customer demand, optimising the design and condition of equipment to maximise efficiency and reliability, and performing maintenance as required;
- 3. **Power Distribution** designing and installing the distribution system to deliver demanded electricity to households, performing routine and emergency maintenance in order to maximise safety, reliability and efficiency
- 4. **Customer Billing -** record customer use for each billing period, calculate bill, produce printed bill, deliver to customer, collect payment, and monitoring payment performance, take action if the account is not paid within a certain period
- **5. Reporting** provide regular business information to various stakeholders including EAC (it is one of the licence conditions)

The detailed REE activities required for each function are described in the following table. This table also classifies each activity as either essential, an EAC licensing requirement, or as non-essential with respect to the facilitation/management of the activity by the REE Management Tool. In other words, how important is it that each particular activity is covered by the new REE Management Tool in order for it to be useful.

Each activity is also classified as either 'universal', meaning that the majority of REE businesses currently perform this activity, or not.

Task and Activity	Description	Essential?	Universal?
1. Customer Registration			
Maintain waiting list of potential customers	 When a new potential customer asks to be connected to the network then an REE staff member adds their details to a waiting list (date, name, telephone number, code identifier*, location*, type of customer*) 	Yes	No
Maintain a list of existing customers	 When a new customer is connected to the REE network then an REE staff member adds their details to the list of active customers, and removes them from waiting list (date, name, telephone number, code identifier*, location*, type of customer*, feeder connection*, power rating*, if 3 phase*) 	Yes	Yes
Remove customers that are disconnected	 When a customer is disconnected from the REE network for any reason an REE staff member notes their change of status on the list of active customers (date, reason for disconnection*) 	Yes	Yes
2. Power Generation			
Record operating hours of engines	 At the start and end of each supply period each day an REE operator records the actual daily operating hours for each engine and generator (date, time, engine identifier, engine hours, generator identifier, generator hours) 	EAC	No
Record daily engine performance characteristics	 Each day during each supply period an REE operator records daily engine performance characteristics (date, time, engine identifier, fuel consumption, operating hours, exhaust temperature, cooling water temperature, air temperature, lubricating oil volume) 	EAC	No
Record daily generator	 Each day during each supply period an REE operator records daily 	EAC	No

performance characteristics	generator performance characteristics for each phase (date, time, phase number*, electrical power, current, voltage, frequency, power factor)		
Record details of breakdowns or problems with engines or generators	 When a breakdown or problem is identified in an engine or generator then an REE operator records the details of the problem (date and time of incident, description) 	EAC	
Record details of repairs to engines or generators	 When a repair must be made to an engine or generator an REE operator records the details of the work (date and time of repair work, description, duration of work, duration of network outage, cost of spare parts and consumables, name of REE operator that does the work*) 	EAC	No
Record details of any planned maintenance performed	 When any planned maintenance activities are performed on an engine or generator an REE operator records the details of the work (description, time+date, duration of work, duration of network outage, description and cost of spare parts, description and cost of consumables, name of REE operator that does the work*) 	EAC	No
Record details of any fuel purchases	 When fuel is purchased for the engines an REE staff member records the details (date, fuel type, quantity, supplier, price) 	EAC	No
Record details of any lubricating oil purchases	 When lubricating oil is purchased for the engines an REE staff member records the details (date, fuel type, quantity, supplier, price) 	EAC	No
Record details of any purchases of other consumables	 When other consumable items are purchased for the engines an REE staff member records the details (date, description of consumable, quantity, supplier, price) 	EAC	No
3. Power Distribution			

Record technical details of new connections	 When a customer is connected an REE operator records the details of the connection (customer name, customer identifier*, address*, meter box identifier*, transformer identifier*, feeder identifier*, maximum current rating, 3- phase or Single Phase*) 	EAC	No
Record energy sent to the REE network	 At the start and end of each supply period each day an REE operator records the energy output to each phase and each feeder of the REE network (date, time, feeder identifier*, phase number*, energy output meter reading) 	EAC	No
Record daily performance characteristics of the REE network	 Each day during each supply period an REE operator records daily performance characteristics of the REE network (date, time, feeder identifier*, phase number*, current, voltage, frequency, power factor) 	EAC	No
Record any changes to the REE network	 When the REE network is changed an REE operator records the changes made (date, nature of the change, location of the change, length of conductor installed or removed, rating of conductor installed or removed, if conductor is bare or insulated) 	EAC	No
Record performance characteristics throughout the network	 Regularly an REE operator measures and records performance characteristics at a number of locations throughout the REE network and preferable during peak the load period (date, time, location, feeder identifier*, phase number, voltage level, current, frequency, power factor) 	EAC	No
Record incidents of network faults	 When there is a fault discovered in the REE network an REE staff member records the details (date, time, location, description) 	EAC	No
Record any network repairs conducted	 When a fault in the REE network is repaired an REE operator records the details of the work (date, time, location, description of repairs, duration of work, duration of network outage, cost of spare parts and consumables, name of staff member that does work*) 	EAC	No

4. Customer Billing			
Read customer's meters	 At the end of each billing period an REE staff member visits every consumption meter and records the reading (date, time, customer name or identifier*, location*, meter identifier*, reading, name of REE staff member) 	Yes	Yes
Calculate customer consumption and fee	 After recording the customer meter readings the REE staff member returns to the REE office and calculates the consumption and cost for each customer (name of customer, customer identifier*, billing period start date, billing period end date, old meter reading, new meter reading, total consumption over the billing period, price per kWh, total bill for the billing period) 	Yes	Yes
Produce customer bills	 After calculating the consumption and cost for each customer, an REE staff member produces a bill for each customer (name of customer, customer identifier*, number of bill*, billing period start date, billing period end date, payment due date, old meter reading, new meter reading, total consumption over the billing period, price per kWh, total bill for the billing period, outstanding balance*, total due*) 	Yes	Yes
Record customer payment	 When a customer makes a bill payment the REE staff member records the details of the payment and issues the customer a receipt (date, time, customer name or identifier*, old total due*, total paid, new total due*, new payment due date*, receipt number, REE staff member name) 	Yes	Yes
Remind customers with overdue payments	 When the payment due date lapses for any customer and the customer fails to make the defined minimum payment then an REE staff member will contact the customer to enquire about payment (date, time, customer name or identifier*, total due*, total paid, REE staff member name, comments) <if payment is made then links to previous activity></if 	No	No

Disconnect customer	 After a further defined grace period, if any customer fails to make the defined minimum payment or meet any conditions agreed in the follow-up phone call, then an REE staff member will physically disconnect the customer from the REE network by disconnecting the wires inside the meter box (date, time, customer name or identifier*, REE staff member name, customer status*, comments) 	Yes	No
Re-connect customer	 When a previously disconnected customer pays an agreed minimum of the amount due and/or complies with agreed conditions then an REE staff member will physically re-connect the customer to the REE network by reconnecting the wires inside the meter box (date, time, customer name or identifier*, REE staff member name, customer status*, comments) 	No	No
5. Reporting			
Internal REE management report	 Regularly the REE Manager will calculate and record general performance characteristics of the REE business (date, the period that the report refers to, total number of customers, number of customers of each type*, total new customers connected for the period, total number of customers disconnected during the period, total value of bills issues for period, total bill payments collected during period, name and details of customers with overdue bill payments, average energy losses for the period, total costs for the period, net revenue for the period) 	EAC	No
EAC Licence application information	 When the REE first applies for an EAC licence and REE operator records the following general information and submits it to EAC (date, REE Business Name, REE Licensee Applicant, Type of license applied for, REE full location details, REE contact details, Technical specifications of each engine and generator, Full technical specifications of REE network, number of customers, average energy sold per year, proposed electricity tariff(s), capital cost and 	EAC	No

	age of all equipment, running costs of business,)		
Annual EAC licensee report	 Once per year the licensed REE must submit a full report to the EAC (Licensee Number, Licensee name, type of license, full location details; For Each Generator: full technical specifications, fuel and oil consumption, costs, repairs, and output characteristics; For REE Network: full technical specifications for conductors, transformers and poles). 	EAC	No

Notes:

• 'Essential' denotes that either it is an essential element of majority of REE businesses today, OR it is an essential requirement of the relevant government regulator, such as EAC

• Two types of REE staff are defined here: REE Staff, who can be any person working in the business including the owner, technical staff and administrative staff; REE Operator refers to the technical staff only, REE Manager refers to either an on-site manager or the owner.

• The parameters marked with asterix are not common to all REE businesses

5. REE Stakeholders and Information Flows

The main stakeholders in most REE businesses can be summarised and classified as either internal to the business, or external, as follows:

A. Stakeholders within REE			
Owner(s)	owner of the business (an individual, or group of people)		
Operator	the manager/operator employed by the owner to run the business		
Technical Staff	employees who perform technical tasks relating to generation and distribution of power		
Billing Staff	employees who visit each customer to read meters, issue bills and receive payments		
Accountant	employee who performs all book keeping and financial reporting activities		

B. Stakeholders outside REE			
Customers	customers of the REE		
Fuel Supplier(s)	suppliers of fuel to the REE		
Other Suppliers	suppliers of equipment, parts and other		
EAC	electricity Authority of Cambodia		
MIME and DIME	Ministry of Industry, Mines and Energy + provincial departments		
Financier(s)	bank, micro-credit agency, family members, investors etc		
MEF	the provincial taxation departments of the Ministry of Economy and Finance		

Annexe 1

The flow of information between the external REE stakeholders is represented in the matrix below.

To From	REE	Customers	Fuel Suppliers	Other Suppliers	EAC	МІМЕ	Financier
REE		Bills Receipts	Payment	Payment	Licence application Annual report	General reports on request	Repayments Dividends Financial reports
Customers	Regist. details Payment						
Fuel Suppliers	Invoice						
Other Suppliers	Invoices						
EAC	Licence Tariff rate Formats						
MIME	Operating Permission				Policy Regulations Law		
Financier	Funding						

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 REE Management Tool if possible. These are described in the following table.

REE Management Tool Interface			
Language	Khmer language throughout (using Khmer 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 REE 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.		
REE Management Tool Ou	utput		
EAC Requirements	The output forms shall comply with any relevant EAC licence requirements, such as contents and format of customer bills and reports to EAC.		
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 REE's operating costs.		
Integrated Forms	Where possible relevant information will be combined onto a single form in order to further save production costs, eg: the customer bill should include a customer receipt section that can be completed by hand, torn-off and handed to the customer when a bill is paid.		
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 than sending it directly to a printer. This will allow REEs 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 REE Manage	ement Tool		
Initial Set-up	The user should be clearly prompted to define standard parameters and preferences during the first use of the tool. Such parameters would include basic technical specifications such as number, type and capacities of gen- sets; and defining any grace period allowed prior to		

	Annexe 1
	disconnecting a customer for not paying bills. The set-up process should be simple for standard users, but allow as much flexibility as possible for REEs with different management and reporting needs.
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 REE 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	А
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></none>
Currency	Cambodian Riels	R
	US Dollars	\$
Liquid Volume	Litres	
	Gallons	G
Temperature	Degrees Celsius	°C
Distance	Metres	m

Acronym	Term
DEMT	Distributed Energy Management Tools
DIME	Department of Industry, Mines and Energy (provincial)
DO	Diesel Oil
EAC	Electricity Authority of Cambodia
EdC	Electricité du Cambodge
HFO	Heavy Fuel Oil
MEF	Ministry of Economy and Finance
MIME	Ministry of Industry, Mines and Energy
REE	Rural Electricity Enterprise

ANNEX A. PROCEDURES FOR BILLING AND PAYMENT

Here are some samples of the procedures requested by the REE business that will be assisted by the software tool.

Billing procedure



Payment collection process



ANNEX B. GENERAL ORGANISATION OF INTERFACES WITHIN THE APPLICATION

(Next page) schematic organisation of the 5 main modules :

- Customer registration
- Customer billing
- Power distribution
- Power generation
- Reports

Nota: in the interfaces document, the modules customer registration and customer billing are mixed together.



DEMT REE Management Tool Specifications

ANNEX C. SOFTWARE INTERFACE DESIGN

C.1 Main screen

C.1.1 Screen F1 : main menu



This screen is the main menu which leads to the 5 main screens.

On this screen, the enterprise name, phone number, manager name and logo or picture of the REE can be fully customised within the parameters menu.

C.2 Access to parameters and customization of the application.

Different parameters are set by default in the delivered application but can be modified in the interfaces available in the "tool setup" option of the main menu.

Annexe 4

C.2.1 Screen FP : Menu for parameters

application parameters	- 🗆 🛛
list of customer classes	
list of inputs types	
list of tariffs classes	
Enterprise description	
currencies used	1.00
application setup	₽•

C.2.2 Screen FP4 : Enterprise description

Allow to modify the description of enterprise and the currency used (from the currency list defined in the screen FP5). A new logo can be dragged in the picture box.

■ A_REE		🖃 🗖 🔀
REE_name	Name of the Enterprise	logo
adress	address of enterprise	
phone	phone number	
manager_name	manager name	
Currency used by default	Riels 💽	
<u>_</u>	· <u>»</u>	

The currency used by default is selected from the currency list (screen FP5, cf C.2.5 p23); It is set only one time at the first setup as every money input will be stored in the database using this currency. This parameter is enabled while no input has been entered in the database.

C.2.3 Screen FP2 : list of inputs types

List of the different type of inputs (spare parts or consumables) that can be bought for the REE business. These elements are provided as a pick-list to the user when recording items bought for a repair or maintenance purpose.

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type name	spare / consumable	further description	distribution / generation
oil filter	consumable		generation
join	consumable		generation
water pipe	spare part		generation
wire 15mm	spare part		distribution
wire 25mm	spare part		distribution
3			
	fur	ther description	

C.2.4 Screen FP3 : list of tariffs classes

of tariffs classes				
customer class	tariff per kWh	connection tariff	connection capacity (A):	flat rate per month:
normal class	238	1000	5	1000
high consumer	198	1000	15	5000
entreprise	160	500	50	10000
low consumption	500	50	1	500
"+"	B	_	_	_
add a new class	lass normal cla	105		
add a new class customer c tariff per K	lass normal cla V 23	iss:		
add a new class customer c tariff per k ³ connectior	lass normal cla V 23 Itarifi 100	100 5 5 7 7		
add a new class customer o tariff per R connection	lass normal cla v 23 htarift 100	155 5 1 7 7	Th	is frame appears when
add a new class customer of tariff per k ¹ connection	lass normal cla V 23 tariff 100	1000 T	Th	is frame appears when ord is added by clickir
add a new class customer o tariff per k connection	lass normal cla V 23 o tariff 100		Th rec "ac	is frame appears when ord is added by clickir dd" button or for a moo

List the different tariff class used by the enterprise (not limited)

C.2.5 Screen FP5 : currencies used

Currently only used for Riel and Dollars to record the conversion rate and allow some payments in the 2 currencies.

"add" button or for a modification

of the selected record.

Annexe	4
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🖽 correncies o	sed	_ 🗆 🛛
currencyName currencySymbol	Riels R	
Value in Dollars	1	0,008
*** <u>*</u>	2	

C.2.6 Screen FP6 : application setup

Automatically opens at the first use of the application to allow the user to select the desired options so that non-essential options are hidden and the application appearance is simplified.

This interface allow the user to choose among the following management options :

- Use of medium voltage devices? (if set to no, all the sections concerning the transformers MV/LV are hidden)
- Record the daily performance at the input of the network^{*}? If this option is chosen, the tracking of Voltage and current is compulsory but another option to select is the tracking of current and power factor.
- Record the daily performance along the network^{*}? If this option is chosen, the tracking of Voltage and current is compulsory but another option to select is the tracking of current and power factor.
- Record the list of spare parts and consumables purchased during the maintenance and repairs operations for distribution and generation modules^{*}? (if set to no, just a text description of the operation will be recorded on each operation)
- Record regular genset checking^{*} (operating hours, temperatures...)^{*}?
- Simple bill consultation (if set to yes: the frame with the buttons "for the selected customer for the billing period" is hidden, the payments record, bills and balance can only be checked for all the customers listed). Acceptable for small REEs.
- Allow to record extra expense for the customers (like extra electric appliances, wiring checking...)
- Location of customer: by X/Y square grid, by street address or both.
- Credit practical details :
 - Credit allowed or not? [default=Yes]
 - If allowed, for which items? (installation fee / monthly consumption charges / extra services) [default= installation fee and monthly consumption charges]
 - Maximum amount allowed (ie :the maximum negative balance before the REE refuses to provide more credit until payments are made, or disconnects customer) [default=no limit],
 - maximum number of payment periods with zero repayment allowed [default=no maximum],
 - interest rate per period (the rate at which the customer is charged for outstanding balances) [default=0%]

^{*} if set to no, the application is not EAC compliant and the EAC report will be incomplete

^{*} if set to no, the application is not EAC compliant and the EAC report will be incomplete

C.3.1 Screen FCr1 : View or modify customers



Annexe 4

C.3.1.1 screen FCr2 : Register a new Customer

this screen is available in 2 modes :

- Modification : the data of the selected customer appear in the text boxes and are modifiable
- Adding : the boxes are blank, the user enters the data for the new customer and when he cliks on "OK", a new customer_id is generated automatically. As for all forms, A data entry check is performed for each textbox.

Castonici registration	
customer_id [NuméroAuto]	Connection state
name	C connected This area is
address	waiting for connection
	C disconnected for non payment purpose : (not modifiable)
phone	C disconnected for other reason
registration_date	Connect this custommer
customer class	Reconnect this custommer
location record location	Disconnect this custommer
	Delete this custommer
Save modifications Cancel modifications	ł
	🗉 villidation
	do you really want to delete that customer and to free the meter ?
	YES No

- the list control customer class lists all the value of the table "C_customerClass" that can be modified within the screen FP1
- in adding mode, the following radio buttons controls "connection state" are enabled (the others are disabled) :
 - \circ connected
 - waiting for connection
- in modification mode, all the radio buttons controls are enable except when the customer has been connected : the state "waiting for connection" is disabled.

If the value of "connection state" is set to "waiting for connection" then the customer is added to the waiting list.

If the customer was waiting for connection and the radio button "connected" is pressed, then the screen FD1 opens to record the connection details when the modifications are saved for this customer.

If the customer was connected and the radio button "disconnected for non payment" is pressed, then the screen FCr3 with "disconnected for non payment" written in the textbox "reason for disconnection" opens when the modifications are saved for this

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customer. Idem with the "disconnected for other reason" option but with a blank case in "reason for disconnection".

The "record location" button open the following screen as a pop-up :

ES Location		
X grid position	0	
street adress		
House description (and special landmark near this location)		
	1	4

depending of the initial setup options, we can record the location of a particular customer either by his position on a square grid, by his street address and optionally by a description of a particular landmark close to his house.

C.3.1.2 Screen FCr3 : Customer disconnection

🖼 customer disconnection		
Name of customer : Sven Ottlieb		Enabled only in case of a "disconnection for other reason". Overwise, disabled this control and fill it automatically with : "non payment"
reason for disconnection		
staff member who has done the	<u>.</u>	
<u> </u>	<u></u>	

Annexe 4 C.3.1.3 Screen FCr4 : Customer reconnection

customer reconnection	
Name of customer : Sven Ottlieb	
disconnection date 12-oct-04	
reason for non payment disconnection	
disconnection staff: bob	
reconnection date 13-nov-04	
reconnection staff john 💽	
9 3	P •

C.3.1.4 Screen FD1 : connection details

This screen allow to link a customer with a meter when the connection is done. The meters lists in the meter code are non connected meters. When a new meter is connected, the installation date can be entered (by default : it's set to the current date).

By clicking on "delete this user and free the meter", the connection with the meter and the customer is removed forever within the database and he customer is deleted (warning message before).

By clicking on search meter, the box under this button appears and let the user choose a meter on a particular feeder, line and meter box.



Annexe 4 C.3.2 Screen FCb0 : Billing and payments

	connected customer	S show all the connecte	ed customers			date : 10/08/	/2005
search by customer code or name :		Show only the custom	ers meeting the	ese conditions		billing period :	
	#	restrict list to that feeder :		그 🕅 limit to o	verdues bills	nº6 from 01/03/	/2000 to 30/03/2000 🔄
earch b	oy meter code :	restrict list to that meterbo		restrict by tariff class :	<u> </u>		
	<u>#9</u>	restrict list to triat meterbo					
e, select	a customer in this list :	nhono customor clas	es motor code	roading date	concumption invo	ico dato consumption	hillor axtra avnancee auteta
D1	Eliane No:	0921-12 34 normal class	A2/2/A105	e reading date	consumption invo	ice date consumption	billet extra expenses buist
C2	Paula Wils	(5) 555-472 entreprise	A1/2/A103	21/07/2005	200		
C4	Regina Mu Ropo Rhill	(71) 555-77 high consum	A1/2/A104	21/07/2005			
C1	Sven Ottlie	030-007432 normal class	A2/1/A101	12/02/2004	245		
	Report A1	•					Report A3
the sel ecord c and oth	lected customer for the billin consumption ler expenses record pay	record rement for all customers print the meter reading sheet record consumption	listed here for t record payr billing summ report	this period : ment ary overdun repo	Il bills for all for billing - the bills custon	sted customers for all per summary overdue bi aport report ner details report from the list	rinds:
the sel ecord c and oth	lected customer for the billin consumption er expenses record pay	ng period : bill for all customers print the meter reading sheet record consumption	listed here for t record payr billing summ report	this period : ment issue a ary overdu reput	Il bills for all for billing e bills custon	sted customers for all per summary overdue bi sport report ner details report from the list	
the sel	dected customer for the billing issue the record pay	ng period : bill for all customers print the meter reading sheet record consumption	listed here for t record payr billing summ report	this period : nent issue a overdua reput t A2	Il bills for all fing bills bills re bills custon	sted customers for all per summary overdue bi report report ner details report from the list	rinds : t t tomer detail
be see ecord c and oth By pe fre to ccc	y default, when eriod (<i>the curre</i> om <i>the A_REE</i> customer infor	ng period : print the meter reading sheet record consumption this form is open ent billing period is table). But the us rmation for this pa g the selected period	n, the bill record payr Report Report a, the bill s recorde ser can s articular priod will b	this period : issue a issue a overdur reput t A2 ing period ed in the select and period. O be listed h	d is set to t <i>"currentPer</i> other period nly the cus here.	he current riod" field d to access	tinds: tomer details customer details report sort the list by: Customer code Customer name Connection status Connection status Customer dass preview the report print the report
By pe fre to ccc Th st	y default, when eriod (<i>the curre</i> om <i>the A_REE</i> o customer infor onnected during he list shown in ratus :	this form is open ent billing period is table). But the us rmation for this pa g the selected period the interface give	a, the billing summer of the billing summer	this period : inserved with reported to the first of the	d is set to t <i>"custon</i> " "custon" "custon" "custon" other period nly the custon here.	he current riod" field to access stomers billing	rieds : t t t t t t t t t t t t t
By pee free to ccc Th sta	y default, when erexpenses y default, when eriod (<i>the curre</i> o <i>m the A_REE</i> o customer infor onnected during he list shown in atus : • Name, Ac • Tariff clas • Meter coc	a this form is open ent billing period is table). But the us mation for this pa g the selected per the interface give ddress, phone	n, the bill record payr Report n, the bill s recorde ser can s articular priod will b es an ov	this period : issue a ing period t A2 ing period period. O period. O period. O period. O period. O period. O period. O	d is set to t <i>"custon</i> " of the custor	he current riod" field d to access stomers mers billing	riveds : tomer details report customer details report customer code Customer name Customer name Custome

- Last amount due
- Outstanding balance

- Total paid
- New balance

This list can be filtered by feeder, by a line (from lines deserved by the selected feeder) or by a meterbox (from the meterboxes deserved by a selected line) or even by tariffs classes. It's also possible to list only the overdue bills.

C.3.2.1 Screen FCb1 : Record consumption

This screen is popped-up from the last screen either by using the record consumption for a selected customer (in that case, no navigations arrows appear) or for all customers (the red navigations arrows allow to go to the following customer in the same order as in the printed "meter reading sheet")

	🖽 record consur	nption (meter reading)			
	billing Period:				
	customer code customer: adress: meter_code: meter location: last reading: last reading date:	C1 Sven Ottlieb Obere Str. 579 A2/1/A101 main street:2:3:A101			
These arrows are visible only if there is several neter to read consumption record for everal customers in the ame time)	reading date: reading time: Staff Member : jo reading: other expension	12/01/2004 10:40 hn 234 kWh se due: 234 R	•	(if this option is selected in the initial setup)	

C.3.2.2 Screen FCb4 : Record payments

This screen is popped-up from the last screen either by using the record payments for a selected customer (in that case, no navigations arrows appear) or for all customers (the red navigations arrows allow to go to the following customer in the same order as in the printed "meter reading sheet").



C.4 Power distribution module

Most of the features of this module can be accessed from the same interface using tabs controls :

- Network elements
 - o Feeders
 - o Lines
 - o Transformers
 - o Meter boxes
 - o meters
- Daily records
 - Daily performance
 - Energy sent to the network
- Reports

The REE network is symbolize by the next convention :



REE Network schema as recorded in the software

C.4.1 Series of Screens FD0 : Network elements

C.4.1.1 List of feeders

	ork elements	Daily records plan	ned maintenance repo	orts				
Feed	ders Lines	Transformers me	terboxes meters					
list	t of feeders							
	cod	e name	e voltage	length of bare	length of insulated co	cond size	length (m)	
	A	main stree	et					
L	В	secondary	feed					
-	-							
	n selected i	feeder	1	[10			
0	n selected I	feeder	modify the	code	A	-		
0	n selected I record perfo	feeder	modify the selected feeder	code	A Imain street	_		
	n selected I record perfo caracter	feeder	modify the selected feeder	code name	A main street		_	
	n selected I record perfo caracter incidents for	feedei ormance istics – that feeder <i>f</i>	modify the selected feeder Add a new feeder	code name voltage	A main street			
0	in selected I record perfo caracter incidents for	feeder	modify the selected feeder Add a new feeder	code name voltage length of bare	A main street Cond m			
- - -	n selected I record perfo caracter incidents for record a main operal	feeder ormance istics – that feeder <i>f</i> ntenance <i>not</i>	modify the selected feeder Add a new feeder ta : to be EAC compliant cessary to record the	code name voltage length of bare length of insul	A main street cond m ated cond m			
0	n selected I record perfo caracter incidents for record a main operal	feeder prmance istics – that feeder <i>F</i> ntenance <i>not</i> per	modify the selected feeder Add a new feeder ta : to be EAC compliant ressary to record the formatic caracteristics	code name voltage length of bare length of insul	A main street v cond m ated cond m		~	
	n selected I record perfo caracter incidents for record a mai operal	feeder prmance istics that feeder netenance per (es en	modify the selected feeder Add a new feeder ta : to be EAC compliant ressary to record the rformance caracteristics pecially the voltage) at d of the line dwing neak	code name voltage length of bare length of insul conductor size	A main street v cond m ated cond m e (average): mm ²	9	2	
	n selected I record perfi- caracter incidents for record a mai operal	Feeder	modify the selected feeder Add a new feeder ta : to be EAC compliant essary to record the formance caracteristics pecially the voltage) at d of the line during peak e	code name voltage length of bare length of insul the conductor size total length of	A main street v cond m ated cond m e (average): mm ² the section m	œ,	2	
	n selected I record perf- caracter incidents for record a mai operal	Feeder	modify the selected feeder Add a new feeder ta : to be EAC compliant essary to record the formance caracteristics pecially the voltage) at d of the line during peak e	code name voltage length of bare length of insul conductor size total length of	A main street v cond m ated cond m e (average): mm² the section m	B .9	2	
	n selected l record perfi- caracter incidents for record a main operal	Feeder	modify the selected feeder Add a new feeder ta : to be EAC compliant cessary to record the formance caracteristics specially the voltage) at d of the line during peak e	code name voltage length of bare length of insul conductor size total length of	A main street V cond m ated cond m e (average): mm² the section m	9	2)	
	n selected record perfi- caracter incidents for record a main operal	Feeder ormance istics – that feeder <i>f</i> ithat feeder <i>f</i> ithat feeder <i>f</i> ithat feeder <i>f</i> ithat feeder <i>f</i> ithat feeder <i>f</i> ithat feeder <i>f</i>	modify the selected feeder Add a new feeder ta : to be EAC compliant ressary to record the formance caracteristics pecially the voltage) at d of the line during peak e	code name voltage length of bare length of insul conductor size total length of	A main street v cond m ated cond m ated cond m s (average): mm² the section m	B y	2	

C.4.1.2 List of lines

ower distributio	n							
vork elements Daily	records planned m	naintenance reports	1					
eders Lines Tran	nsformers meterbo	xes meters						
		Eaodor		100				1
t of electric lines (cor	nnected on feeders)	:	-	-				
feeder code	feeder name	line number	voltage	length (m)	length_bare	length_insulat	cond_size	
A	main street	1						
A	main street	2						
A	main street	3						
В	secondary feed	1						
]B	secondary feed	2			1		-	
on selected line : record performanc caracteristics incidents for that l record a maintenan operation	re modify ine Add ce nota : to b necessary performan (especially end of the time	the selected line l a new line e EAC compliant, it is to record the ce caracteristics the volkage) at the line during peak load	feeder : line num feeder voltage length of length of cond siz total leng	A ber on i bare cond f insulated cond e (average) gth of the section	I V m m m m	, <u>~</u>	F	
This box app adding a line	ear when mo with above b	difying or outtons						₽•

C.4.1.3 List of transformers

This screen is available only if the medium voltage option is set to yes in the initial setup.

of transformers (connected or	n feeders) : F	Feeder		• 7		
teeder	number on feede	r capacity (f	voltage in	voltage out	transfo. type	
modify the selected tran Add a new transformer	sformer record a	maintenance eration c H L	ieeder number on feeder capacity (kVA) High voltage value Low voltage value 	0 0 kVA 0 V 0 V	Transformer type for pole mounted for packet for substation	

C.4.1.4 List of meter boxes

we	er distribution							_	
work	elements Daily re	ecords reports							
		Gaussian meterboye	e laurena l						
seut	ers Lines Trans	romers meterboxe	ine ·					- 1	
ist o	of meter boxes (cor	nected on lines) :			<u> </u>	_	_	-	
	Teeder	line number	meterbox pole number						
	main street	1							
	main street	2	1						
-	main street	2	2						
	main street	2	3						
	main street	3	1						
	main street	3	2						
	secondary feed	1	1						
-	secondary feed	1	2						
5	modify the selec Add a new me	ted meter box		_	_				
fe m P	eder / line number: leterbox: ole number :	main street / 1	• 1 •						

C.4.1.5 List of meters

t	of meters (cont.	ained in a meterbox, con	ected to a line) :		- meter	box :	· 7
	meter code	meter code (long)	feeder / line / meter box	c	installation date	connected	faulty
>	A101	A2/1/A101	feeder:main street line:2 meterbox:1	2	13/12/2003		
	A102	A1/1/A102	feeder:main street line:1 meterbox:1		14/12/2003		
	A103	A1/2/A103	feeder:main street line:1 meterbox:2		15/11/2003		
	A104	A1/2/A104	feeder:main street line:1 meterbox:2		10/10/2003		
	A105	A2/2/A105	feeder:main street line:2 meterbox:2	(e	09/10/2003		
	A106	A2/3/A106	feeder:main street line:2 meterbox:3	(
	A107	A2/3/A107	feeder:main street line:2 meterbox:3				
	A108	A2/3/A108	feeder:main street line:2 meterbox:3				
	A109	A3/1/A109	feeder:main street line:3 meterbox:1				
	A110	A3/2/A110	feeder:main street line:3 meterbox:2				
*	Null	Null					
							•
	modify	the selected meter	meter code A101 feeder / line / meter	_			
	Modify Add show th connecte	the selected meter a new meter ne customer d to this meter	meter code A101 feeder / line / meter feeder:main street line:1 r feeder:main street line:2 r	meterbox:1 meterbox:2 meterbox:2 meterbox:2 meterbox:3 meterbox:1			
	modify Add show th connecte update the from with th	the selected meter a new meter be customer d to this meter long meter code e new short codes	meter code A101 feeder / line / meter feedermain street line: 1 feedermain street line: 2 feedermain street line: 2 feedermain street line: 3 feedermain street line: 3 installation date connected ✓	meterbox:1 meterbox:2 meterbox:2 meterbox:3 meterbox:3 meterbox:1 13/12/2003			

C.4.2 Screens FD2 : Daily Monitoring

C.4.2.1 Energy sent to the network per feeder and per phase

Power distribution					🛛
network elements Daily records p	olanned maintenance reports				
Energy sent to the network Daily	Performance				
list of records of Energy sent to the	e network				
date time t	eeder_id phase1	n	phase2	phase3 Ov	
* /08/2005	561	0	0	0	
 select the period : for the current period for all periods recorded for the selected period from : 30/12/1899 To : 08/08/2005 	modify the selected record Modify or Add a new record date \$9/07/2005 time 18.11 feeder main street Own Consumption: \$1000000000000000000000000000000000000	Add a new reco phas phas phas kWh <i>The own or</i> consumption	erd 1 0 kWh 2 0 kWh 3 0 kWh 3 0 kWh sumption id recorded from a to of the power house	• meter tracking the	
					•

C.4.2.2 Daily performance of electricity sent to each feeder per phase

This screen is enabled only if this option is selected in the initial setup. If it is selected, another option allow to record only the voltage and current. In this case, the Frequency and power factor boxes will be hidden and not displayed in the consultation list neither.
					Annexe 4	Ļ				
Pov	ver distribution									
twor inerç	k elements Daily recor gy sent to the network <i>perfor mance record</i>	rds planned maintenar Daily Performance at n <i>ded per phase at ger</i>	nce reports network input pe nerator output	rformance ald	ong the network]
_	date:	time: fee	eder: \	(ph1:	C ph1:	Eph		PE ph1:	Vn	
•	09/08/2005	main s	treet	3	o pint	4		p		
-	10/08/2005	main s	treet	3		3	3		3	
4									•	
sel	lect the period :	-	modify the	selected r	ecord Ac	ld a new reco	ord			
0 0	for the current period	date	9/08/2005 time		Feeder name :		1-			
c	for the selected period from : 30/12/1899	d Voltage Current	phase 1 3 v 4 A	phase (3 4	2 phase V 3 A 4	V A	1			
	To : 09/08/2005	Frequeni PowerFa	ictor		Hz 0	Hz	<u></u>	20		

C.4.2.3 Screen FD4 : Measure of the performance along the network

This screen is enabled only if this option is selected in the initial setup. If it is selected, another option allow to record only the voltage and current. In this case, the Frequency and power factor boxes will be hidden and not displayed in the consultation list neither.

Power distribu	ution								
Energy sent to the	Daily records plan	ined mainter rformance a	nance reports	ance alor	ng the network				
these records	allow to track th	e losses t	hroughout the networ	k (m)	Vinhaas 1	C phase 1	E phone 1	DE phase 1	
► 09/08/. 14	:50	IIIIe	position on the line	0	v phase i O	C phase T	r phase i	PP phase 1	
• select the period : • for the curren	t period	modify	the selected record	Ad	d a new record	on a feeder]	×	
For all periods For the selecte from : 00/12/10 To : 09/08/20	recorded ed period 599 505				secondary	line]		
									Q±

the buttons "add a new record on a feeder" and "add a new record on a secondary line" open a popup with one of the 2 following screens. These input screens can also be opened from the list of network elements for feeders (cf C.4.1.1) and lines (cf C.4.1.2) with the "record performance characteristics" button control. These screens disappear when the save button or the cancel button are clicked.

The measurements can be done as frequently as desired (preferably at peak load time).

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For a measurement on a feeder :

🖴 measure of perform	ance along the network 🛛 🗖 🗙
date 9/08/2005 time 10:20	location on the measure — main feeder secondary line
feeder line number on that feeder	•
position on the feeder from plant	the 0 m
Voltage phase 1 O V Current O Frequency O PowerFactor O	phase 2 phase 3 0 V 0 0 A 0 2 0 Hz 0 0
	9

For a measurement on a secondary line (connected to a feeder) :

🕫 measure of perform	ance along the network 🛛 🗖 🔀
date 9/08/2005 time 10:20	location on the measure — main feeder secondary line
feeder Inne number on that feeder	J J
position on the line from the feeder junction	m
Voltage 0 V Current 0 A	
Frequency 0 H PowerFactor 0	z 0 Hz 0 Hz
	9

C.4.2.4 Screen FD8 : record load curve for a typical day

This screen appears first in readOnly mode : it lists all the record for load curve done per day and per feeder (or for the whole network if no feeder).



For each record in this list, it is possible to open the related report (drawing the load curve), modify the data for this record or add a new record. The modify and add buttons leads to the next screen :

ate:	02/10/2003	feeder: whole r	etwork 🗾 🛛	✓ 3 phase	network (uncheck for mo	nophase net	work)	
ime: 08:	for this typical d 00 power phase 1	lay: I 13 kV	A power phase 2 15	kVA	power phase 3 13	kva	-	
:ime: 09:	00 power phase 1	111 kV	A power phase 2 12	kva	power phase 3 11	kva		
ime: 10:	00 power phase 1	10 kV	A power phase 2 11	kva	power phase 3 10	kva	_	
:ime: 12:	00 power phase 1	13 kV	A power phase 2 15	kva	power phase 3 14	kva	-	
:ime: 01:	00 power phase 1	14 kV	A power phase 2 16	kVA	power phase 3 16	kva		
ime:	power phase 1		A power phase 2 0	kva	power phase 3 0	kva	-	
time:	power phase 1	l o kv	A power phase 2 0	kVA	power phase 3 0	kva		
Enr : IIII	selected rve	▶1 ▶★ sur 6 modify	the selected ad curve	dd a new lo curve	rad			

on the "feeder" listbox, the first item selected by default is : "whole network". If the 3 phase option is checked, 3 textboxes let record the power per phase, if it is unchecked, only one textbox for the power record.

It is better to have one record per hour but not compulsory, we can have as many record as we want, the more records we have, the more precise is the load curve.

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C.4.3 Screen FD3 : Recording Network Maintenance Operations

The list of all the maintenance operations can be accessed by using the "maintenance" tab :

Power distribution						
network elements Daily records	maintenance reports					
select the period :	Network mainte	nance list				
for the current period	date:	time:	description	planned_dura	duration of operation	n:du
C for all periods recorded	▶ 05/08/2005	13:08				0
C for the selected period	*					
from : 30/12/1899						
To: 11/08/2005						
add a maintenance operation	print this list]				•
						•

The button "add a maintenance operation" allow to record a new maintenance operation.

It is also possible to enter a new maintenance operation directly from the list of network elements for feeders (cf C.4.1.1) and lines (cf C.4.1.2) and transformers with the "record a maintenance" button (in this case, the screen is accessed in modifying mode).

The input screen for the maintenance operations is as following :

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Topores						
level of og	r A Y	plann duration durati REE staff mem	ed duration: of operation : 0 on of outage : 0 iber :	hours hours hours		
add a new spare part purchase_date	description	number price	per unit pr 0 0	ice	Displayed only if "record list of sp parts and consum initial setup optic selected. Otherw replace it by a sin textbox which rea manually the cos spare parts and consumables	`the are vables" on is ise, nple cord t of
▶ ▶ ▶ ★ sur 1 tal cost of spare parts : 0 maintenance extra cost	s: [0	= maintenance total	cost:	\$		
	add a new spare part c transf add a new spare part purchase_date add a new spare part sur 1 tal cost of spare parts : 0 maintenance extra cost	add a new spare part c line c line c line	Image: superior of operation plann Image: superior of feeder Image: superior of operation Image: superior of feeder Image: superior of operation Image: superior of feeder Image: superior of operation add a new spare part Image: superior of operation purchase_date description purchase_date description purchase_date description interval Image: superior of operation interval Image: superation i	evel of operation feeder ine ine	evel of operation • feeder • fine • transformer • REE staff member: • N >* sur 1 • N >* sur 1 • maintenance extra costs: • maintenance total cost: • maintenance total cost: • • • • • • • • • • • • • • •	Planned duration: hours duration of operation: 0 ine

If the record list of spare parts and consumables initial setup option is not selected,

C.4.4 Screen FD5 : record a network incident

In the list of network elements for feeders (cf C.4.1.1) and lines (cf C.4.1.2), the "list of incidents" button control allow this screen to pop-up for the selected elements (either feeder or line).

This screen disappears when the save button or the cancel button are clicked.

or the current period	time:	position on l	feeder:	line:	description of i	solved?	repair date:	repair time	repair operatio	repear duration:	outage
or all periods recorded	00:50	0	main st	main		V	13/07/2005	01:11		0	
m ; 30/12/1899											
05/08/2005											
Add a new											
Add a new incident											
Add a new incident											
Add a new incident											
Add a new incident ord a reapair for selected incident											
Add a new incident											

by clicking on "add a new incident" : he following input screen appear :

-	7 (1110)	
a Vetwork III	cident	
date	13/07/2	
time	00:50	
feeder	main street	-
line	main street / line:2	-
description of incident		
solved?	F	
REEstaff		
<u> </u>	y record the r	epair for this incident

By clicking on the "record the repair for this incident" button, the next screen appears and allow to record the repair description relative to this incident.

C.4.5 Screen FD6 : Recording Repairs

🖪 network re	pair						
date time incident: description of incident	13/07/ 01:11 13/07/20	2 05 00:50:: <u>-</u>		duration of repair (h duration of outage (REEstaff member) [
list of spare parts	used :	add a new spare part]				
typ	e_id	purchase_date	description	number pric	e per unit	price	
Enr: II (1	N ▶ ★ sur 1	total cost of spare (parts :		*	
					Displaye spare pa	d only if the "reco rts and consumab	ord list o les"
					initial set Otherwis	tup option is selec e, replace it by a	cted. simple
					textbox w cost of st	which record man pare parts and	ually the
REE Manage	ement Too	I Specifications			consuma	bles	

Annexe 4 C.4.6 Reports on the Distribution Side

Power distribution	
network elements Daily records planned mainter	nance reports
distribution network component report preview the report print the report distribution network structure report preview the report print the report distribution incidents report for the current period for all periods recorded for the selected period from : 30/12/1899 To : 09/08/2005 preview the report print the report	distribution activity report for the current year (EAC) for the current period for the selected period from : 30/12/1899 To : 09/08/2005 preview the report print the report

these reports can also be launched from the report menu (screen FR1 of 0). The different reports are described in this section.

C.5.1 Screen FG1 : List of Gen-sets

	Genset_num	installation date		
	▶ A1	12/02/2000		
add a new genset	A2	13/07/2005		
	A3	12/04/2000		
modify this genset	B1 B2	12/12/2000		
	- D2 	22/02/2000		
	<u>*</u>	24/07/2005		
	/			
ngine		Generator		_
brand CAT		brand	GE	
type A150KW		type	ZE150KW	
serial number AZE 4546Y		serial number	asdk 323435	
Engine capacity (HP) 150		Disabisal David	200	
	5000	Electrical Power	200 KVA	
	5000	Power factor :	0,8	
ourchase date: U1/L	J1/2001	purchased price (\$)	4000	
umber of hours at purc	10609	purchase date:	01/01/2001	
FuelType		purchase date.	10000	
Diesel Oil	0	number of hours at	purd 10609	
heavy fuel			0	
Gasoine			<u></u>	
begining date: 01/03/2000 period e	nd date: 30/03/2000 p	eriod number: 6 current da	ate: 24/07/2005 current time: 10:	:36
				ffre

Annexe 4 C.5.2 Screen FG1 : Monitoring Gen-Sets

Add a new checking	temperature evolution — exhaust temp.
egular genset checking	air temp.
date 08/08/2005	
BEEstaff	60
engine hours	40
	20
uel consumption meter reading	0 + + + + + + + + + + + + + + + + + + +
_ubricant consumption meter reading	
*c	fuel and lub consumptionfuel consumption (L/h)
cooling water temp. *c	lubricant consumption (L/h)
ubricant volume	14
	12
e controls appear when adding a	
checking with "add a new	13/10/2000 14/10/2000 15/10/2000 16/10/2000 17/10/2000
ing" button	
iod begining date: 01/03/2000 period end date: 30/03/	2000 period number: 6 current date: 08/08/2005 current time: 17:42

the fuel consumption is computed as this :

FC= (current fuel meter reading - last fuel meter reading) / (current engine hours – last engine hours)

Same for lubricant consumption.

The charts trend is over a range of 1 month.

C.5.3 Screen FG1 : regular purchases

C.5.3.1 Fuel purchases

🎟 po	wer generation						
Gense	t list Genset checki	ng regular purchases incid	ents planned maintenance				
Fuel	Lubricant cons	umables spare parts					
list	of fuel purchases						
	date	quantity (L)	supplier name	price_liter	FuelType	buy amount	
•	24/07/2005	0		0		0	
Er	nr : 14 <	1 ▶ ▶I ▶* sur 1					
4	- 9 2						
period	begining date: 01/0	3/2000 period end date: 3)/03/2000 period number: 6	current date: 24/07/200	05 current time: 10:3	9	
						112	

C.5.3.2 Lubricant Purchases

B pov	wer generation						
Genset	: list Genset check	ing regular purchases in	cidents planned maintenance				
Fuel	Lubricant cons	sumables spare parts					
ISC	date	guantity (L)	supplier name	price liter	buy amount		
•	13/07/2005	10	SHELL		2 20		
*	24/07/2005	0			0 0		
Enr		1 🕨 🕅 🌬 sur	1				
"+	· 🖳 🖓	']					
period	begining date: 01/0	03/2000 period end date:	30/03/2000 period number: 6	current date: 24/	07/2005 current time: 10:39	D4	
						₩ P	
							_

Annexe 4

C.5.3.3 Consumables

Displayed only if the "record list of spare parts and consumables" initial setup option is selected.

Some consumables can also be added from the "planned maintenance" windows and from the repair windows. Even if their different buy purpose is recorded, they all can be listed in this form.

I I <thi< th=""> <thi< th=""> <thi< th=""> <thi< th=""></thi<></thi<></thi<></thi<>		 number	price per unit	type of purchase	for maintenance	tor repair
		1	213	oil filter	•	<u> </u>
		C	0 0	join	۲	•
					۲	۲

C.5.3.4 Spare parts

Displayed only if the "record list of spare parts and consumables" initial setup option is selected.

Same remark as for consumables

EB po	wer generation								_ 🗆 🗙
Gense	t list Genset checking "	egular purchases	incidents planned i	maintenance					
Fuel	Lubricant consumable	es spare parts							
lis	date of purchase	ses supplier	description	number	price per unit	type of purchase	for maintenance	for repair	
•				2	2323	water pipe	•		
*						100 m	۲	۲	
Er	nr : 14 4 1 1	• ▶ ▶ ▶ ₩ si	ur 1	_	_		_	_	
	1 - 1 - 1								
	"+" 🖳 💴								
					anna datar	24/07/2005			
period	r begining date: 01/03/200	u period end dac	e: 30/03/2000 per	iou number: 6	current date:	24/07/2005 Current t	ime: 10;40	P •	

C.5.4 Screen FG1 : incidents

	time	genset number	description of incident	incident solved ?	incident origin	REE staff
19/07/2005	5	A3			, j.	sam
nset numb	<u>"+"</u>	REE	staff [sam _	view or record for this incid This fra record "add" of	ame appear whe is added by clic or "modify" but	en a new king on the tons or for a
dent solved "		2		modifie	cation of the sel	ected record.

By clicking on "view or record repair for this incident", the following screen pops up and let record the repair operation for the particular incident :

Anne	exe 4	
🖼 Genset Repairs		
genset Incident date repair date REEstaff genset number repair time description of repair	work duration: hou outage duration hou	Displayed only if the "record list of spare parts and consumables" initial setup option is selected. Otherwise, replace it by a simple textbox which record manually the
list of consumables purchases		cost of spare parts and
Enr: II I I III * II * sur 1	0 join	
date of purchase supplier description number price per u Image: Supplier Image: Supplier Image: Supplier Image: Supplier Image: Supplier Image: Supplier Image: Supplier Image: Supplier Image: Supplier Image: Supplier Image: Supplier Image: Supplier Image: Supplier Image: Supplier Image: Supplier Image: Supplier Image: Supplier Image: Supplier Image: Supplier Image: Supplier Image: Supplier Image: Supplier Image: Supplier Image: Supplier Image: Supplier Image: Supplier Image: Supplier Image: Supplier Image: Supplier Image: Supplier Image: Supplier Image: Supplier Image: Supplier Image: Supplier Image: Supplier Image: Supplier Image: Supplier Image: Supplier Image: Supplier Image: Supplier Image: Supplier Image: Supplier Image: Supplier Image: Supplier Image: Supplier Image: Supplier Image: Supplier Image: Supplier Image: Supplier Image: Supplier Image: Supplier Image: Supplier Image: Supplier Image: Supplier	nit type of purchase	₽.*

C.5.5 Screen FG1 : planned maintenance

On the opening, this screen is blank except the "add an operation" button. When clicking on it, a new record is added with the controls as follow :

Displayed only if the "record list of spare parts and consumables" initial setup option is selected. Otherwise, replace it by a simple textbox which record manually the cost of spare parts and consumables

Annexe	4
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add an genset of date time	egular purchases number 23/07/2005	incidents planned	maintenance	0 hour	maintenance (generator engine	on engine or generator?		
			consumables cost		0 🖳	20		_
of consumables purch	ases							
date of purchase	supplier	description	number	price per unit	type of purchase	for maintenance	tor repair	
			1	213	on miter			
				, U	jun			
	▶ ▶ ▶ # si	ur 2		-		_	_	
r: 14 1 1 of spare parts purchase	▶ ▶1 ▶* si es	ur 2 description	number	price per unit	type of purchase	for maintenance	for repair	+
r: 14 4 1 of spare parts purchas date of purchase	▶ ▶1 ▶* sı es supplier	ur 2 description	number 2	price per unit	type of purchase	for maintenance	for repair ®	
r: 14 1 of spare parts purchas date of purchase	es supplier	ur 2 description	number 2	price per unit 2 2323	type of purchase water pipe	for maintenance ③	for repair ® ®	
r: 14 4 1 of spare parts purchase date of purchase		ur 2 description	number 2	price per unit 2 2323	type of purchase water pipe	for maintenance © ®	for repair © ©	

C.5.6 Screen FG10 : Generation reports



C.6 Reporting module

All the reports launch controls can be accessed from this module (as most of them can also be launched from their related module expert for the financial and EAC reports .

C.6.1 Screen FR1_C : menu for access for customer and billing reports

🖼 general reports	
customer billing reports distribution reports ge customer reports customer summary report customer simple report	eneration reports Financial reports and EAC reports billing reports Overable bills report billing summary report © for the current period © for the selected period from : \$0/12/1899 To : 10/08/2005 preview the report print the report
	₽*

C.6.2 Screen FR1_D : menu for access for distribution reports

Same interface as in C.4.6 Access to reports : C1,C2,C3,C4.

C.6.3 Screen FR1_G : menu for access for generation reports

Same interface as in C.5.6 Access to reports : D1,D2,D3,D4.

Access to reports : B1,B2,A3,A2.

Annexe 4 C.6.4 Screen FR1_F : menu for access for financial and EAC reports

		distribution reports	generation reports		
se 4 boxes er checkbo	Manual parameters Check to con extra parameters enter income other t sold for the desired p enter Employee expe the desired period : enter management a administration exper desired period : enter loan repayment desired period : are enabled if the x is checked	aplete the reports with enters to be EAC comp han energy erriod : enses for nd enses for ts for the ts for the	R R R R	income and expenses rep Please consider first abo or not the manual param the left pane. for the current year for the current period for the selected period from 30/12/1899 To: 31/108/2005 preview the report print the report Please consider first about f or not the manual parameter the left pane. preview the reports preview the reports preview the reports preview the reports preview the reports preview the reports preview the reports	bort put filling leters on (EAC) d od Ming Is on Report F1
] ₽+

The income and expense report required by EAC needs some extra information not tracked by the software. Thus, it is necessary to fill manually this information before editing this report. This is done with the 4 boxes on the left pane of this interface.

ANNEX D. REPORT SPECIFICATIONS

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A. Billing Reports

A.1.	Individual Customer Bills
Format	Standard EAC Format
	 Main section plus a small tear-off receipt at bottom of form
	 Fit to half A4 size to save paper.
Parameters	Header: REE Business Name, Logo, EAC License Number and contact details, and "Customer Bill"
	 Main section: Customer Number, Customer Name, Period of Bill, Previous Meter Reading, This Meter Reading, Energy Consumed, Tariff Rate, Total Bill
	 Plus if the REE allows credit, then also show the Carry-Over Balance and the Running Total.
	 Plus if the REE allows additional expenses to be billed to customer, then also show the total of any Additional Expenses and add this to a Grand Total or to the Running Total (if credit is allowed)
	 Receipt section: Customer Number, Customer Name, Period of Bill, Total Bill
Options	 User can choose to print all bills, or select individual customers to print Bills can be printed directly, or saved to file for printing elsewhere

A.2.	Billing Summary Report
Format	 Header: "Billing Summary Report for: " <insert name="" of="" ree=""></insert> 1 page with table or dot points for part 'a' at top, then chart for part 'b' underneath
	 charts should have clear legend and also label point values Footer: page number
Parameters	 a. <u>Current Period Summary</u> Dates of Report Period Date of report Total number of active customers (currently connected) Total kWh sold for all customers for the period Total value of bills issued for all customers for the period <u>Billing Performance Trends</u> Bar Chart with each period along x-axis, and with two y-axes: kWh on the left and the chosen currency for the REE on the other y-axis; and displaying the following series of data: Total kWh billed for all customers for each period Total value of bills issued for all customers for each period
Options	 User chooses which periods to be shown for the trend charts

A.3.	Overdue Bills Report
Format	 Header: "Overdue Bills Report for " <insert name="" of="" ree=""></insert>
	 Summary table at top of first page
	 Then a single table listing all customers with outstanding payments due (as many pages as necessary)
	 Footer: page number
Parameters	 a. Summary (table) Total number of customers with outstanding payments this period Percentage of customers with outstanding payments this period, compared to total number of active customers this period Total value of outstanding payments this period Percentage of the total value of outstanding payments compared to the total value of bills issued. b. Listing of Overdue Bills (table) Customer Code Customer Name Total Amount Owed Date of Last Payment
Options	•

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B. Customer Reports

B.1 Customer	Summary Report
Format	 Header: "Customer Summary Report for " <insert name="" of="" ree=""></insert>
	 One main chart on a single page with a clear legend and labelled point values
	 Footer: page number
Parameters	 a. Customer Status Single bar chart displaying periods along x-axis, and numbers of customers on y-axis, and displaying the following data series for each period: Number of connected customers Total number of potential customers waiting for connection Number of new connections in the period Number of customers disconnected during period If the REE has multiple classes of customers or tariff rates, then the proportional numbers of these will be labelled on each of the above bars. So, eg: if an REE has two tariff classes then for each period in the chart there will be 4 bars, according to the series mentioned above, and each bar will be divided and labelled into the proportional type of tariff.
Options	None

B.2 Customer	details Report
Format	 Header: "Customer Details Report for " <insert name="" of="" ree=""></insert>
	 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
	Footer: page number
Parameters	 Summary Table Entry Number (ie: row numbers to track how many are in report)
	 Customer Code
	 Customer Name
	 Customer Address
	 Customer Phone Number
	 Customer Status
	 Customer Class (if defined)
	 Feeder connection
	 Meter code Reading data
	Consumption
	 Invoice date
	 Consumption billed
	 Extra expense
	 Last amount due
	 Outstanding balance
	 Total paid
	Current Balance
Options	The user will be prompted to select a single search criteria from the following list
	Customer code
	Customer name
	Meter code
	Customer class
	Connection status
	Connection date
	When accessed from the "list of connected customer" interface, the report
	includes only the connected customers with allow to apply a search criteria to
	restrict that list by :
	On Waiting List
	 Currently Connected - by Class (if the REE has defined multiple classes
	then user will be prompted to choose which class, or all of them)
	 Currently Connected – by reeder (the user will be prompted to choose any of the feeders, or all of them)
	any of the reducts, of all of them) ■ Currently Connected – by line
	 Currently Connected – by meethox
	 Newly Connected (in current period)
	 Newly Disconnected (in current period)
	 Currently Disconnected

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B.3 Basic Customer Report		
Format	 Header: "Customer Details Report for " <insert name="" of="" ree=""></insert> 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 Footer: page number 	
Parameters	 a. customer list Customer Code Customer Name Customer Address Customer phone Customer Status (is connected / is waiting / is disconnected) Customer Class (if defined) Meter code (if connected) 	
Options	 The user will be prompted to select a search criteria from the following list List all the customers List only the connected customers List only the waiting customers List only the disconnected customers The user will be prompted for which field to sort by: Customer code Customer name Connection date The user will be prompted if he wants to group the records by (a single or both options can be chosen together): Customer class (if defined) Connection status 	

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C. Distribution Network

C.1 Distribution Network Structure Report		
Format	 Header: "Distribution Network Structure Report for " <insert name="" of<br="">REE></insert> 	
	 Single table formatted to indicate the hierarchy of network elements, printed over as many pages as needed 	
	 This report is produced for the current period 	
	 Footer: page number 	
Parameters	 This table will print a full list of network elements and customer connections, sorted and formatted according to the 'network hierarchy' as follows: 1. Feeder Identifierfeeder code, feeder name, voltage, length of bare/insulated conductor, average conductor size, total length. 1.1. line identifier, voltage, length of bare/insulated conductor, average conductor size, total length and if medium voltage network : Transformer Identifier with capacity,voltage in/ voltage out, 1.1.1 Meter Box Identifier with pole number 1.1.1.1 Customer Meter with : short meter and long meter codes, installation date, connection status (connected or not) 	
Options	 None 	

C.2 Distributio	n Network Components Report
Format	Standard EAC Format
	Header. Distribution Network Report for <insert frame="" or="" ree=""></insert>
	as needed
	 This report is produced for the current period
	 Footer: page number
Parameters	 a. Transformers (6 columns) Row number Transformer type (pole-mounted, packet or substation) Medium Voltage (showing input and output voltages, eg: "0.4/15 kV") Low Voltage (as above) Installed Capacity (in units of kVA) Number of transformers
	 b. Conductors (8 columns) Row number Conductor type (Medium Voltage or Low Voltage, with phase 1, 2, 3 for LV) Rated capacity of conductor (in units of kV) Length of Insulated Conductor Length of Bare Conductor Voltage at the end of Conductor during peak load
Options	 None

C.3 Distributio	n Activity Report
Format	 Standard EAC Format (except for the period – see below) Header: "Distribution Activity Report for " <insert name="" of="" ree=""></insert> Two summary tables as described below, running over as many pages as needed
Parameters	 Footer: page number a. Energy Distribution Activity (5 columns) Row number Description: Total Energy Distributed (kWh) Total Energy Sold (kWh) Energy Line Losses (kWh) Total time that the generators were not working (hours) Total time that the grid was not operating (hours) Total time for maintenance of the grid (hours) Total cost of maintenance of the grid (Riels) Total number of faulty customer meters Total number of working hours per day (hours) Units (as indicated above) Value for the period Notes b. Current Tariffs (4 columns) Tariff Description Unit of tariff (eg: Riels) Tariff Rate per kWh
Options	 Note The user will be given option to choose the reporting period as either Appual (the required EAC format, which gives the 12 months to date) or
	Current Period.

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C.4 Distribution Incidents Report	
Format	 Header: "Distribution Incidents Report for " <insert name="" of="" ree=""></insert> Summary table and then a single table with full listing of incidents as described below, running over as many pages as needed The user will be prompted to define the report period Footer: page number
Parameters	 a. Summary of Distribution Network Incidents Total Number of Distribution Network Incidents in the period Total Number of Performed Distribution Network Repairs in the period Total Cost of Distribution Network Repairs in the period b. Single Table with an entry for each network incident during the period: Date of Incident Time of incident Location of incident (feeder code or line number) Description of incident Date of repairs (rest will be blank if not yet repaired) Description of network outage Total cost of spare parts and consumables Name of staff member that performs repairs
Options	 The user will be prompted to define the report period

C.5 Load Curv	e Report
Format	 Header: "Load Curve Report for " <insert name="" of="" ree=""></insert>
	 Single plot of the load curve.
	 The user will be prompted to define the report period
	 Footer: page number
Parameters	 <u>Load Curve</u> Plot of total demand throughout a 24 hour period. Time is on x-axis (actual time of day) and demand on y-axis (kVA). User selects which 24hr period to plot (chooses date) It is unlikely that the user will have recordings of power for every hour, and often will have no recordings. So if less than 3 recordings are available for the selected period then an error message should be displayed informing that the load curve is not meaningful due to lack of input data.
Options	The user will be prompted to define the report period

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D.1 Generatior	n Summary Report
Format	 Standard EAC Format (except for the period – see below) Header: "Generation Summary Reports for "<insert name="" of="" ree=""></insert> A single Summary table on a single page Footer: page number
	 Summary Table (8 columns) Row number Description: Engine Manufacturer (name) Rated Engine Capacity (HP) Rated Power Output of Generator (kVA) Power Factor of Output (fraction between 0 and 1.0) Energy Produced per Week (kWh) Energy Produced for the period (kWh) Name of Fuel Supply Company Total Fuel Consumption for the period (Litres) Specific Fuel Consumption in Period (Litres) Specific Lubricant Supply Company Total Lubricant Consumption in Period (Litres) Specific Lubricant Consumption for the period (Litres) Specific Cost of Repairs in the period (Riels) Total Number of Repairs in the period Number of Breakdowns in the period Cost of Planned Maintenance Activities (Riels) Own Consumption (kWh) Total Energy Distributed in the period (kWh) <just consumption="" generated="" less="" own="" the="" total=""></just> Units (as indicated above) Total for all generators Generator 1 Generator 2 Generator 3 <expand as="" for="" generators="" needed="" number="" of="" the=""></expand> Notes
Options	• The user will be given option to choose the reporting period as either Annual (the required EAC format, which gives the 12 months to date) or Current Period.

D.2 Fuel and Lubricant Consumption Report	
Format	 Standard EAC Format (except for the period – see below) Header: "Fuel and Lubricant Consumption Report for " <insert name="" of="" ree=""></insert> A single Summary table on a single page (landscape orientation) Footer: page number
Parameters	 Summary Table with one column for each month plus a column of field labels: "Diesel Fuel Data" Diesel Fuel Supplier (if many suppliers during the period, list all of them) Quantity Purchased (Litres) Price per Litre (Riels) Total cost (Riels) "Lubricant Data" Lubricant Supplier (if many suppliers during the period, list all of them) Quantity Purchased (Litres) Price per Litre (Riels) Total cost (Riels) Generation" Total Generation Output (kWh) Own Consumption in Powerhouse (kWh) Total Energy Sold (kWh) Total Energy Equivalent of Flat-Rate Customers
Options	• The user will be given option to choose the reporting period as either Annual (the required EAC format, which gives the 12 months to date) or Current Period.

D.3 Generatior	a Trends Report
Format	 Header: "Generation Trends Report for: " <insert name="" of="" ree=""></insert>
	 1 page with X charts, each with a clear legend and labelled point values
	 Footer: page number
Parameters	 <u>a. Generation Output Trends</u> Bar Chart with each period along x-axis, and energy (kWh) on y-axis, and the following series: Total kWh produced by each engine (on a single bar, showing contribution from each engine Total kWh distributed after subtracting own consumption <u>b. Fuel Consumption Trends</u> Bar Chart with each period along x-axis, and Litres of Fuel per kWh on y-axis, and the following series: Specific Fuel Consumption of each engine (three separate bars per period) * The chart area will be divided into 3 areas indicating three classifications of engine efficiency as defined by EAC in the 2004 Annual Report: Good = Less than 0.32 L/kWh Medium = 0.32 to 0.36 L/kWh Low = More than 0.36 L/kWh
Options	 User chooses which periods to be shown for the trend charts

D.4 Generatior	Incidents Report
Format	 Header: "Generation Incidents Report for "<insert name="" of="" ree=""></insert>
	 Summary table and then a single table with full listing of incidents as described below, running over as many pages as needed
	 The user will be prompted to define the report period
	 Footer: page number
Parameters	 a. Summary of Generation Incidents (table with a column for each individual gen-set, plus a totals column): Number of Generation Incidents in the period Number of Generation Incidents for each gen-set (separately) Number of Performed Generator Repairs in the period Cost of Generator Repairs in the period
	 b. Separate Table for each Gen-Set, with an entry for each incident during the period: Date of Incident Time of incident Gen-Set Identifier Description of incident Date of repairs (rest will be blank if not yet repaired) Description of repairs Duration of work Duration of generation outage Total cost of spare parts and consumables Name of staff member that performs repairs
Options	 The user will be prompted to define the report period

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E. Financial Reports

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E.1 Income and	d Expenses Report
Format	 Header: "Income and Expenses Report for " <insert name="" of="" ree=""></insert> Standard EAC Format (except for the period – see below) A single summary table on a single page The user will be prompted to define the report period Footer: page number
Parameters	 Summary Table (2 columns – Item Description and Total for the Period, all in Riels): Income from Energy Sold Other (entered manually by the user) Total Income Diesel Fuel Expenses Lubrication Expenses Consumables Expenses Employees Expenses (entered manually by the user) Maintenance and Spares Expenses Management and Administration Expenses(entered manually by the user) Depreciation Unusual Planned Maintenance Costs Loan Repayments (entered manually by the user) Total Expenses <if an="" blank="" costs,="" does="" employee="" enter="" explanatory="" leave="" manual="" not="" note="" then="" user="" with=""></if>
Options	 The user will be given option to choose the reporting period as either Annual (the required EAC format, which gives the 12 months to date) or Current Period. The user will be prompted to directly enter the Employees Expense for the period (and for other icome, management and administration expenses and loan repayments), but if they choose not to then the report will default to a blank entry as indicated above.

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F. EAC Licensee Reports

F.1 Annual Lic	ensee Report
Format	 Header: "EAC Annual Licensee Report" Licensee Name: <insert name="" of="" ree=""> Licence Number: <insert licence="" number=""> Type of License: <insert type=""> Location: <insert address="" full=""></insert></insert></insert></insert> Standard EAC Format Combine the separate reports into one, as described below Footer: page number
Parameters	Combine the following reports to create single EAC Annual Report: Generation Summary Report – page 1 Distribution Network Components Report – page 2 Distribution Activity Report – page 3 Fuel and Lubricant Consumption Report – page 4 Income and Expenses Report – page 5
Options	

G. Data Entry Forms

G.1 Meter Reading Forms	
Format	 Header: "Meter Reading Form for: " <insert name="" of="" ree="">, "Date": <insert date=""></insert></insert> "Meter Reader": <leave employee="" enter="" for="" her="" his="" name="" space="" to=""></leave> Single table of customer details with blank space for data entry Footer: page number
Parameters	 Table with 8 columns and entry for each customer: Customer Identifier Customer Name Customer Location Period of Bill Previous Meter Reading This Meter Reading (blank space for data entry) Date of reading Time of reading Comments (blank space for data entry)
Options	 User is prompted to choose which customers to print Meter Reading Forms for (should be sorted by the Meter and Meter Box identifiers) Forms can be printed directly, or saved to file for printing elsewhere

G.2 Engine Monitoring Form	
Format	 Header: "Engine Monitoring Form for: " <insert name="" of="" ree="">, "Monitoring Period": <insert period=""></insert></insert> Single table with columns for each parameter needed, and blank rows for staff to enter data each day.
	 Footer: page number
Parameters	 a. Table of Data to be recorded daily (or as often as practical) with labels and blank space for data entry: Date Time engine identifier fuel consumption operating hours shown on meter exhaust temperature cooling water temperature air temperature lubricating oil volume initials of staff member
Options	 The user will be prompted to specify the period for the report to be used

G.3 Generator Monitoring Form	
Format	 Header: "Generation Monitoring Form for: " <insert name="" of="" ree="">, "Monitoring Period": <insert period=""></insert></insert>
	 Single table with columns for each parameter needed, and blank rows for staff to enter data each day.
	 Footer: page number
Parameters	 a. Table of Data to be recorded daily (or as often as practical) with labels and blank space for data entry: Date Time generator identifier phase number voltage frequency (if possible) power factor (if possible) Energy output meter reading (if meter is connected to more than one phase or generator then staff can indicate this on sheet) initials of staff member
Options	 The user will be prompted to specify the period for the report to be used

G.4 Generator	Incidents and Repairs Monitoring Form
Format	 Header: "Generator Incidents and Repairs Monitoring Form for: " <insert name of REE>, "Monitoring Period": <insert period=""></insert></insert
	 Single table with columns for each parameter needed, and blank rows for staff to enter data as needed.
	 Footer: page number
Parameters	 a. A blank table to be filled-in when an incident occurs: Date of Incident Time of incident Gen-Set Identifier Description of incident Date of repairs (rest will be blank if not yet repaired) Description of repairs Duration of work Duration of generation outage Total cost of spare parts and consumables initials of staff member
Options	 The user will be prompted to specify the period for the report to be used

G.5 Distribution Monitoring Form	
Format	 Header: "Distribution Monitoring Form for: " <insert name="" of="" ree="">, "Monitoring Period": <insert period=""></insert></insert>
	 Single table with columns for each parameter needed, and blank rows for staff to enter data each day.
	 Footer: page number
Parameters	 a. Table of Data to be recorded daily (or as often as practical) with label and blank space for data entry: Date Time feeder identifier if measure on a secondary line : line number on that feeder location of the measure from the plant if feeder measure or from the feeder junction if secondary line measure (in meters) phase number voltage frequency (if possible) power factor (if possible) initials of staff member
Options	 The user will be prompted to specify the period for the report to be used

G.6 Distributio	n Incidents and Repairs Monitoring Form
Format	 Header: "Distribution Incidents and Repairs Monitoring Form for: " <insert name="" of="" ree="">,</insert> "Monitoring Period": <insert period=""></insert> Single table with columns for each parameter needed, and blank rows for staff to enter data as needed.
	 Footer: page number
Parameters	 a. A blank table to be filled-in when an incident occurs: Date of Incident Time of incident Location of incident Description of incident Date of repairs (rest will be blank if not yet repaired) Description of repairs Duration of work Duration of network outage Total cost of spare parts and consumables initials of staff member
Options	 The user will be prompted to specify the period for the report to be used

Annexe 5

ANNEX E. DATA TABLES STRUCTURE




