9. Evaluation

9.1 Evaluation of the Pilot Project

Evaluation of the Pilot Project was conducted using PCM method. The Pilot Project was evaluated from the viewpoint of 5 evaluation criteria (efficiency, effectiveness, impact, relevance, sustainability).

The evaluation was conducted based on the Project Design Matrix (hereafter referred to as "PDM") which was prepared on December 2000. Necessary data and information for the evaluation were collected through the questionnaire survey and field survey. The questionnaire surveys were conducted three times. First questionnaire survey aimed to collect base line data of users was conducted on December 2000, and second questionnaire survey aimed to collect data for mid-term evaluation was conducted on June 2001. Then third survey aimed to collect data for final evaluation was conducted on October 2001. The result of these surveys were shown on ANNEX B. In addition, field surveys aimed to discuss with village people were also conducted. The targeted peoples of the field surveys were not only individual users, but also the representatives of the public facilities installed SHS. The survey results for public facilities were also shown on Annex C.

The Pilot Project was evaluated form the viewpoint of the "five evaluation criteria" which consisted "efficiency", "effectiveness", "impact", "relevance" and "sustainability". The outline of five evaluation criteria and PDM was described on Annex D.

The result of evaluation is mentioned as below. The more detail of the evaluation is shown on Table 9.1 and 9.2.

(1) Efficiency

In assessing the efficiency, achievement level of the outputs in comparision to the efficient use of financial, human and material resources are examined.

As of October 2001, almost all of the outputs were realized. There were several problems recognized during the mid-term evaluation (June 2001). The necessary measures for these problems were drawn up through the discussion among the PPMC, the Operator and users. The JICA study team confirmed that the Pilot Project was well operated without any major problems on October 2001.

However, MMEH/ASER pointed out following items about the timing and quantity of input.

Concerning the duration of stay and dispatched frequency of JICA Study Team, MMEH recommended assigning at least one JICA expert for whole period of the Pilot Project. The JICA Study team also pointed out the importance and necessity of assistance by Japanese side during the initial stage of the implementation.

The timing of the project also needs more consideration. So far, any comprehensive rural electrification plan has not been drawn up yet in Senegal. Therefore, expected role for SHS by Senegal side has not been defined yet. In addition, ASER who is one of the main counter part agencies of the Project, also didn't established when the Project started. The efficiency of the input might be reduced in these situations.

Besides of above problems, difference correspondence of VUA is one of the subject should be concerned. The new fee collection system which required more participation of VUA has been adopted since June 2001. However, VUA in Mar Lothie was less cooperative to assist the new system than VUA in Mar Fafaco. It is considered that some kind of education activities for VUA's capacity building would has been included in the project activities.

(2) Effectiveness

Effectiveness concerns the extent to which the project purpose has been achieved, or is expected to be achieved, in relation to the outputs produced by the project.

The project purpose, establishing operation and management system of SHS, is almost realized as of October 2001. Many of SHS units well worked and maintained. However, there are still some subjects should be solved in the operation and maintenance system, such as revision and cutback of the operation cost and capacity building of the VUA.

(3) Impact

Impact is intended and unintended, direct and indirect, positive and negative changes as a result of the project.

The major impacts reported by users were;

- Learning condition for children was improved
- Streets were well lighted (lighting from the entrance light of the house)
- Petrol consumption was saved
- Working condition in night time was improved

Based on the experience of the Pilot Project, ASER prioritized Mar Island for a model area of decentralized rural electrification, and is preparing new project which consists of improving utilization of existing generator, introducing SHS for individuals and public light in Mar Island. Any negative impacts in socio-economic and environmental sector wasn't reported.

It is concluded that Mar Island is going to get great deal of positive impact from the Pilot Project.

(4) Relevance

Relevance is to question whether the outputs, project purpose and overall goals are still in keeping with the priority needs and concerned at the time of evaluation.

Rural electrification by SHS is in line with the basic policy of the Government of Senegal. Although any actual electrification strategy and/or program using SHS hasn't been drawn up, ASER / MMEH allots SHS for important role for realizing the Rural Electrification.

Considering the needs of village people, SHS satisfied almost all of users. However, it seems that user's demand to power is increasing as time passed. Therefore, there is some possibility to change the degree of user's satisfaction in near future.

(5) Sustainability

Sustainability of the development project is to question whether the project benefits are likely to continue after the JICA project has come to an end.

MMEH is a responsible ministry for electrification, and ASER is an implementing agency for rural electrification. Both organizations have important roles for rural electrification in the Government of Senegal.

MMEH /ASER has strong intention to continue the project activities after the termination of the Pilot Project. In fact, ASER has a plan to establish the new project which covers all activities of the Pilot Project.

People in Mar Island also eager to continue the project activities, too. The users are satisfied with SHS, and want to use it continuously. There were about one hundred subscribers on the waiting list on June 2001, ant the number of subscribers was increased to 200 on October 2001.

Although both MMEH and ASER couldn't prepare the budgets for continuing the future activities, they will take necessary procedures before January 2002 when the Pilot Project is handed over.

On the other hand, operation cost of the project activities such as maintenance and replacement cost of the equipmentare covered by the collected electricity fee. The assumption adopted for drowning the financial plan of the Pilot Project such as price projection of PV equipment should be monitored continuously, and it's results should be reflects the financial plan.

(6) Conclusion

It is concluded that the Pilot Project was almost succeeded, although there were several inappropriate points in "Efficiency".

MMEH and ASER place the Mar Island as a priority area for rural electrification, and villagers in Mar Island also eager for continuing and expanding the project activities.

However, some subjects should be solved still remain, such as enhancement of the VUA's capability and establishment of more effective operation system. Recommendations and lessons learned are shown on following chapter.

9.2 Technical Evaluation

SHS systems installed in Mar Island were evaluated on static condition and dynamic condition. The both of conditions are attached below as the "periodical maintenance report" and for the dynamic condition "logging data analysis" was made taking advantage of the data-loggers.

(1) Periodical Maintenance

The periodical maintenance had been held on June and August 2001. The result will be shown on the attached "Periodical maintenance report-1 and -2" in Annex E. Judging from the reports, all of the systems are working normally as designed, and they had been under good care of the local technician, except for below mentioned items. The most important indicator of batteries voltage has shown normal on all of systems through the testing period of a year.

(2) Dynamic Condition

To check actual functions of SHS, load patterns and meteorological data, three data-loggers have been installed in the households separately and the data were analyzed. The result shows normal action of the systems through worst weather condition of rainy season in June to August. The batteries had been recovering its normal capacity on the days following night power consumed. As the attached graphs show the batteries voltages show fully charged voltage of 13.7 V by 1:00 p.m. of following days and never falling down to 11.1 V of over charged.

(3) Troubles and Action Taken

- Unusually short life of fluorescent tubes

  As of October 2001, 14% of fluorescent tubes have been broken done showing anode spot (local black spotting).

(4) Cause of Break Down

This phenomenon may originate from spreading of radiation material coated on the anode of fluorescent tubes, which occurred over heating of the electrode when it started to work. In this case the trouble was generated for poor quality of ballast inverter. It is clearly identified by the test result of CERER.

(5) Measure Taken

JICA study team and the supplier discussed on the matter and agreed that, all of troubled lamps should be replaced in charge free based on the agreement of purchasing. For the replacement "the integrated lamp"(the ballast combined with a "U" F/L light in a solid shape: "SOLSEM", the product of Steca, Germany) shall be used. The integrated lamps have been widely accepted with good experience for SHS around the world. As of 12th

October 2001 immediate necessity replacement of 57 sets (14% of all installation) were replaced.

Additional 50 sets of "the integrated lamps" are stored in the local technician's hand for future replacement.

(6) Reason for Replacement

Initially installed fluorescent lights "Thin-lite" have advantage of low cost to replace because of the tubes are easy to separate from the ballast inverters when "the integrated lamps" are not, but those for general use tubes are designed to apply stable grid AC current to energize. In other hand the integrated lamp are designed to apply DC of SHS, so that matching of tube and ballast is perfect. Expected life of integrated lamp of 6000 Hrs (manufacture's data) with high performance will compensate higher initial cost. Availability also covered by the operator stock of 50 units in the village.

- *Charge regulator troubles*

  3 pieces of charge regulator's indicator lamp were not worked and was replaced. They were presumed that improper soldering of indictor lamps. 5 pieces them are erroneously acted. The erroneous action may occur when temperature compensation unit were not connected properly at the installation work. Since the action may not generate serious situation immediately, field technician reconnected tightly after cleaning the terminals and put them under careful observation. He shall replace them when the same error happened again.

- Conclusion

  Considering the generally good aspect of the periodical maintenance record and the logging -data analysis result, it seems that all systems are working as designed under the good care of the local technician. It is recommended to make periodical maintenance once a year from now on.

Table 9.1 Results of Evaluation (1/8)

Evaluation Point	Point to be checked	Results
1 Efficiency 1-1 What degree is the output achieved?	1) Were all of the SHS units installed on time?	No, installation of SHS units delayed about 2 months from the original plan. This delay took large influence on application of the Pilot Project (see case No. 6 on Table 2). Installation was supposed to be started on September. But as it was SHS installed on November. This delay was mainly caused by the delay of delivery of goods, due to long summer vacation of SHS manufacture in Europe. In addition, some works such as preparation of tender document and procurement of components, were also taken longer periods than estimation, because SHS market hasn't matured yet in Senegal.
	2) Did users use SHS unit in the way of manuals?	Yes, according to the Operator, most of the users use SHS in line with the manual, although 25 users didn't clean solar panels at initial stage. Regarding the intelligibility of the manuals, all users answered that the manual was easy to understand.
	3) Did the operator collect CFA 3,700 per month for the electricity charge?	Yes, CFA 2,775,000 was collected for the period from December 2000 to September 2001, while the total amount of the fee in this period was CFA 3,515,000. The fee collection rate during this period was about 80%. The reasons not to pay were divide roughly into two categories. The case of health post was explained on the ANNEX C. Due to postpone of fluorescent lamps replacement, the health committee of Mar Lothie has paid for only 1 unit of SHS, although they installed 2 units. The PPMC notified the health committee to remove this SHS, unless the health committee would pay the outstanding account in October 2001. The remaining cases were just delay of payment due to financial reason. It was pointed out the difficulty of frequent payment for users hadn't monthly or regular income. However, the Operator took an optimistic view of this delay. According to the Operator, all of the users had will to pay the fee, except a case of the health post.

Table 9.1 Results of Evaluation (2/8)

Evaluation Point	Point to be checked	Results
	4) Did the operator manage their expenditure appropriately since December 2000?	Yes, the Operator modified fee collection system appropriately. There was a large amount of cost spent for fee collection from December to June. The cost for fee collection accounted for 27 % of the total expenditure of CFA 1,292,600 in this period. Therefore, new fee collection system has been introduced since June. As the result, cost for fee collection decreased more than CFA20,000/time. On the other hand, expenditure included CFA 250,000 of exceptional miscellaneous cost for procurement of motorbike for the Local Technician. These costs were caused by the change of the project size and design, because the number of subscriber didn't reach the minimum requirement (see case 1 to 3 on Table 2 and Table 9.3).
	5) Did the operator replace malfunctioned parts in the way of the contract?	Yes, in general. There were somecases that the operator couldn't fix the unit within the period determined on the contract. This delay was caused by the shortage of spare-parts such as charge-controller and fluorescent tubes. On the other hand, some users took time to decide replacement, because they had to purchase fluorescent tubes by themselves.
	6) Did the SHS units generate power as planned?	Yes. According to the record of data loggers, SHS has constantly generated expected power, and keeping the battery condition as good as voltage of more than 12V since the beginning of the Project (see Chap 9.2).
1-2 Was the project size appropriate compared with the project purpose?	1) Were the number, specialties and duration of stay of the dispatched JICA Study Team appropriate?	No, MMEH mentioned that the frequency and dispatch period of the Study Team was too short to implement the Project. In general, 1 to 2 experts assigned through the whole project period. Regarding the capabilities, the Operator answered that member of JICA Study Team had very high technologies, even though they often insisted high quality standard during the installation of SHS.
	2) Were the number of officials, technicians and consultants in the Senegal side and assigns period appropriate?	No, the officials from ASER participated in the Project from the progress period, because ASER was established in the middle of 2000. On the other hand, electrical engineers from MMEH joined the Project only in initial stages. MMEH pointed out the difficulty to conduct cooperation works with the JICA Study Team (see case No.5 on Table 2).
	3) Were the sizes and ability of VUAs appropriate?	No, more participation of VUA in Mar Lothie is required. On the other hand, VUA in Mar Fafaco worked well. The Operator requested VUAs assistance for fee collection. So far, the actual activity of VUA in Mar Fafaco was only assistance for fee collection. On the other hand, VUA in Mar Lothie didn't take any action (Fee was collected by the Local Technician). Therefore, the PPMC request VUA in Mar Lothie to collect fee by themselves. The fee collection including VUAs activities will be monitored by the PPMC.

Table 9.1 Results of Evaluation (3/8)

Evaluation Point	Point to be checked	Results
	4) Was the number and ability of the Local Technician appropriate?	Yes, so far, the Local Technician has performed his duty. It was planned to assign 2 local technicians in original design of the project which designed for 150 users. However, there were only 95 subscribers applied the Project. Therefore, number of local technician was also reduced to one person. Because the Local Technician covered 2 villages, some mobility problem was reported in the initial implementing stage. Therefore, the Operator provided him a motorbike. In consideration of maintenance record, it seems that the Local Technician has performed his duty in this stage. However, the Operator expects him to carry out the higher level works than the original plan.
	5) Were the number, specification and quality of the installed SHS units appropriate?	Yes, because the project aimed to confirm the feasibility of management system for SHS, size of the project was designed from the financial viewpoint. Therefore, original scale of the project was basically suitable for its purpose. However, following problems were reported. In consideration of income and expenditure balance, the minimum number of the participants was estimated more than 150. But as it was, only 79 users (95 units) were applied by the subscribers. On the other hand, there are still many villagers want to electrify their house. More than 200 villagers newly applied to the project after starting the installation. Concerning the suitability of the options, small modification for Option 1 was conducted based on the request from user (see case No.9 and 10 on Table 2). The PPMC has allowed to modify the specification of SHS when the Operator agreed user's request through the technical investigation since June 2001. Then user's demand was surveyed on October 2001. The modification system of SHS based on the user's needs is established in this way.

Table 9.1 Results of Evaluation (4/8)

Evaluation Point	Point to be checked	Results
1-3 Was the timing of the cooperation relevant?	1) Was the JICA study team timely dispatched?	No, considering the organizational situation in Senegal side, it seems that the timing of detachment was bit earlier. ASER, the real counter part agency of the Project, was established after the Project started. In addition, the rural electrification plan also hasn't drawn up yet. Therefore, there were some difficulties to design the Project due to lack of a real decision-maker in Senegal side. Regarding the assignment schedule of JICA Study Team, there was no person assigned during the initial implementing stage of the Project, although 2 members visited project site on March 2001. It was very difficult for stakeholders such as ASER, MMEH, the Operator and VUAs to accomplish each role without any assistance by JICA Study Team.
	2) Was the Pilot Project timely started?	No, as already mentioned above, the Project should have started after the establishment of ASER, or after drawing up the rural electrification plan by Senegal side. However, the technical feasibility of SHS was almost confirmed through the project conducted by GTZ. The remaining subject was only the operation and management system. Therefore, the Project aimed to establish the management system of SHS timely started from this view point.
	3) Was the local technician timely trained?	Yes, basically. The Local Technician finished his training course in the institute before the SHS installation started, and was assigned to the installation as for OJT. The training for the Local Technician was conducted as scheduled. However, the Operator pointed out that capability of the Local Technician wasn't good enough for his works. Because there was only one technician in the Project site, the Operator couldn't send him for another training course. It seems that necessity and timing of the additional training should be considered when the project schedule was designed.
	4) Was the PPMC timely established?	No, Although the Project was discussed between MMEH and JICA Study Team since the beginning, the PPMC was established just before the implementation of the Project, because the delay of ASER's establishment. Due to the delay of PPMC's establishment and shortage of discussion, roles of the PPCM wasn't clearly confirmed by ASER / MMEH when the PPMC was established. Therefore, monitoring by the PPMC didn't conducted in first 5 months. ASER / MMEH and JICA Study Team discussed and agreed the monitoring procedure of the Project by the PPMC at the mid-term evaluation.

Table 9.1 Results of Evaluation (5/8)

Evaluation Point	Point to be checked	Results
2 Effectiveness Was operation and management system for SHS established?	1) Were the 95 units of installed SHS well work?	Yes, all of main problems identifiedduring the project period were solved, and SHS units worked as well as planned. According to CERER, ballast-inverter of fluorescent tube and battery didn't satisfied specification required (see case No 13 on Table 2). The abnormal short life span of fluorescent tube supposedly attributed to the ballast-inverter was recognized at some SHS units. In addition, malfunction of some charge controllers also reported. All of malfunctioned devices are replaced by the Operator free of charge.
	2) Was the operation cost recovered by electricity charge?	Yes, there is every possibility. Based on the original financial plan of the project, the expected surplus in 2001 was CFA 1,818,000. According to the Operator, we can expect high possibility to collect remaining fee, although the collected fee for last 10 months was CFA 2,775,000which was only 80% of the total amount of CFA 3,515,000. On the other hand, as mentionedabove, the expenditure for last 6 months included exceptional cost for purchasing the motorbike. This kind of cost wasn't occurred in usual situation. Therefore, we excluded this cost (CFA 250,000) from the total expenditure when the income and expenditure was evaluated. Based on the above presupposition, it is estimated that the surplus in 2001 would be CFA 1,882,800.
3 Impact 3-1 Did the project contribute to the improvement of the rural electrification sector?	1) Did the project contribute to the socio-economic upgrading in Mar Island?	The major impacts reported by users were; – Learning condition for children was improved. – Streets got less darkness during night time because the entrance light of the houses along the streets. – Consumption volume of petrol was saved. – Working condition at nighttime was improved.
	2) What was the factors contributing to / inhibiting the development of the rural electrification sector?	The Project was broadcasted several times by the broadcasting station. This would contribute to extend peoples knowledge regarding the rural electrification. ASER prioritized Mar Island for a model area of rural electrification. Based on the experience of the Project, ASER was preparing new development project which consists of improving utilization of existing generator, introducing SHS for individuals and public light in Mar Island.

Table 9.1 Results of Evaluation (6/8)

Evaluation Point	Point to be checked	Results
3-2 Did the project contribute to regional development?	1) To what extent has the project contributed to the socio-economic upgrading of the concerned region?	As mentioned above, ASER is preparing the new development plan for Mar Island. In addition, some positive impacts such as improving learning condition for children and working condition at night was reported from users. These impacts are expected to contribute the socio-economic upgrading in Mar Island. So far, any negative impact wasn't reported.
	2) What are the factors contributing to/inhibiting the development of Mar Island?	Due to the large demands of SHS in Mar Island, ASER is preparing the new project to introduce additional SHS in Mar Island. The new project targets not only SHS, but also effective use of existing autonomous generator in the Island. However, this project is still on designing stage, due to unsettled financial source.
4 Relevance 4-1 Was the Project planning relevant?	1) Did the electrification by SHS meet the living condition of Mar Island?	Yes, SHS satisfied needs of people in Mar Island. There wasn't any extension plan of existing grid, or electrification plan in Mar Island (except above new project prepared by ASER). To consider these situations, Mar Island was one of the appropriate sites for the Pilot Project. Regarding the natural condition in Mar Island, any negative influence on SHS wasn't reported.
4-2 Were the needs in Senegal well identified?	1) Was the rural electrification still consistent with the development policy of Senegal Government?	Yes. ASER / MMEH plan to introduce SHS for lighting oriented electrification in rural area, or electrification for the areas which weren't covered by grid extension. The Project was drawn out in accordance with this policy.
	2) Was SHS an appropriate device for realizing the rural electrification plan of the Senegal Government?	Yes. ASER prioritized Mar Island for model area of rural electrification, and SHS was one of electrification measure for Mar Island. Because of good reputation of the Pilot Project, many villagers eager to introduce SHS too. It is concluded that electrification by SHS is in line with the government policy and meets the user's demand.
	3) Was SHS an appropriate device to meet the electricity demands of village people?	Yes. As the result of interview survey, most of the users answered that they were satisfied electrification by SHS. However, 56 users felt shortage number of light. In addition, some users required more powerful SHS for using color TV, refrigerator, etc.

Table 9.1 Results of Evaluation (7/8)

Evaluation Point	Point to be checked	Results
4-3 Was the cooperation planning process relevant?	1) Was the target level of the output relevant?	Yes, target level of the output was relevant in consider with the capability of ASER, MMEH and VUAs. Although ASER was a newly established agency, Senegal Government has rich experiences for rural electrification using SHS through the cooperation projects with foreign donors such as GTZ. There were also many local consultants who engaged in these cooperation projects. Senegal Government appoints these consultants as a staff of ASER. On the other hand, village people in Mar Island run the many kinds of committees. They operate the water supply system in the Island by themselves. It is considered that both C/P and village people have enough ability to fulfill the required roles to realize the outputs.
	2) Was the target level of the project purpose appropriate?	Yes. The technical feasibility of SHS was already confirmed by the GTZ project. Consequently, remaining subjects were operation and maintenance system for SHS. The Pilot Project aims to establish operation and maintenance system for SHS in Mar Island. It was concluded that the project purpose met the demands for improving the rural electrification using SHS.
	3) Did the outputs contain all of necessary items for realizing the project purpose?	Yes, the Pilot Project was designed based on the results of problem analysis. So far, any shortage or lack of necessary items wasn't recognized.
4-4 Was the implementa-ti on schedule relevant?		No. As mentioned above, it is considered that the Project would be implemented more effectively, if it was started after ASER was established.
5 Sustainability 5-1 Did MMEH/ ASER have organizational sustainability?	1) Were there any political supports to MMEH/ ASER for rural electrification?	Yes, MMEH was a responsible ministry for electrification, and ASER was an implementing agency for rural electrification. The Government of Senegal fully supported MMEH and ASER for fulfilling the above obligation.
	2) Did the ASER/MMEH intend to continue the project activities?	Yes, ASER intended to continue the project activities. As mentioned above, ASER prioritized Mar Island as a model area for rural electrification. ASER planed to expand the project activities, too.

Table 9.1 Results of Evaluation (8/8)

Evaluation Point	Point to be checked	Results
	3) Did the ASER/MMEH intend to allocate enough technicians and staffs for the project activities?	Yes. In fact, there were only politicians participated the Project from ASER / MMEH, and electric expert was dispatched from CERER. The Project also will be continued in cooperation with CERER. In addition, ASER agreed to allocate their own technicians to the Project in the future on recommendation from the JICA Study Team.
	4) Did the VUAs intend to continue the project activities?	Yes. Both VUAs in Mar Lothie and Mar Fafaco eager to continue the project activities.
5-2 Did the implementing organization have financial sustainability?	1) Were the operating expenses for the project activities securely acquired?	Yes, necessary expenses for the project operation was basically covered by collected fees. So far, fee has been collected smoothly, and it is expected that this fee collection would be continued in the future too.
	2) Was the official financial support guaranteed?	No, it was still not sure in this period. The JICA Study Team requests ASER/MMEH to budget for continuing the Project for next year. Although ASER couldn't prepare the specific budget in this period, ASER made a definite promise to continue the project activities.
5-3 Did MMEH / ASER have material and technical sustainability?	1) Did MMEH / ASER utilizes transferred technology properly?	Yes, ASER drew up the new electrification project based on the experience of the Pilot Project. And ASER intended to continue the project activities in the future too.
	2) Did ASER / MMEH have necessary equipment to continue the project activities?	Yes, they will have it. In fact, all of necessary equipment was completed by the JICA Study Team. These equipment will be transferred to ASER / MMEH. In addition, all of this equipment is available in Dakar.
	3) How did ASER / MMEH transfer the techniques to other staffs?	So far, all counterparts from both agencies haven't transferred any knowledge and techniques to other staff.. It is expected that these knowledge and techniques will be transferred through the monitoring survey by the PPMC.

Table 9.2 Project Design Matrix for Pilot Project (1/2)

Project title : Pilot Project for PV Rural Electrification in Mar Island
Project area : Mar Island
Target Group : People in Mar Island
Duration : From March 2000 to October 2001
Prepared by JICA Study Team on June 2001

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumption
【Overall Goal】 People in Mar Island realize the possibility to improve living condition through the electrification.	• Electrification plans for improvement of the living standard (not limited to lighting purpose) are proposed from people in Mar Island.	• Project proposal prepared by the people in Mar Island	
【Project Purpose】 Operation and management system for SHS is established in Mar Island.	• All of installed SHS units are worked well when the pilot project terminated. • The operation cost is recovered by collected electricity fee.	• Report of the PPMC • Result of "SHS working condition survey in Mar Island"	• Operator continues their activitiy. • Price of SHS is decleased 50% during next 20 years.
【Output】 1 SHS units are installed to the households which want to be electrified with the SHS. 2 User utilizes the SHS following manuals. 3 Electricity fee are collected from users in schedule. 4 Maintenance and repair of SHS are well carried out. 4-1 Operator carries out the regular maintenance of SHS. 4-2 Operator repairs the broken SHS. 5 SHS works in line with a specification.	1 All of installed SHS units are worked appropriately when these units are installed. 2-1 Any SHS units aren't modified without permission from the operator. 2-2 User cleans SHS up. 3-1 CFA 3.5 million was collected by the end of September 2001. 3-2 CFA ??? of surplus was secured by the end of September 2001. 4-1 Utilization conditions of SHS are confirmed every month. 4-2 Repair of the broken SHS is started within one week from the report. 5 SHS generates electricity as planned.	1 Construction record of contractor / Completion certificate 2-1 Report of monitoring survey 2-2 Report of monitoring survey 3 Record of bank account 4-1 Report of monitoring survey 4-2 Report of monitoring survey 5 Record of data logger	

Table 9.2 Project Design Matrix for Mid-term Evaluation (2/2)

Narrative Summary	**Input**	**Important Assumption**
【Activities】 1-1 Specification and capacity of SHS are designed. 1-2 Specification and capacity of SHS are explained to the people in Mar Island. 1-3 Initial payment is collected from subscriber. 1-4 SHS units are installed to each household. 2-1 Users manual for SHS unit is prepared. 2-2 Directions for using SHS are explained to users when it's installed. 2-3 User training are conducted regularly by the Operator. 3-1 Role of each stakeholder is defined. 3-2 VUA is established. 3-3 Operator is selected. 3-4 Schedule of electricity fee collection for each user is prepared. 3-5 Operator collects the electricity fee as scheduled. 3-6 Operator penalizes the person who doesn't pay an electricity fee. 3-7 VUA educates users to heighten their awareness of payment. 4-1 Operator conducts periodical maintenance of SHS. 4-2 Operator rectifies inappropriate usage of SHS. 4-3 Operator repairs the SHS based on the request from VUA. 4-4 PPMC supervises the maintenance and repair activities by the operator. 5-1 PPMC sets up the data logger. 5-2 PPMC collects the data from data logger, and analyzes it.	<u>Japanese side</u> Dispatch of consultants team 8 consultants 35.7MM C/P Training Provision of equipment - 100 units of SHS system <u>Senegal side</u> C/P Office of PPMC	• Spec. and capacity of SHS meets user's needs . • Trained member of VUA continues his work. • Income level of users doesn't become worse than present level. **【Precondition】** • Village people in Mar Island want electrification by SHS.

Table 9.3 Expenditure of the Pilot Project

Unit: CFA

	Local Technician	External Technician	Fee Collection	Trans-portation	Telephone card	Miscellaneous	Total
Jan-01	40,000		67,000	29,000			136,000
Feb-01	40,000	80,000	69,000	7,500			196,500
Mar-01	40,000	80,000	75,000	112,600			307,600
Apr-01	40,000	80,000	74,000	19,000		250,000	463,000
May-01	40,000			20,000			60,000
Jun-01	40,000		69,500	20,000			129,500
Jul-01	40,000	160,000	48,000	17,500			265,500
Aug-01	40,000	80,000	48,000	20,000		10,000	198,000
Sep-01	40,000		47,500	23,000	5,000	24,600	140,100
Oct-01	40,000			28,000	5,000		73,000
Total	400,000	480,000	498,000	296,600	10,000	284,600	1,969,200
%	20.3	24.4	25.3	15.1	0.5	14.5	100.0

Remarks: CFA250,000 on the miscellaneous on April 2001 was paid for purchasing motorbike for the transportation tool of local technician. Most of the other miscellaneous was used for repairing the motorbike.

Detail Items of Expensiture for Fee Collection Before Introducing New Collection System

Unit: CFA

Items	Average cost
Rent a car (one way to Ndangane)	25,000
Public transportation (Ndangane to Dakar)	4,000
Rent a boat (Ndangane to Mar Island)	5,000
Rent a Horse cart	2,500
Accomodation	15,000
Food expenses	24,000
Total	75,500

Detail Items of Expensiture for Fee Collection After Introducing New Collection System

Unit: CFA

Items	Average cost
Rent a car (one way to Ndangane)	25,000
Public transportation (Ndangane to Dakar)	11,000
Food expenses	12,000
Total	48,000

10. Recommendations and Lessons Learned

10.1 Procurement of SHS Components

Although most of all components for SHS are made in industrialized countries, common international standards are not yet established enough. Prior to open a bid many preparation works are necessary to get reliable components. Normally, suppliers have not enough stock of the components for big projects, particularly, batteries stock are limited for the reason of degradation by time. A purchaser needs to survey availability of necessary components, read time of supply to the project site, testing laboratories to check qualities based on required specifications. Bidders side also need to study availability with manufacturers or primary suppliers and read time for import. Consequently it takes more than 6 months. In this context, we need to accelerate establishment of pre-designed "standard SHS " base on the sociological and "standard specification for the SHS components for procurements" base on the market study. It is also recommended that the special instruments like data loggers need to be prepared separately by study team because it is not easy to purchase in developing country and it is only tool for research work.

10.2 Local Technician for Maintenance

The local technician has been working very effectively. He understood basic of SHS and diagnose on minor system troubles beside of his dairy maintenance work of battery checking and lamp replacement. He says it is very happy to have a job.

A local technician shall be the mediator between users and a project operator, so that he shall be forced to stand different position from village people when he lives in traditional village society. To keep a technician's professionalism and their position stable, it is recommendable to give them official license and give chances to refresh their performance.

10.3 Recommendation beside of Pilot Project (PV hybrid with existing water lifting diesel generator)

Rational use of Diesel generators for Water Supply Facility in Rural Villages

Many un-electrified villages including Mar-island have diesel generators for water supply. These diesel generators have much greater power than its demand at constant operation to bear rush current to start. Operation hour per day is only 3 to 6 Hrs. or so with light load.

These excess power of diesel generators are easy to convert to household electrification. Necessary investment for battery bank and PV panels array makes ideal hybrid power unit. The benefits of the system will be,

- Reducing fuel cost
- Eliminating "non load operation of diesel generators", which gives damage to the system
- Power supply to households
- Prepare enough power for color TV and some refrigerators, crop mills.
- Small local industry power source

Operating organizations for these facilities that established with cooperation of JICA or CARITAS are already exist in the each villages. When this idea materialized it can be the great power for rural development. Since, there are some people in MEH and ASER interested in this idea, it is recommendable to accelerate study on this task. A conceptual diagram will be shown on the next page.

ANNEX

ANNEX A CONTRACT PAPER OF THE PILOT PROJECT

CONTRAT ON THE PV ELECTRIFICATION IN MAR ISLAND

CONTRACT USER AND MATFORCE

CONTRACT ON THE PV ELECTRIFICATION IN MAR ISLAND

This contract is passed between MATFORCE "Compagnie d'Applications Mécaniques" which headquarters is located at 10 avenue Feidherbe-Dakar represented by his Managing Director Mr. Mamadou SOW acting on the behalf and for the above-mentioned company hereunder referred as the "operator" and subscriber

Mr. _____ living in _____ (hereafter referred as "USER"). The two parties made the following agreement.

Preamble

This agreement is made in the idea of the execution of cooperation Pilot Project between MEH and JICA within the framework of Study for the PV Rural Electrification Plan. To cope with the new procedures of rural electrification subsequent to the reform on electricity sub-sector, the state has decided to entrust ASER through Project ownership delegation with the management of the Project.

The objective of this project is the implementation of PV system for the electrification of Mar Islands in the sub-prefecture in Fimela, Department of Fatick. This project consists in the installation of PV systems. The PV system for the contract consists of two parts.

(1) The first part

The first part is as follows;

"One 55W Solarex PV panel (SX55)", "One Battery charge/discharge regulator Uhlman SLR1010", "One 100 Ah battery M14-SOL", "One battery box CPM-14" and "Cables and Fixtures" (hereafter referred as "MAIN PART")

(2) The second part

There are three types of the second part. One type of the second part is selected by "USER".

The second part is as follows; (Please put a mark on the selected variety)

- Variety 1:
  "Five – 8 [W] fluorescent lamp DC", "One DC/DC Voltage dropper", "One radio socket", "Five switches" and "Junction box and cables and fixtures"
- Variety 2:
  "Three – 8 [W] fluorescent lamp DC", "One DC/DC Voltage dropper", "One radio socket", "One TV socket", "Three switches", and "Junction box and cables and fixtures"
- Variety 3:
  "Two – 8 [W] fluorescent lamp DC", "Four –LED lamp", "One DC/DC Voltage dropper", "One radio socket", "One TV socket", "Six switches", and "Junction box and cables and fixtures"
  (hereafter referred as "INTERNAL PART")

General Clauses

Article 1: Object of the Contract

The object of this contract is to define the necessary conditions for the implementation and management of the Rural Electrification Pilot Project in Mar Island and define the obligations and responsibilities of the concerned parties.

Article 2: Description of the concerned Partners

The owner of this project is MEH that entrusts its execution to ASER.

ASER, the executing agency of rural electrification is owner of the project and by the same way of the installed PV equipment and makes the Pilot Project Operator carry out management of the Project.

The Pilot Project Operator is entrusted by ASER, the mission to ensure proper management of the Project equipment.

The USER is the direct beneficiary of the electricity services offered.

Article 3: Validity

The present contract shall take effect for 5 years from the date of signature. The contract condition will be reconsidered between "USER" and "PILOT PROJECT OPERATOR" when the contract is terminated. "USER" also will be able to withdraw from the contract in this time.

Article 4: Settlement of Contentions

In case of contention between the two parties, the latter will try their best to reach amicable mutual understanding. If they fail to reach a compromise, the contention will be submitted to the judgment of ASER. If the contention still remains after submission to ASER, the two parties will submit to the competent Law court of Senegal.

Article 5: Penalty: Transfer of the PV System

If the "USER" does not pay the "Monthly Payment" within 30 days from the date of the invoice issued the "PILOT PROJECT OPERATOR" shall send a first notification to "USER" requesting payment of due amount within one week. If the latter still does not pay the "PILOT PROJECT OPERATOR" shall suspend the electric supply and give a last notification for payment within a fortnight. If at the end of that deadline "USER" still does not pay the "OPERATOR OF THE PILOT PROJECT" will remove the whole of the "PV System" from the "USER" at any time with its all accessories without any other notification and will keep at his disposition the removed system without prejudice to appeals given to him by legal clauses.

If the "USER" makes alternations or modifications that may cause damages to the PV system without approval of the "OPERATOR", the latter shall remove the PV system at any time from the "USER" as mentioned on article 13.

Chapter II: Obligations and Responsibilities of each party

I) PILOT PROJECT OPERATOR OBLIGATION

Article 6: Maintenance & Repaires

The "PILOT PROJECT OPERATOR" under the contract with "ASER" shall be responsible for the maintenance and repair of the "MAIN PART" and the "INTERNAL PART". The "PILOT PROJECT OPERATOR" will carry out ordinary maintenance every month.

In case of minor repair, fixing or replacement is made within three (3) days from the date of notification. In case of major repair, fixing or replacement is made within seven (7) days from the date of notification. All of the necessary cost for maintenance and repair include replaced components is covered from the regular monthly payment.

Article 7: Replacement of PV system components

The "PILOT PROJECT OPERATOR" replaces components of the PV system based on the estimated lifetime of each component. Replacing components and estimated lifetime of components are as follows;

Replacing Components	Estimated Lifetime
Battery	4 years
Regulator	10 years
PV module	20 years
Ballast	10 years

All of the necessary cost for replacement is covered from the collected fees.

Article 8: Fee collection

The PILOT PROJECT OPERATOR is responsible for fee collection. The collected fees will be deposited in the bank account opened for that purpose.

The 25th of each month the User will receive an invoice which must be paid at the latest the 5th after consumption period. Fees must be paid to the operator employee who will give a receipt. Users will be informed of his visit 2 or 3 days before.

II) OBLIGATIONS AND RESPONSIBILITIES TO BE TAKEN BY USER

Article 10: Initial Payment

So that to be provided electricity service using installed PV systems, User have to pay total Amount of FCFA 45,000 the Initial Payment for each PV system.
The initial Payment is not refundable.

Article 11: Monthly Payment

11-1. Amount of the Monthly Payment

The "USER" shall pay FCFA 3,700 as "Monthly Payment". The timing of the payment is depending on the payment schedule that the "USER" selected. (Please put a mark on the selected payment schedule). ASER and PILOT PROJECT OPERATOR have the possibility to revise the amount of the monthly payment every year. Meanwhile any modification must be submitted to a written notification and with ASER approval.

User chooses his own payment schedule and will put a cross in the corresponding box

- Monthly payment
  User will pay FCFA 3700 on December 30, 2000. The same amount will be paid all months from this date
- Quarterly payment
- User will paid FCFA 11,100 for December 30 2000. The same amount will be paid all three months from this date.
- Semi-annually payment
  User will pay FCFA 22,200 on December 30.200, and will pay the same amount in every half year from this date.

11-2. Payment Method:

The "monthly payment " will be collected by the "Pilot Project Operator". "User" should pay his monthly payment as a schedule above

Article 12: Notification of the repairing demand

The "USER" must notify the "PILOT PROJECT OPERATOR" of malfunction and/or breakdown of the PV system. "PILOT PROJECT OPERATOR" fixes the PV system based on the notification. If the "PILOT PROJECT OPERATOR" does not fix the system beyond the schedule period, "USER" will inform ASER.

Article 13: Exclusion

Any repairing and replacement of the components of PV system in the case of following reasons, necessary cost is charged "USER".

- An important handling mistake
- A case of theft
- An accident, an omission or an abnormal use
- A displacement of the PV system without approval of the "PILOT PROJECT OPERATOR"
- Any modification, accessories assembling or dismantling of the PV system

If the "USER" makes alternations or modifications that may cause damages to the PV system without approval of the "PILOT PROJECT OPERATOR", the latter shall remove the PV system at any time from the "USER" who won't be able to ask for any compensation or indemnity.

Article 14: Cancellation of the contract

The User can cancel the contract when the operator does not respect his obligations as stipulated in the contract or when the latter does not provide the services as stated in above article 6 and 7.

In that case, that cancellation can be done through a letter (with acknowledgment of receipt) after having submitted a written notice without any success.

Article 15: Case of force majeure

The operator is not responsible for delays or damages springing from the execution of this contract in force majeure.

Force majeure means any event that the operator cannot control, any unexpected event that prevents the fulfillment of the obligations of the operator

Article16: Insurance

The operator will subscribe insurance for professional risks relating to the execution of this project.

Article 17: Accessibility

The operator can have access at any time and without restriction to the User's house to work on the PV system.

This contract was made into four copies and signed by both parties

Date,

_____

The PILOT PROJECT OPERATOR The USER

ANNEX B RESULTS OF THE QUESTIONNAIRE SURVEY

1. Outline of the Questionnaire Survey

There were 34 villagers participated to the Pilot Project from Mar Lothie & Mar Soulou, and 45 from Mar Fafaco, although the number of subscribers was fluctuated during the subscription period. These participants (users) weren't changed during the project period. There were 12 users introduced 2 units of SHS, and 2 users introduced 3 units. Therefore, total number of installed SHS were 95 units. 72 users out of 76 introduced same/larger number of fluorescent lamp/LED than the number of paraffin lamp they had before project started (see Table B- 1).

The questionnaire survey targeted all users were conducted for confirming the electrified condition. However, the Mosque (1 user) and health posts (2 users) which were utilized by all of village peoples were omitted from the interviewees, because survey items would be different from the ordinary users. The hotels were included interviewees, because the beneficiaries of SHS were both gests and owner/staff of the hotels. Therefore, targets of questionnaire survey were 76 users. The questionnaire surveys conducted 3 times, first one was conducted on December 2000 as a baseline survey, then second was on June 2001 (mid-term evaluation) and third was on October 2001 (final evaluation).

2. Socio-economic Condition

Almost all of the user's households are Serer tribe and Moslem (see Table B- 2 and 3). Family size of the users in Mar Fafaco tend to larger than Mar Lothie (see Table B- 4). Family size of 27 households out of 32 in Mar Lothie is between 6 to 15 persons. In contrast, 19 households out of 44 have more than 16 family members. The users in Mar Fafaco also has larger number of rooms/household (see Table B- 5). There are 20 users having 4 to 5 rooms/household, and only 4 users have more than 8 rooms/household. In contrast, there are 17 households having more than 10 rooms/household. However, number of lamps/household is 2 to 5 lamps/household both in Mar Lothie and Mar Fafaco (accounting for 57 households out of 76) (see Table B- 6).

Main industry of Mar Island agriculture and main products are millets for self-consumption and ground nuts for cashable product. The harvest season of these crops is between October and December, and farmer has cash income only once a year. Many

villagers in Mar Fafaco are engaged in fishery sector, and fishermen have cash income every month. Besides, employee of private company and self-employment are major income sources in the Island. There are 64 households out of 76 having 1 to 3 family members who have cash income (see Table B- 7 & 8). Many youths in rural area go to work in urban area or foreign countries, and make remittance. There are 64 users out of 76 answered that family member works in urban area / foreign countries (see Table B- 9 & 10).

Income frequency of household is one of key factor for setting up the collection frequency of electricity fee (see Table B- 11 to 13). All users chose most suitable payment frequency for electricity fee from monthly, bi-monthly and semi-annually payment. There were 40 users out of 76 chose monthly payment, then 17 users chose bi-monthly, and remaining 17 users chose semi-annually (see Table B- 14). According to the results of questionnaire survey, 72 households out of 76 answered that they had family member having income every month. However, 26 households out of these 72 chose bi-monthly or semi-annually payment. These users answered the reason to choose bi-monthly or semi-annually payment that they adjusted the payment frequency to income frequency. It means that the family member having monthly income works outside of the Island, and they come back every 2 to 6 months. Incase of users who are employed as sailors in private companies, many of them come back to the Island every 6 months. Although there are no bank and other financial institutions in the Island, 25 households out of 76 had bank accounts (see Table B- 15 & 16).

3. Energy Utilization

Main energy sources in Mar Island are paraffin, firewood, candle, gas cylinder and dry cell (see Table B- 17). Some households use car battery for power supply of TV. There were 75 user's households out of 76 used gas, 64 households used paraffin, and 55 households used firewood before starting the Pilot Project. Paraffin and candle are used for lighting, dry cell is for torch lamp, radio and radio cassette, then firewood and bottled gas is for cooking (see Table B- 18). Average expenditure for energy sources per household was CFA 12,142 / month. Although family size of user's household in Mar Lothie was smaller than Mar Fafaco, average expenditure for energy sources in Mar Lothie (CFA 15,063 / month) was larger than Mar Fafaco's one (CFA 10,017 / month).

Paraffin, candle, dry cell and battery charge are replaceable energy sources by SHS among the energy sources used in Mar Island. The replaceable energy cost by SHS was estimated CFA 4,362 / month (CFA 5,691 / month in Mar Lothie, and CFA 3,395 / month in Mar Fafaco), although cost for dry cell included for torch lamp which couldn't replace by SHS. Monthly fee for SHS in the Pilot Project (CFA 3,700) is almost same range of the replaceable energy cost by SHS.

According to the survey results in June and October 2001, the replaceable energy cost by SHS decreased to about CFA 1,400 / month. It means that users spent about CFA 5,100 / month (including CFA 3,700 of the monthly fee for SHS) for lighting and power supply of radio/radio cassette. To compare the expenditure before Pilot Project started, user's expenditure increased about CFA 700 / month (see Table B- 19).

4. Utilization of Electric Appliances

There were 114 radio/radio cassette and 14 TV possessed by users in December 2000. The number of radio/ radio cassette decreased 79, and number of TV increased 16 in October 2001 when the Pilot Project was terminated (see Table B- 20). There were 11 households which increased the number of owned radio/ radio cassette, and 32 households decreased it. In addition, the households increased the number of TV was 10, and 8 households decreased it (see Table B- 21).

It means that 25 radios/radio cassettes were decreased from 76 households within 6 months from December 2000 to June 2001. That is most unlikely to break down the 25 radios/radio cassettes within 6 months. There are some possibility that the users answered larger number than actual number.

The Pilot Project prepared 2 type of SHS, namely lighting-oriented system and TV and lighting-oriented system. TV and lighting-oriented system was chosen by 52 users out of 76. However, 39 users out of 53 didn't have TV. In contrast, 2 users out of 23 who chose lighting-oriented system had TV (see Table B- 22).

Dry cell was used for power source of radio/radio cassette before starting the Pilot Project (December 2000) (see Table B- 23). One user already installed SHS before the Pilot Project started. All of the users except this SHS owner used car battery for power supply of TV. There were 59 users out of 73 used SHS as a power source of radio/radio cassette,

and 11 out of 12 used SHS as a power source of TV. Utilization period of radio/radio cassette was decreased from 10 hours/day to 6 hours/day. In contrast, any change wasn't observe for utilization period of TV(see Table B- 24).

5. Maintenance Activities

The SHS units owned by 26 users out of 76 were troubled from December 2000 to June 2001 (see Table B- 25). In addition, SHS units owned by 57 users were troubled from June to October 2001. Number of users who got machine trouble more than once in each period was increased from 7 users (December 2000 to June 2001) to 29 users (June to October 2001). Most popular trouble was fluorescent light. There were 19 users fluorescent tube were burnt out from December 2000 to June 2001, and 52 users from June to October 2001, due to malfunction of ballast inverter(see Table B- 26). Because of this malfunction, 48 fluorescent tubes were replaced from December 2000 to June 2001, and 108 fluorescent tubes were replaced from June to October 2001 (see Table B- 27). In addition, machine trouble of the charge controller was also reported (6 cases from December to June, and 13 cases from June to October).

According to the contract between user and Operator, minor repair, fixing or replacement is made within 3 days, and in case of major repair, fixing or replacement is made within 7 days. Most of machine troubles occurred during the project period were replacement of fluorescent tube which didn't belong to the category of repair work by the Operator. However, users didn't have any means to purchase fluorescent tube except through the Local Technician. Therefore, replacement of fluorescent tube was also categorized in repair works in this questionnaire survey. 14 cases of machine trouble out of 18 were fixed within 3 days from December to June. There was only one case; replacement of charge controller, which took more than 2 weeks to repair, due to shortage of spare -parts. There were 35 cases of machine trouble out of 60 were fixed within 3 days, and 13 cases were fixed within 7 days from June to October 2001. However, 12 cases took more than 7 days to repair, and 10 cases out of these 12 took more than 2 weeks. These delays were caused by insufficient supply of spare –parts. There was a tendency that repair work in Mar Fafaco took longer time than Mar Lothie. It seems that this delay was related the location of Local Technician who lived in Mar Lothie.

Mar Fafaco is 30 minutes away from Mar Lothie by horse cart, and users in Mar Fafaco have to report it to Local Technician in Mar Lothie. In addition, some users pointed out

the difficulty of contact to Local Technician, because he went round user's households as his routine work. These problems were confirmed at the questionnaire survey on October 2001, and discussed measures at the seminar on October.

The Local Technician is supposed to conduct a monthly maintenance. There were 8 users answered that the Local Technician didn't visit their houses for monthly maintenance sometimes (see Table B- 29). All of these 8 users lives in Mar Fafaco. In addition, the Local Technician also pointed out the difficulty to cover two villages by one person. Therefore, the Operator provided motor bike for the Local Technician to improve working condition. As the results, 74 users out of 76 answered that the Local Technician visited their houses for monthly maintenance from June to October.

6. Fee Collection

As mentioned above, there were 40 users chosen monthly payment, 18 users chosen bi-monthly payment and 18 users chosen semi-annually payment on December 2000. However, many users didn't follow their chosen payment schedule. As of October 2001, all of the users paid monthly fee from December to May except 1 unit in the health post in Mar Lothie. However, collection rate was gradually decreased after June, and there was only one user paid monthly fee for September (see Table B- 30). Although payment of monthly fee was delayed, it seemed that payment was done steadily. As the results of questionnaire survey on October 2001, 33 users didn't remember their chosen frequency (see Table B- 31). According to the Operator, users paid their monthly fee when they had cash income, and the Operator didn't recognize any problem about payment.

7. Intention of Modifying SHS

As of October 2001, 44 users out of 76 requested modification of SHS unit (see Table B-32). Many users pointed out insufficient brightness of LED at the questionnaire survey on June. However, 29 users requested to increase the number of LED on October. In addition, 21 users requested to increase the socket for TV. VUA explained the reason of these requests.

- Users realized that LED was enough bright for night work such as infant care. (Users started to use LED as a night lamp)

- Some users introduced lighting oriented system want to use TV. These users should replace fluorescent tube with LED when they install TV socket.
- Some users intended to increase number of lamps. They chose LED which capacity was smaller than fluorescent light.

There are some users who still aren't satisfied brightness of LED. However, it is quite big changes that number of users who try to choose appropriate lighting equipment is gradually increased. In addition, some users try to adjust the total capacity with decreasing number of fluorescent when request to increase LED or TV socket. It seems that users promoted better understanding for SHS though the one year experience.

The information regarding the request of modification submitted to the Operator. The Operator will dispatch engineer to investigate the feasibility of each request.

Annex B

Table B-1 Number of Lamps Users Possessed (1/2)

(Users in Mar Lothie and Mar Souloe)

No.	Name of Users	Before the Project		After the Project					
				No. of SHS	No. of option possessed		No. of electric bubles		
		No. of Rooms	No. of Lamps		1	3	F. tube	LED	Total
1	Mosque	1		1	1		5		5
2	Abdou Mata Diouf	7	4	1		1	2	4	6
3	Abdoul Aziz Thior	4	4	1		1	2	4	6
4	Abdoulaye Diom	12	6	1		1	2	4	6
5	Ablaye Debe Gning	4	3	1		1	2	4	6
6	Adama Faye	8	4	1		1	2	4	6
7	Agnes	7	19	3	2	1	12	4	16
8	Alioune Senghor	4	2	1		1	2	4	6
9	Birama Ndiaye	4	1	1		1	2	4	6
10	Health post			2	2		10	4	14
11	Doudou Lamine Diom	5	2	1		1	2	4	6
12	El Hadj Coumba Ndiaye	4	3	1		1	2	4	6
13	El Hadj Doudou Diom	5	5	1		1	2	4	6
14	Mamau Thior	5	3	1		1	2	4	6
15	Etienne Dogue	5	2	1		1	2	4	6
16	Fabirama Bop	3	3	1		1	2	4	6
17	Fally Faye	5	1	1		1	2	4	6
18	Ibrahima Ndiaye	6	5	1		1	2	4	6
19	Issa Diop	7	7	2		2	4	8	12
20	Joseph Ndiogoye	5		1		1	2	4	6
21	Julienne Dogue	6	4	1		1	2	4	6
22	Khady Ndiaye	4	4	1	1		5		5
23	Madaba Thior	4	2	1	1		5		5
24	Salifou Ndiaye	8	5	1	1		5		5
25	Mamadou Kangou Ndiaye	6	5	1		1	2	4	6
26	Mamour Thiare	19	10	1	1		5		5
27	Martine Claudin	4	2	1		1	2	4	6
28	Michel Ndongue	5	2	1		1	2	4	6
29	Pape Latyr Faye	5	2	1		1	2	4	6
30	Paul Ndiogoye	4	3	1		1	2	4	6
31	Sabou Thior	7		3		3	6	12	18
32	Sidy Faye	4	4	1		1	2	4	6
33	Souleymane Rocky Faye	4	4	1		1	2	4	6
34	Theophile Thior	4	3	1		1	2	4	6

Remarks: Option 1; Lighting oriented, Option 3; Lighting & TV oriented

Annex B

Table B-1 Number of Lamps Users Possessed (2/2)

(Users in Mar Fafaco)

No.	Name of Users	Before the Project		After the Project					
		No. of Rooms	No. of Lamps	No. of SHS	No. of option possessed		No. of electric bubles		
					1	3	F. tube	LED	Total
1	Abdou Kaling	8	4	1	1		5		5
2	Abdou Ramane Bopp	7	4	1		1	2	4	6
3	Abdou Sarr	7	5	1		1	2	4	6
4	Abibou Sarr	12	5	1		1	2	4	6
5	Alouine Diome	6	3	1		1	2	4	6
6	Ameth Fall	2		1	1		5		5
7	Ansou Thiare	4	3	1	1		5		5
8	Arfang Moussa Ndong	6	2	1		1	2	4	6
9	Bakary Diome	12	4	2	1	1	7	4	11
10	Birama Ndong	12	7	1	1		5		5
11	Birame Mai Faye	5	3	1	1		5		5
12	Health Post			2	2		10		5
13	El Hadj Alioune Thiam	11	4	2	1	1	7	4	11
14	El Hadj Alioune Thiare	6	4	2	1	1	7	4	11
15	El Hadj Birame Faye	17	2	1	1		5		5
16	El Hadj Cheick Thiare	8	2	1		1	2	4	6
17	El Hadj Lamine Diom	11	7	2	1	1	7	4	11
18	El Hadj Mamadou Baro	9	4	1	1		5		5
19	El Hadj Ousmane Diop	14	9	2	2		10		10
20	El Hadj Sacou Kaling	8	5	1	1		5		5
21	Fabi Senghor	12	6	1	1		5		5
22	Faly Dione	7	2	1		1	2	4	6
23	Famara Sarr	18	9	1	1		5		5
24	Issa Kane	12	5	1	1		5		5
25	Issa Sarr	12	6	2	1	1	7	4	11
26	Lamine Mousso Ndiaye	16	2	1		1	2	4	6
27	Lamine Daba Diom	5	5	1		1	2	4	6
28	Lamine Diop	6	3	1	1		5		5
29	Lamine Thior	17	5	2	1	1	7	4	11
30	Mady Coumba Faye	10	7	1	1		5		5
31	Mady Diouf	8	4	1	1		5		5
32	Mady Sarr	8	4	1	1		5		5
33	Mady Yaye Faye	5	3	1		1	2	4	6
34	Mamadou Amadou Sarr	17	5	2	1	1	7	4	11
35	Mamadou Baro	10	6	2	1	1	7	4	11
36	Mamadou Kaling	11	2	1		1	2	4	6
37	Mamadou Madiang Faye	7	3	1	1		5		5
38	Mamadou Ndiakal Bopp	6	5	1		1	2	4	6
39	Mamadou Rogue Sarr	15	5	1		1	2	4	6
40	Moussa Diom	10	8	1	1		5		5
41	Ousmane Diouf	7	5	1		1	2	4	6
42	Ousmane Fatou Ndiaye	3	1	1		1	2	4	6
43	Ousmane Tamsir Ndiaye	6	4	1		1	2	4	6
44	Sagar Thiam	15	5	1	1		5		5
45	Yakhaya Sane Sarr	7	4	1		1	2	4	6

Remarks: Option 1; Lighting oriented, Option 3; Lighting & TV oriented

Table B-2 Tribe of theUsers

Unit : Households

	Wolof	Serer	Others	Total
Mar Lothie & Soulou	2	27	3	32
Mar Fafaco		43	1	44
Total	2	70	4	76

Table B-3 Religion of theUsers

Unit : Households

	Moslem	Christian	Buddhist	Total
Mar Lothie & Soulou	24	9	2	35
Mar Fafaco	44			44
Total	68	9	2	79

Note : Three households in Mar Lothie have plura religions in one household

Table B-4 Number of Households by Familiy Size Bracket in December 2000

Unit : Households

	Number of Family Size					
	< 5	6-10	11-15	16-20	> 20	Total
Mar Lothie & Soulou	4	14	13	1		32
Mar Fafaco	3	7	16	7	11	44
Total	7	21	29	8	11	76

Table B-5 Number of Rooms in Dwelling Unit in December 2000

Unit : Household

	Number of Rooms									
	<3	4	5	6	7	8	9	10	>11	Total
Mar Lothie & Soulou	1	12	8	3	4	2	0	0	2	32
Mar Fafaco	2	1	3	6	6	5	1	3	17	44
All villages	3	13	11	9	10	7	1	3	19	76

Table B-6 Number of Lamps in Dwelling Unit in December 2000

Unit : Household

	Number of Lamps									
	0	1	2	3	4	5	6	7	>8	Total
Mar Lothie & Soulou	1	2	7	6	7	4	1	1	2	31
Mar Fafaco		1	6	6	10	11	3	3	3	43
All villages	1	3	13	12	17	15	4	4	5	74

Note : 2 households didn't answere.

Table B-7 Number of Family Members Having Cash Income in December 2000

Unit : Households

	Number of Family Member Having Cash Income						
	1	2	3	4	5	6	Total
Mar Lothie & Soulou	11	6	8	3	2	2	32
Mar Fafaco	9	22	8	4	1		44
Total	20	28	16	7	3	2	76

Table B-8 Number of Family members Having Income Sources by Type of Income Sources in December 2000

Unit : Person

	Mar Lothie & Mar	Mar Fafaco	Total
Farmer	11	31	42
Fisherman	2	44	46
Labor	8	2	10
Service	0	0	0
Merchant	14	5	19
Private company employee	20	16	36
Government employee	11	0	11
Self-employed	15	10	25
Remittance	1	0	1
Pension	1	7	8
Total	83	115	198

Table B-9 Number of Family Member Working in Town in December 2000

Unit : Households

	Number of Family Member Working in Town							
	0	1	2	3	4	5	6	Total
Mar Lothie & Soulou	12	12	4	1	1	1	1	32
Mar Fafaco	15	10	11	7		1		44
Total	27	22	15	8	1	2	1	76

Table B-10 Position of the Family Member Having Cash Income in December 2000

Unit: Person

	Head	Spouse	Child	Spouse of Child	Grand-child	Parents	Others	Total
Mar Lothie & Soulou	27	12	23	1	1	4	15	83
Mar Fafaco	45	3	40	0	1	15	5	109
Total	72	15	63	1	2	19	20	192

Table B-11 Income Frequency by Type of Occupation in December 2000

Unit : Person

	Monthly	Tri_monthly	Annually	Others
Farmer	0	0	42	0
Fisherman	43	0	0	3
Labor	10	0	0	0
Service	0	0	0	0
Merchant	19	0	0	0
Private company	34	0	0	2
Government employee	11	0	0	0
Self-employed	25	0	0	0
Remittance	0	1	0	0
Pension	3	5	0	0
Total	145	6	42	5

Table B-12 Income Frequency of Family Members in December 2000

Unit : Person

	Monthly	Tri_monthly	Annualy	Others	Total
Mar Lothie & Soulou	69	2	11	1	83
Mar Fafaco	76	4	31	4	115
Total	145	6	42	5	198

Table B-13 Income Frequency of the Households in December 2000

Unit : Households

	Monthly	Tri monthly	Annualy	Total
Mar Lothie & Soulou	30	1	1	32
Mar Fafaco	42	-	2	44
Total	72	1	3	76

Table B-14 Selected Payment Frequency of Eelectricity Fee

Unit : Households

	Monthly	Bi monthly	Semi annualy	Total
Mar Lothie & Soulou	24	7	1	32
Mar Fafaco	16	11	17	44
Total	40	18	18	76

Table B-15 Possession of Bank Account in December 2000

Unit : Households

	Yes	No	Total
Mar Lothie & Soulou	7	25	32
Mar Fafaco	18	26	44
Total	25	51	76

Table B-16 Affordable Amount for Saving in December 2000

Unit : CFA/month

	Average	*Minimum*	*Maximum*
Mar Lothie & Soulou	15,265	2,000	30,000
Mar Fafaco	9,600	1,000	30,000
All villages	12,134	1,000	30,000

Note : Only 39 interviewees answered (Mar Lothie 19, Mar Fafaco 21)

Table B-17 Type of Energy Sources in December 2000

Unit : Households

	Paraffin	Fire wood	Candle	Coal	Char-coal	Bottled Gas	Battery	Dry Cell
Mar Lothie & Soulou	30	29	19	3	5	31	3	31
Mar Fafaco	43	42	6	0	1	44	1	43
Total	73	71	25	3	6	75	4	74

Table B-18 Type of Energy Sources by Purpose in December 2000

Unit : Households

	Paraffin	Fire wood	Candle	Char-coal	Bottled Gas	Battery
Cooking						
Mar Lothie & Soulou		29		7	31	
Mar Fafaco		42		1	33	
Total		71		8	64	
Lighting						
Mar Lothie & Soulou	30	1	19		5	1
Mar Fafaco	43	0	6		10	
Total	73	1	22		15	1

Table B-19 Change of Monthly Expenditure for Energy

Unit:CFA

	Replacable expenditure by			Total expenditure		
	Dec. 00	June01	Oct.01	Dec. 00	June01	Oct.01
Mar Lothie & Soulou	5,691	2,955	1,425	15,063	11,988	10,820
Mar Fafaco	3,395	546	1,417	10,017	5,898	9,276
Total	4,362	1,560	1,421	12,142	8,462	9,926

Remarks: "Replacable expenditure" consists of "Paraffin", "Candle", "Battery charge" and "Dry cells"

Table B-20 Number of Electric Appliances

Unit:set

	Radio/Radio cassette			TV		
	Dec. 00	June01	Oct.01	Dec. 00	June01	Oct.01
Mar Lothie & Soulou	52	35	35	7	10	12
Mar Fafaco	62	44	44	7	3	4
Total	114	79	79	14	13	16

Table B-21 Number of Users of Which Number of Electric Appliances Changed From December 2000 to October 2001

Unit:households

	Radio/Radio cassette			TV		
	Inc	Dec	NC	Inc	Dec	NC
Mar Lothie & Soulou	1	17	14	6	1	25
Mar Fafaco	10	15	19	4	7	33
Total	11	32	33	10	8	58

Remarks: Inc; increased, Dec; decreased, NT; not changed

Table B-22 Number of Households Having TV by Selected Type of SHS System

Unit: households

	Possession of TV		
	Yes	No	Total
Lighting-Oriented	2	21	23
TV & Lighting-Oriented	14	39	53
Total	16	60	76

Table B-23 Type of Energy Source Used for Electric Appliances

Unit: households

	Dec-00		Jun-01		Oct-01	
	Radio/ Cassette	TV	Radio/ Cassette	TV	Radio/ Cassette	TV
PV system		1	59	11	56	13
Dry cells	72		13		11	
Battery	2	4	1	1	4	
Generator		2				
Total	74	7	73	12	71	13

Table B-24 Average Hour to Use Electric Appliances

Unit:hours/day

	Dec-00	Jun-01	Oct-01
Radio/Cassette	10	6	6
TV	4	4	4

Table B-25 Frequency of SHS Trouble

Unit: households

	Frequency of trouble		
	No	Once	More than once
Dec. to June	50	19	7
July to Oct.	19	28	29

Table B-26 Troubled Divice of SHS

Unit: households

	Battery	Controller	FL lamp
Dec. to June	1	6	26
July to Oct.	2	13	52

Table 27 Number of FL Tube Burnt Out

Unit: tubes

Dec. to June	48
July to Oct.	108

Table B-28 Required Days for Repaire SHS from the Request

Unit: households

	Dec. - June					June to Oct.				
	=<3	4 - 7	7 - 14	> 14	Total	=<3	4 - 7	7 - 14	> 14	Total
Mar Lothie & Soulou	5	0	0	0	5	18	4	1	0	23
Mar Fafaco	9	1	2	1	13	17	9	1	10	37
Total	14	1	2	1	18	35	13	2	10	60

Table B-29 Implementation of Regular Maintenance by Local Technician

Unit: households

	Dec. - June			June to Oct.		
	Yes	No	Total	Yes	No	Total
Mar Lothie & Soulou	32		32	31	1	32
Mar Fafaco	36	8	44	43	1	44
Total	68	8	76	74	2	76

Table B-30 Payment Condition of Electricity Charge by Individual Contractor in Mar Lothie & Mar Soulou (1/3)

Unit : CFA

No.	Name	No of SHS	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Total
1	Abdou Khadre Ndiaye	1	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700			33,300
2	Abdou Mata Diouf	1	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700				29,600
3	Abdoul Aziz Thior	1	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700			33,300
4	Abdoulaye Diom	1	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700			33,300
5	Ablaye Debe Gning	1	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700				29,600
6	Adama Faye	1	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700		37,000
7	Agnes	3	11,100	11,100	11,100	11,100	11,100	11,100	11,100	11,100	11,100			99,900
8	Alioune Senghor	1	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700			33,300
9	Birama Ndiaye	1	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700			33,300
10	Dispensaire	2	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700		37,000
11	Doudou Lamine Diom	1	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700				29,600
12	El Hadj Coumba Ndiaye	1	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700		37,000
13	El Hadj Doudou Diom	1	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700			33,300
14	Etienne Dogue	1	3,700	3,700	3,700	3,700	3,700	3,700	3,700					25,900
15	Fabirama Bop	1	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700			33,300
16	Fally Faye	1	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700				29,600
17	Ibrahima Ndiaye	1	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700				29,600
18	Issa Diop	2	7,400	7,400	7,400	7,400	7,400	7,400	7,400	7,400				59,200
19	Joseph Ndiogoye	1	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700			33,300
20	Julienne Dogue	1	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700				29,600
21	Khady Ndiaye	1	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700				29,600
22	Madaba Thior	1	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700				29,600
23	Mamadou Kangou Ndiaye	1	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700				29,600
24	Mamau Thior	1	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700			33,300
25	Mamour Thiare	1	3,700	3,700	3,700	3,700	3,700	3,700	3,700					25,900
26	Martine Claudin	1	3,700	3,700	3,700	3,700	3,700	3,700						22,200
27	Michel Ndongue	1	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700			33,300
28	Pape Latyr Faye	1	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700		37,000
29	Paul Ndiogoye	1	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700			33,300
30	Sabou Thior	3	11,100	11,100	11,100	11,100	11,100	11,100	11,100	11,100	11,100			99,900
31	Salifou Ndaye	1	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700			33,300
32	Sidy Faye	1	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700			33,300
33	Souleymane Rocky Faye	1	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700				29,600
34	Theophile Thior	1	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700			33,300
Sub-total		40	144,300	144,300	144,300	144,300	144,300	144,300	140,600	133,200	88,800	14,800	0	1,243,200

Table B-30 Payment Condition of Electricity Charge by Individual Contractor in Mar Fafaco (2/3)

Unit : CFA

No.	Name	No of SHS	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Total
1	Abdou Kaling	1	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700				29,600
2	Abdou Ramane Bop	1	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700				29,600
3	Abdou Sarr	1	3,700	3,700	3,700	3,700	3,700	3,700	3,700					25,900
4	Abibou Sarr	1	3,700	3,700	3,700	3,700	3,700	3,700						22,200
5	Alouine Diome	1	3,700	3,700	3,700	3,700	3,700	3,700	3,700					25,900
6	Ameth Fall	1	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700			33,300
7	Ansou Thiare	1	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700				29,600
8	Arfang Moussa Ndong	1	3,700	3,700	3,700	3,700	3,700	3,700						22,200
9	Bakary Diome	2	7,400	7,400	7,400	7,400	7,400	7,400						44,400
10	Birama Ndong	1	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700				29,600
11	Birame Mai Faye	1	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700			33,300
12	Dispensaire	2	7,400	7,400	7,400	7,400	7,400	7,400	7,400	7,400				59,200
13	El Hadj Alioune Thiam	2	7,400	7,400	7,400	7,400	7,400	7,400	7,400	7,400				59,200
14	El Hadj Alioune Thiare	2	7,400	7,400	7,400	7,400	7,400	7,400	7,400	7,400	7,400			66,600
15	El Hadj Birame Faye	1	3,700	3,700	3,700	3,700	3,700	3,700						22,200
16	El Hadj Cheick Thiare	1	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700				29,600
17	El Hadj Lamine Diom	2	7,400	7,400	7,400	7,400	7,400	7,400	7,400	7,400				59,200
18	El Hadj Mamadou Baro	1	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700			33,300
19	El Hadj Ousmane Diop	2	7,400	7,400	7,400	7,400	7,400	7,400						44,400
20	El Hadj Sacou Kaling	1	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700				29,600
21	Fabi Senghor	1	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700				29,600
22	Faly Dione	1	3,700	3,700	3,700	3,700	3,700	3,700	3,700					25,900
23	Famara Sarr	1	3,700	3,700	3,700	3,700	3,700	3,700						22,200
24	Issa Kane	1	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700				29,600
25	Issa Sarr	2	7,400	7,400	7,400	7,400	7,400	7,400	7,400	7,400				59,200
26	Lamine Mousso Ndiaye	1	3,700	3,700	3,700	3,700	3,700	3,700						22,200
27	Lamine Daba Diom	1	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700	40,700
28	Lamine Diop	1	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700				29,600
29	Lamine Thior	2	7,400	7,400	7,400	7,400	7,400	7,400	7,400					51,800
30	Mady Coumba Faye	1	3,700	3,700	3,700	3,700	3,700	3,700						22,200

Remarka : [.........] part was paid from December 2000 to June 2001

Table B-30 Payment Condition of Electricity Charge by Individual Contractor in Mar Fafaco (3/3)

Unit : CFA

No.	Name	No of SHS	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Total
31	Mady Diouf	1	3,700	3,700	3,700	3,700	3,700	3,700						22,200
32	Mady Sarr	1	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700				29,600
33	Mady Yaye Faye	1	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700				29,600
34	Mamadou Amadou Sarr	2	7,400	7,400	7,400	7,400	7,400	7,400						44,400
35	Mamadou Baro	2	7,400	7,400	7,400	7,400	7,400	7,400						44,400
36	Mamadou Kaling	1	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700				29,600
37	Mamadou Madiang Faye	1	3,700	3,700	3,700	3,700	3,700	3,700						22,200
38	Mamadou Ndiakal Bopp	1	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700				29,600
39	Mamadou Rogue Sarr	1	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700	40,700
40	Moussa Diom	1	3,700	3,700	3,700	3,700	3,700	3,700	3,700					25,900
41	Ousmane Diouf	1	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700				29,600
42	Ousmane Fatou Ndiaye	1	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700				29,600
43	Ousmane Tamsir Ndiaye	1	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700			33,300
44	Sagar Thiam	1	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700				29,600
45	Yakhaya Sane Sarr	1	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700				29,600
Sub-total		55	203,500	203,500	203,500	203,500	203,500	203,500	144,300	122,100	29,600	7,400	7,400	1,531,800
Grand total		95	347,800	347,800	347,800	347,800	347,800	347,800	284,900	255,300	118,400	22,200	7,400	2,775,000

Remarka : [dotted box] part was paid from December 2000 to June 2001

Table B-31 Number of Users Who Could Answere the Selected Payment Frequency

Unit:households

Village	Answered	Couldn't	Total
Mar Lothie & Soulou	27	5	32
Mar Fafaco	16	28	44
Total	43	33	76

Table B-32 Device Intended to Modified

Unit:households

	FL lamp	LED	TV
Increase	16	29	21
Decrease	20	6	1

ANNEX C EVALUATION ON THE ELECTRIFIED PUBLIC FACILITIES

Besides of the questionnaire survey, the JICA Study Team interviewed representatives of public facilities which installed SHS to evaluate the electrification condition.

1. Health Post in Mar Lothie

(1) Existing Condition of the Facility

There were a health post and a maternity house in Mar Lothie operated by the health committee in the village. The average number of patients of the health post was 75 person/month, and 3 person/month at the maternity house. Because the health post accepts emergency case at any time, lighting equipment for medical examination at nighttime is indispensable. They used candle for lighting before the Pilot Project started.

On the other hand, the health committee in Mar Lothie decided that any birth in the village should be done in the maternity house from the viewpoint of hygienic aspect. If delivery was done in the maternity house, the expense was only CFA 2,000. However, it was charged CFA 3,000 including penalty, if delivery was done outside of the maternity house. Normally, pregnant women are hospitalized 2 to 3 days before the expected date of confinement. It was recognized that the dim light of paraffin lamp or candle at nighttime causes to increases anxiety of pregnant women.

(2) Purpose of Electrification

Lighting for nighttime is indispensable for both health post and maternity house. While candle and paraffin lamp were utilized before the Pilot Project was started, sufficient brightness couldn't be provided. To solve this problem, the health committee decided to install 2 units of SHS in the health post, maternity house and also nurse's house which was adjacent to the health post, and was owned by the health committee. The health committee expected a great deal of improvement on working condition using fluorescent lamps

(3) Utilization Condition of SHS

According to the nurse, the brightness of fluorescent tubes was good enough for medical examination, and power supply has never stopped since December 2000. The patients were also glad to this electrification. However, the nurse pointed out that the number of

fluorescent tubes didn't satisfy their demand. They wish to install one more light for toilet in both the health post and the maternity house.

On the other hand, village women who delivered of babies in the maternity house answered that hospital room is brighter than before introducing SHS. They also pointed out that it was very hard to take bugs away from babies under the paraffin lamp or candle. Now, it is very easy to take care babies after install SHS.

(4) Achievement Degree of the Project Purpose

Both nurse and patients agreed that the care condition was really improved since SHS was introduced. It is evaluated that the purpose of the electrification the health committee mentioned was almost realized. However, as the nurse pointed out, there are some points to improve care condition such as installing lamps in rest room.

(5) Problems

The health committee was supposed to pay all electricity fees before the Pilot Project started. However, the health committee has paid fee only for one unit of SHS since December 2000. The reason didn't pay for one unit is that the lighting equipment didn't installed in line with a location plan prepared by the health committee, due to absence of responsible person during installation period. All the equipment was installed following the instruction of nurse who wasn't informed of the location plan. Because of this inappropriate installation, the health committee requested installer to replace 2 fluorescent tubes from nurse's house to the health post and the maternity house. However, because health committee refused to pay necessary cost for this replacement, the request didn't accepted as of October 2001. Therefore, the health committee has also refused to pay for this one unit since the project started.

2. Mosque in Mar Lothie

(1) Existing Condition of the Facility

The mosque in Mar Lothie was operated by the mosque committee. There were many Muslims come to pray the mosque from 5 a.m. to 9 p.m. The lighting was necessary during pray time at early morning and nighttime. They used autonomous generator for lighting. However, operation cost for the generator was costly, and the generator was often

broken down. The autonomous generator was out of order when the Pilot Project started, and they used paraffin lamps and candles donated by the believers.

(2) Purpose of Electrification

The mosque committee decided to install the SHS as the power source for lights during pray time in the morning and nighttime, and also power source for loudspeaker used during the meeting time. The electric fee is paid from the contribution of the believers.

(3) Utilization Condition of SHS

According to the representative of the mosque committee, there were not only fluorescent lights, but also a loud speaker was used in the pray time at early morning and nighttime. This loud speaker was also used at the religious meetings, too.

They have never experienced to stop the electricity supply since the project started, and they also haven't recognized any trouble for their SHS unit. Normally, they use only 3 fluorescent lights out of 4, and remaining light is used only a few times.

According to the believers in Mar Lothie, all of them admired this electrification. There were not only believers in Mar Lothie, but also believers in neighboring villages, namely Mar Soulou and Wandje come to pray this mosque. These believers also were grad to this electrification, too.

(4) Achievement degree of the project purpose

It is concluded that the purpose of electrification of the Mosque was almost achieved in consideration of above situation. It was estimated that the original targets of the Pilot Project were only a part of villagers. However, a lot of villagers experienced effects of SHS through the electrification of Mosque, where was a public place a lot of villagers utilized.

(5) Problems

Any problems were not reported.

3. Health Post in Mar Fafaco

(1) Existing Condition of the Facility

There was only a health post, but no maternity house in Mar Fafaco. The operation hours and system of this health post was same as it in Mar Lothie. Average number of patient came up to about 200 during rainy season when malaria was sweeping. Because there was no maternity house in Mar Fafaco, delivery was also done in the health post.

Although there was a SHS purchased from GTZ project in the health post, this SHS was usable only in daytime, due to broken down of battery.

When the nurse requested to repair the SHS purchased from GTZ, the health committee in Mar Fafaco refused it, due to high price of battery. Therefore, nurse used torch lamp for lighting during medical examination in the nighttime.

(2) Purpose of Electrification

The health committee of Mar Fafaco decided to introduce SHS for improving working condition of the health post. The health committee installed 2 sets of SHS unit from the Pilot Project, one was for the health post and the other was for nurse's house. The electricity fee for these 2 units was paid by the health committee.

(3) Utilization Condition of SHS

According to the nurse, installed SHS units worked well without any trouble. The nurse also pointed out that the better protection of the patient's privacy was realized to use fluorescent tubes during the medical examination at daytime, too.

(4) Achievement Degree of the Project Purpose

It is concluded that the purpose of electrification of the health post was almost achieved in consideration of above situation.

(5) Problems

Any problems were not reported.

ANNEX D OUTLINE OF THE PCM

1. What is a PCM?

The Project Cycle Management (PCM) Method is a tool for managing the entire cycle of a development project - from formulation and implementation to evaluation - by means of a project format termed the Project Design Matrix (PDM).

2. Elements Constituting PDM

PDM is a table summarizing a project that shows the narrative summary of the project (inputs, outputs, project purpose, overall goal), important assumptions and objectively verifiable indicators needed for a project as well as the logical relationships among them. The definition of each element was as follows;

Overall Goal	:	The effect of a development project expected to be attained as a result of the Project Purpose being achieved.
Project Purpose	:	An objective that is expected to be achieved as a result of project implementation and which is revealed in the form of specific benefits or impacts for the target group.
Outputs	:	Several objectives that must be achieved for the Project Purpose to be attained. Outputs are expected to be achieved by implementing Project Activities.
Activities	:	Specific actions taken by the project to produce Outputs through the effective use of personnel, funds and equipment (Input).
Input	:	Personnel, funds, equipment, land, and facilities necessary for the implementation of the project, offered both by the donor and recipient countries.
Preconditions	:	Necessary conditions that must be fulfilled before a project is initiated. If these conditions are not met, the project should not be initiated.
Important Assumptions	:	Conditions important to the success of a project, but which are beyond the control of the project and

whose probably of being l satisfied cannot be assured.

Objectively Verifiable Indicators	:	Standards that show the achievement of the Outputs, Project Purpose, and Overall Goal in specific terms
Means of Verification	:	Data sources for Objectively Verifiable indicators.

3. Project Evaluation and PCM

The project should be evaluated in the following terms:

Efficiency	:	Measure the efficiency with which the Outputs have been achieved through Inputs, in terms of both quantity and quality, considering the appropriateness, timing cost, and benefit of the Inputs (the relationship between Inputs and Outputs).
Effectiveness	:	Identify the achievement of the Project Purpose, focusing on the extent to which the Project Outputs contributed to its achievement.
Impact	:	Assess the project's effects, both positive and negative, inside and outside of the project, including those effects not anticipated at the project planning stage.
Relevance	:	During the evaluation stage, examine the compliance of the project objectives with the development policy and needs of the expected beneficiaries, and the relevance of the project components.
Sustainability		Assess whether the benefits of the project will be sustained after the donor's assistance is terminated.

The five evaluation criteria (efficiency, effectiveness, impact, relevance and sustainability) helps in focusing the evaluation questions to conduct a comprehensive evaluation. These evaluation criteria directly linked to the design elements of the narrative summary for evaluation.

The results of the above evaluation are incorporated into the next project planning as suggestions and lessons learned from experience. It is therefore important to keep a record of the project planning process, establish indicators for monitoring and evaluation, and specify the means of verification.

ANNEX E PERIODIC MAINTENANCE

PERIODIC MAINTENANCE REPORT-1

Date le 27 juin 2001

(Find, English description on the 'symbols table')

Usagers	CM(weather condition)			CM DJ(w/c of previous day)			Module PV et Support (PV module support)							Batterie				Regulateur de charge		Autres composantes (other components)						
	Soleil (clear)	Nuage (cloudy)	Pluie (rain)	Soleil (clear)	Nuage (cloudy)	Pluie (rain)	PPS	E M PV	O M/A	UL	UC	Icf	Icc	PPB	NE	Ucc	Ucd	E td	ECC	ELF	ELL	B	EDC/DC C	EPR&TV	EF	EC
Wandie		X				X	P	P O	B	13.25	18.71	0.88	0.89	B	B	13.09	12.35	F	B	B	B	B	B	B	B	B
Issa Sarr I		X		X			P	P O	B	13.22	18.31	1.19	1.28	B	RED	13.19	13.03	F	B	B	B	B	B	B	B	B
Issa Sarr II		X		X			P	P O	B	13.14	18.26	1.4	1.48	B	RED	13.09	12.85	F	B	B	B	B	B	B	B	B
M.Barro I		X		X			P	P O	B	13.17	18.71	1.36	1.46	B	B	13.13	12.97	F	B	B	B	B	B	B	B	B
M.Barro II		X		X			P	P O	B	13.09	18.55	1.41	1.47			13.05	12.2	F	B	B	B	B	B	B	B	B
Faly Dione		X		X			P	P O	B	13.23	18.25	1.05	1.13	B	B	13.2	13.06	F	B	B	B	B	B	B	B	B
Lamine Dramé		X		X			P	P O	B	13.18	18.41	0.9	1			13.16	13.03	F	B	B	B	B	B	B	B	B
M.R.Sarr		X		X			P	P O	B	13.06	18.08	0.73	0.81			13.06	12.98	F	B	B	B	B	B	B	B	B
Mady Diouf		X		X			P	P O	B	12.74	18.21	0.57	0.63			12.73	12.72	F	B	B	B	B	B	B	B	B
Mady Y.Faye		X		X						12.97	18.08	0.57	0.63	G		12.93	12.92	F	B	B	B	B	B	B	B	B
M.M.Faye		X		X						12.97	18.1	0.38	0.44			12.76	12.73	F	B	B	B	B	B	B	B	B
Ousmane Diouf			X	X						13.09	18.15	0.5	0.53			13.07	13.03	F	B	B	B	B	B	B	B	B
M.Thiaré										13.08	17.48	0.31	0.36			13.07	12.97									
A.D.Gniang										12.94	16.88	0.21	0.25			12.94	12.92	F	B	B	B	B	B	B	B	B
M.Thiouna		X		X						12.83		0.16	0.23			12.82	12.8	F	B	B	B	B	B	B	B	B
A.Bop		X					P	P O	B	13.75	18.33	1.58	1.77	B	B	13.71	13.4	F	B	B	B	B	B	B	B	B
Dispensaire I		X		X			P	P O	B	1.4	18.27	1.54	1.68	B		13.7	13.46	F	B	B	B	B	B	B	B	B
Dispensaire II		*X*		*X*			*P*	*P O*	*B*	*13.2*	*18.96*	*1.58*	*1.86*			*13.15*	*13*	*F*	*B*	*B*	*B*	*B*	*B*	*B*	*B*	*B*
Y.S.Sarr		X		X			P	P O	B	13.29	18.4	1.31	1.4	B	B	13.26	13.1	F	B	B	B	B	B	B	B	B
L.M.Ndiaye		X		X						13.45	18.6	1.33	1.49	B	RED	13.41	13.21	F	B	B	B	B	B	B	B	B
M.N.Bop		X					P	P O	B	13.33	18.35	1.55	1.64	B	B	13.26	13.04	F	B	B	B	B	B	B	B	B
EL H.C.Thiaré		X		X			P	P O	B	13.57	18.75	2.56	2.82	B	RED	13.51	13.18	F	B	B	B	B	B	B	B	B
Ansou Thiaré		X		X			P	P O	B	13.52	18.46	2.6	2.75	B	RED	13.47	13.3	F	B	B	B	B	B	B	B	B
Mady C.Faye		X		X			P	P O	B	13.36	18.34	1.68	1.88	B	RED	13.3	13.27	F	B	B	B	B	B	B	B	B
Mamadou Ndiaye		X		X			P	P O	B	13.38	18.07	1.62	1.76	B	RED	13.34	13.23	F	B	B	B	B	B	B	B	B
Alou Dione		X		X			P	P O	B	10.5	18.95	3.11	3.5	B	RED	13.86	13.72	F	B	B	B	B	B	B	B	B
EL H.S.Kalong		X		X			P	P O	B	13.24	18.6	2.84	3.42	B	B	13.2	13.13	F	B	B	B	B	B	B	B	B
Sagar Thiam		X		X			P	P O	B	13.5	17.96	2.75	2.8	B	B	13.44	13.37	F	B	B	B	B	B	B	B	B
Faby Senghor		X		X			P	P O	B	13.58	18.39	1.87	1.96	B	B	13.52	13.38	F	B	B	B	B	B	B	B	B
Lamine Thior I		X		X			P	P O	B	10.18	18.63	1.55	1.7	B	B	13.82	13.97	F	B	B	B	B	B	B	B	B
Lamine Thior II		X		X			P	P O	B	13.18	18.84	1.81	1.97	B	RED	13.84	13.4	F	B	B	B	B	B	B	B	B
O.F.Ndiaye		X		X			P	O	B	13.26	18.3	1.32	1.4	B	B	13.22	13.12	NF / PR	B	B	B	B	B	B	B	B
Mady Sarr		X		X			P	P O	B	13.44	18.7	1.42	1.52	B	B	13.39	13.28	F	B	B	B	B	B	B	B	B
Abdou Kalong		X		X			P	P O	B	13.26	18.33	1.26	1.36	B	B	13.22	13.09	F	B	B	B	B	B	B	B	B
EL H.I.Kane		X		X			P	P O	B	13.4	18.91	1.97	2.09	B	B	13.31	13.17	F	B	B	B	B	B	B	B	B
M.A.Sarr I							P	P O	B	1.87	18.23	1.07	1.15	B	B	13.71	13.39	F	B	B	B	B	B	B	B	B
M.A.Sarr II		X		X			P	P O	B	3.3	18.02	0.9	0.97	B	B	13.77	13.37	F	B	B	B	B	B	B	B	B
EL H.A.Thiam I		X		X			P	P O	B	3.3	18.22	1.09	1.18			13.76	13.42	F	B	B	B	B	B	B	B	B
EL H.A.Thiam II		X		X			P	P O	B	7.44	18.52	1.07	1.17	B	B	13.84	13.6	F	B	B	B	B	B	B	B	B
Abibou Sarr		X		X			P	P O	B	13.21	18.19	2.09	2.16	B	B	13.31	13.21	F	B	B	B	B	B	B	B	B
A.M.Ndong		X		X			P	P O	B	13.21	18.11	1.83	1.57	B	B	13.34	13.27	F	B	B	B	B	B	B	B	B
B.M.Faye		X		X			P	P O	B	6.11	18.22	1.09	1.8			13.85	13.61	F	B	B	B	B	B	B	B	B
EL H.O.Diop I		X		X			P	P O	B	13.17	18.25	2.01	2.1	B	B	13.35	13.21	F	B	B	B	B	B	B	B	B
EL H.O.Diop II		X		X			P	P O	B	13.23	18.06	0.87	0.95	B	B	13.2	13.14	F	B	B	B	B	B	B	B	B

Moussa Diop		X		X			P	P O	B	13.43	18.16	0.9	1.09	G	B	13.35	13.2	F	B	B	B	B	B	B	B	B
Hamet Fall		X		X			P	P O	B	13.37	18.95	1.65	1.75	B	B	13.3	13.25	F	B	B	B	B	B	B	B	B
EL H.A.Thiaré I		X		X			P	P O	B	2.44	18.53	1.65	1.77	B	B	13.96	13.62	F	B	B	B	B	B	B	B	B
EL H.A.Thiaré II		X		X			P	P O	B	1.4	18.57	1.5	1.55	B	B	13.72	13.47	F	B	B	B	B	B	B	B	B
Lamine Diop		X		X			P	P O	B	13.33	18.72	1.37	1.48	M		13.29	13.19	F	B	B	B	B	B	B	B	B
Abdou Sarr		X		X			P	P O	B	3.4	17.86	0.88	0.9	B	B	13.72	13.14	F	B	B	B	B	B	B	B	B
Mamadou Kalong		X		X			P	P O	B	13.09	18.13	1.45	1.65	B	B	13.34	13.27	F	B	B	B	B	B	B	B	B
Ibrahima Ndong		X		X			P	P O	B	13.07	18.27	0.76	0.83	B		13.05	12.96	F	B	B	B	B	B	B	B	B
EL H.L.Dione I		X		X			P	P O	B	9.16	18.27	0.88	0.94	B	B	13.93	13.23	F	B	B	B	B	B	B	B	B
EL H.L.Dione II		X		X			P	P O	B	3.6	18.26	0.94	1.05	B	B	13.79	13.78	F	B	B	B	B	B	B	B	B
Bakary Dramé I		X		X			P	P O	B	13.17	18.24	1.75	1.82	B	B	13.24	13.17	F	B	B	B	B	B	B	B	B
Bakary Dramé II		X		X			P	P O	B	13.17	18.27	1.07	1.15	B	B	13.27	13.15	F	B	B	B	B	B	B	B	B
EL H.B.Faye		X		X			P	P O	B	3.15	18.26	0.8	0.86	B	B	13.71	13.15	F	B	B	B	B	B	B	B	B
Adama Faye		X		X			P	P O	B	4.6	18.58	2.85	3.12	B	B	13.97	13.1	F	B	B	B	B	B	B	B	B
Michel Ndong	X			X			P	P O	B	0.11	18.5	2.71	2.7	B	B	13.87	13.4	F	B	B	B	B	B	B	B	B
Paul Diogaye	X			X			P	P O	B	4.82	18.55	2.46	2.68	B	B	13.75	13.26	F	B	B	B	B	B	B	B	B
Joseph Diogaye	X			X			P	P O	B	1.29	18.58	2.59	2.59	B	B	13.57	13.36	F	B	B	B	B	B	B	B	B
A.M.Diouf	X			X			P	P O	B	1.54	18.37	2.72	2.7	B	B	13.58	13.4	F	B	B	B	B	B	B	B	B
Théophile Thior	X			X			P	P O	B	4.8	18.77	2.49	2.4	B	B	13.13	12.75	F	B	B	B	B	B	B	B	B
Faly Faye	X			X			P	P O	B	1.01	18.58	2.11	2.15	B	B	13.7	13.37	F	B	B	B	B	B	B	B	B
Abdoulaye Diom	X			X			P	P O	B	2.51	18.39	2.31	2.39	B	B	13.7	13.19	F	B	B	B	B	B	B	B	B
EL H.D.Diom	X			X			P	P O	B	5.3	18.36	1.9	2.02	B	B	13.65	13.26	F	B	B	B	B	B	B	B	B
Julienne Doj	X			X			P	P O	B	12.72	18.73	1.91	2	B	B	12.66	12.48	F	B	B	B	B	B	B	B	B
Etienne Doj	X			X			P	P O	B	2.17	18.34	1.82	1.97	B	B	13.7	13.27	F	B	B	B	B	B	B	B	B
A.A.Thior	X			X			P	P O	B	1.52	17.92	1.68	1.89	B	B	13.66	13.37	F	B	B	B	B	B	B	B	B
A.K.Ndiaye	X			X			P	P O	B	1.35	18.55	1.68	1.68	B	B	13.65	13.5	F	B	B	B	B	B	B	B	B
Aliou Senghor	X			X			P	P O	B	1.55	18.52	1.51	1.62	B	B	13.69	13.4	F	B	B	B	B	B	B	B	B
EL H.C.Ndiaye	X			X			P	P O	B	1.92	18.5	1.43	1.56	B	B	13.92	13.22	F	B	B	B	B	B	B	B	B
P.L.Faye	X			X			P	P O	B	1.8	18.09	1.44	1.47	B	B	13.72	13.41	F	B	B	B	B	B	B	B	B
Madaba Thior	X			X			P	P O	B	1.78	18.3	1.3	1.32			13.68	13.6	F	B	B	B	B	B	B	B	B
Ibrahima Ndiaye							P	P O	B	2.35	17.96	1.12	1.15			13.65	13.26			B	B	B	B	B	B	B
M.K.Ndiaye	X			X			P	P O	B	3.6	18.22	1.06	1.18	B	B	13.86	13.45	F	B	B	B	B	B	B	B	B
Birama Ndiaye	X			X			P	P O	B	4.97	18.09	0.59	0.89	B	B	13.85	13.36	F	B	B	B	B	B	B	B	B
S.R.Faye	X			X			P	P O	B	3.8	18.3	0.92	0.97			13.66	13.48			B	B	B	B	B	B	B
EL H.D.L.Diop	X			X			P	P O	B	1.48	18.17	0.9	0.99	B	B	13.74	13.64	F	B	B	B	B	B	B	B	B
Saliou Ndiaye	X			X			P	P O	B	5.6	18.3	0.9	0.99	B	B	13.78	13.39	F	B	B	B	B	B	B	B	B
Dispensaire(Maternité)	X			X			P	P O	B	5.7	18.83	0.7	0.9	B	B	13.69	13.15	F	B	B	B	B	B	B	B	B
Dispensaire(Logement)	X			X			P	P O	B	13.7	17.65	0.4	0.46	B	B	13.74	13.1	F	B	B	B	B	B	B	B	B
Sydi Faye	X			X			P	P O	B	2.92	17.82	0.44	0.6	B	B / RED	13.76	13.4	F	B	B	B	B	B	B	B	B
Issa Diop I	X			X			P	P O	B	12.54	17.83	0.55	0.59	B	B	12.54	12.43	F / PR	B / MS	B	B	B	B	B	B	B
Issa Diop II	X			X			P	P O	B	5.7	18.04	0.47	0.5	B	B	13.9	13.55	F	B	B	B	B	B	B	B	B
Agnes I		X			X		P	P O	B	12.5	17.7	0.56	0.61	B	B	12.48	12.41			B	B	B	B	B	B	B
Agnes II		X			X		P	P O	B	12.8	17.87	0.59	0.66	B	B	12.79	12.7	F	B	B	B	B	B	B	B	B
Agnes III		X			X		P	P O	B	12.87	18.06	0.61	0.65	B	B	12.85	12.76			B	B	B	B	B	B	B
Sabou Thior I							P	P O	B	12.92	17.72	0.54	0.6	B	B	12.91	12.86		B	B	B	B	B	B	B	B
Sabou Thior II										13.12	17.62	0.53	0.6	B	B	13.1	13.05			B	B	B	B	B	B	B
Sabou Thior III							P	P O	B	12.8	17.81	0.54	0.6	B	B	12.79	12.74	F	B	B	B	B	B	B	B	B
Khady Ndiaye	X						P	P O	B	12.87	17.48	0.53	0.59	B	B	12.85	12.77	F	B	B	B	B	B	B	B	B
Martine Paudin							P	P O	B	12.8	17.77	0.54	0.6	B	B	12.8	12.78	F	B	B	B	B	B	B	B	B
Arfang D.Sarr		X		X			P	P O	B	13.19	18.33	2.18	2.22	B	RED	13.14	12.52	F	B	B	B	B	B	B	B	B

PERIODIC MAINTENANCE REPORT-2

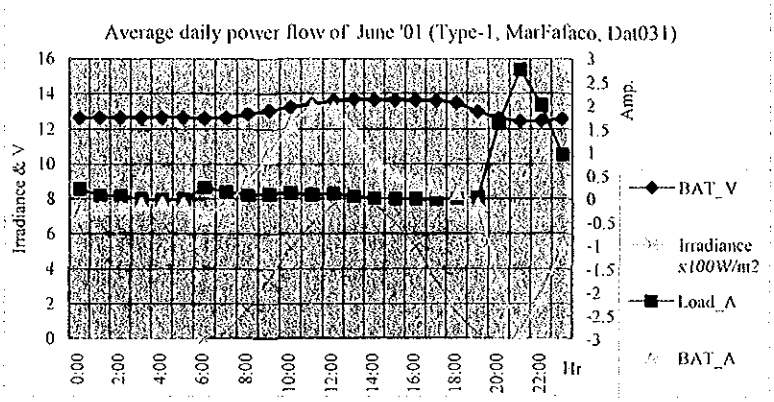
Date le 14 octobre 2001

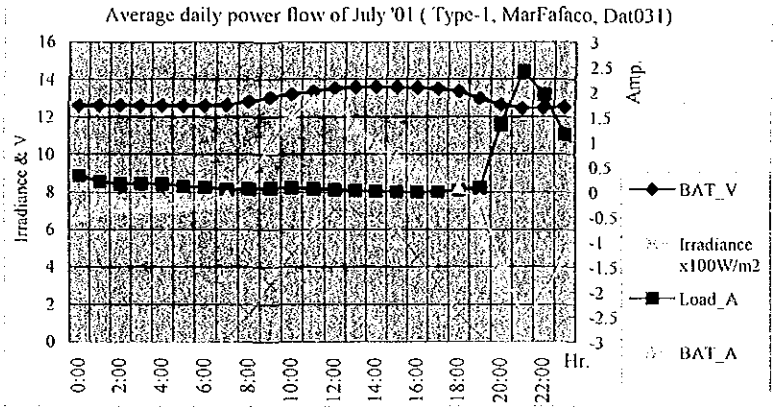
(Find, English description on the 'symbols table')

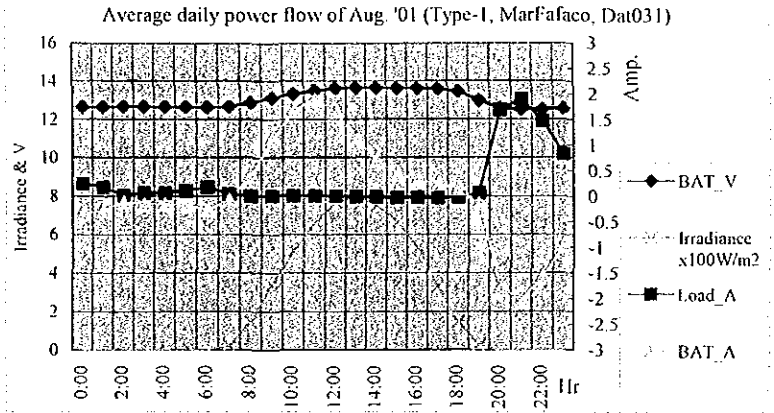
Usagers	CM(weather condition) day			CM D.Kw/c previous day			Module PV et Support							Batterie					Regulateur de charge		Autres composentes(ether components)							
	Soleil (clear)	Nuage (cloudy)	Pluie (rain)	Soleil (clear)	Nuage (cloudy)	Pluie (rain)	PPS	E M PV	O M/A	UL	UC	Icf	Ica	PPB	HE	QEA	Ucc	Ucd	E Id	ECC	ELF	ELL	EI	EDC/DC C	EPR&TV	EF	EC
Lamine Moussou NDIAYE	X			X			P	PO	B	1.18	18.13	2.31	2.32	B	B		13.61	13.24	F	B	B	B	B	B	B	B	B
Issa SARR I							P	PO	B	5.03	18.18	1.49	1.59	B	B		13.79	13.17	F	B	B	B	B	B	B	B	B
Issa SARR II				X			P	PO	B	2.9	17.99	1.35	1.48	B	B		13.66	13.15	F	B	B	B	B	B	B	B	B
Famara SARR							P	PO	B	13.6	17.92	1.6	1.77	B	B		13.65	13.22	F	B	B	B	B	B	B	B	B
Poste de Santé I				X			P	PO	B	1.33	18.28	1.8	1.88	B	B		13.71	13.37			B	B	B	B			
Poste de Santé II							P	PO	B	13.5	18.26	1.64	1.74	B	B		13.43	13.3	F	B	B	B	B	B	B	B	B
Abdourahmane BO	X			X			P	PO	B	18.7	18.16	1.12	1.21	B	B		13.69	13.1	F	B	B	B	B	B	B	B	B
Mamadou BOP	X						P	PO	B	12.9	17.64	0.75	0.81				12.84	12.77	F	B	B	B	B	B	B	B	B
Sagar THIAM	X			X			P	PO	B	13.3	17.55	0.52	0.58	B	B		13.26	13.13	F	B	B	B	B	B	B	B	B
Sacou KALLING							P	PO	B	13.4	18.24	0.88	0.94	B	B		13.36	12.12	F	B	B	B	B	B	B	B	B
Aliou DIOM							P	PO	B	3.95	18.02	0.79	0.88	B	B		13.68	13.27	F	B	B	B	B	B	B	B	B
Mamadou BARO							P	PO	B	0.7	17.84	0.67	0.73	B	B		13.59	13.18			B	B	B	B	B	B	B
Mady Coumba FAYE							P	PO	B	7.36	17.62	0.66	0.79	B	B		13.74	13.09	F	B	B	B	B	B	B	B	B
Abdou Karim THIARE							P	PO	B	13.2	17.65	0.58	0.65	B	B		13.18	12.96	F	B	B	B	B	B	B	B	B
Cheikh THIARE							P	PO	B	13.5	17.34	0.41	0.46	B	B		13.69	12.38	F	B	B	B	B	B	B	B	B
Lamine DIOP							P	PO	B	13.3	18.77	2.2	2.35	B	B		13.2	12.96	F	B	B	B	B	B	B	B	B
Birama NDIAYE										0.02	17.62	1.2	1.21	B	B		13.16	13.12	F	B	B	B	B	B	B	B	B
Abdou Mela DIOUF	X					X	P	PO	B	1.88	18.21	2.72	2.72	B	B		13.69	13.3	F	B	B	B	B	B	B	B	B
Paul NDIOGOYE	X					X	P	PO	B	13.6	17.68	2.86	3.33	B	B		13.7	13.29	F	B	B	B	B	B	B	B	B
Saliou NDIAYE		X				X	P	PO	B	2.75	18.36	1.36	1.45	B	B		13.75	13.26	F	B	B	B	B	B	B	B	B
Michel NDONG							P	PO	B	13.7	17.95	3.24	3.76	B	B		13.58	13.21	F	B	B	B	B	B	B	B	B
Joseph NDIOGOYE							P	PO	B	0.88	18.22	2.82	2.81	B	B		13.73	13.38	F	B	B	B	B	B	B	B	B
Mamadou Kangou NDIAYE							P	PO	B	4.45	18.15	1.32	1.46	B	B		13.75	13.2	F	B	B	B	B	B	B	B	B
Théophile THIOR	X					X	P	PO	B	2.67	18.45	2.21	2.28	B	B		13.73	13.13	F	B	B	B	B	B	B	B	B
El Doudou DIOM	X						P	PO	B	3.1	17.72	1.85	2.03	B	B		13.69	13.25	F	B	B	B	B	B	B	B	B
Abdoulaye DIOM	X					X	P	PO	B	13.5	18.38	2.14	2.29	B	B		13.45	13.12	F	B	B	B	B	B	B	B	B
Sidy FAYE										1.33	18.08	2.64	2.65				13.78	13.38									
Pape Adama FAYE	X					X	P	PO	B	0.75	18.31	3.43	3.42	B	B		13.7	13.6	F	B	B	B	B	B	B	B	B
Dispensaire I (H)	X					X	P	PO	B	14.3	18.39	2.35	2.53	B	B		13.97	13.34	F	B	B	B	B	B	B	B	B
Issa DIOP I	X					X	P	PO	B	4.22	18.34	2.15	2.19	B	B		13.75	13.66	F	B	B	B	B	B	B	B	B
Issa DIOP II							P	PO	B	3.74	18.14	1.78	1.95	B	B		13.73	13.15			B	B	B	B	B	B	B
Doudou DIOM	X					X	P	PO	B	1.89	18.05	1.39	1.48	B	B		13.69	13.33	F	B	B	B	B	B	B	B	B
Souleymane Rocky FAYE	X					X	P	PO	B	0.42	18.02	1.18	1.25	B	B		13.69	13.31	F	B	B	B	B	B	B	B	B
Ibrahima NDIAYE	X					X	P	PO	B	3.28	17.76	1.2	1.32	B	B		13.64	13.14	F	B	B	B	B	B	B	B	B
Madiaba THIOR		X				X	P	PO	B	1.97	18	1.12	1.21	B	B		13.68	13.34	F	B	B	B	B	B	B	B	B
Pape Latyr FAYE		X				X	P	PO	B	2.96	17.65	0.83	0.92	B	B		13.68	13.36	F	B	B	B	B	B	B	B	B
El Coumba NDIAYE		X				X	P	PO	B	13.4	18.06	0.92	0.99	B	B		13.42	12.68			B	B	B	B	B	B	B
Maternité	X					X	P	PO	B	2.25	17.89	2.36	2.32	B	B		13.74	13.49	F	B	B	B	B	B	B	B	B
Lamine SENGHOR		X				X	P	PO	B	5.07	17.53	0.55	0.63	B	B		13.7	13.3	F	B	B	B	B	B	B	B	B
Abdou Aziz THIOR		X				X	P	PO	B	13.7	17.03	0.39	0.47	B	B		13.67	13.16	F	B	B	B	B	B	B	B	B
Julienne DOJ		X				X	P	PO	B	12.4	17.08	0.36	0.42	B	B		12.36	12.37			B	B	B	B	B	B	B
Etienne DOJ		X				X	P	PO	B	13	16.88	0.29	0.34	B	B		12.96	12.79	F	B	B	B	B	B	B	B	B
Mosquée		X				X	P	PO	B	13.6	16.68	0.21	0.28	B	B		13.7	13.09			B	B	B	B	B	B	B
Faoirama MBOP	X			X			P	PO	B	13.1	18.28	2.65	2.81				13	12.76	F	B	B	B	B	B	B	B	B

Khady NDIAYE							P	PO	B	12.8	18.22	1.49	1.58	B	B		12.78	12.68			B	B	B	B	B	B	B
Martine CLAUDIN										13.1	18.36	2.52	2.71				13	12.83									
Faly FAYE							P	PO	B	13.3	18.43	1.12	1.18	B	B		13.25	13.12	F	B	B	B	B	B	B	B	B
Agnes I							P	PO	B	12.7	18.02	1.2	1.4	B	B		12.64	12.55	F	B	B	B	B	B	B	B	B
Agnes II							P	PO	B	13.1	18.65	1.84	1.95	B	B		12.73	12.5	F	B	B	B	B	B	B	B	B
Agnes III							P	PO	B	12.5	17.22	0.88	0.94	B	B		12.44	12.27	F	B	B	B	B	B	B	B	B
Sabou THIOR I	X				X		P	PO	B	1.29	17.38	2.21	2.57	B	B		13.74	13.43	F	B	B	B	B	B	B	B	B
Sabou THIOR II	X				X		P	PO	B	13	18.14	2.39	2.49	B	B		12.92	12.79	F	B	B	B	B	B	B	B	B
Sabou THIOR III	X				X		P	PO	B	13.2	17.74	1.36	1.47	B	B		13.15	13.02	F	B	B	B	B	B	B	B	B
Mansour THIARE	X				X		P	PO	B	8.01	17.77	0.51	0.65	B	B		14.5	13.1	F	B	B	B	B	B	B	B	B
Mamadou THIOR	X				X		P	PO	B	6.41	17.87	0.91	0.99	B	B		13.72	13.14	F	B	B	B	B	B	B	B	B
Abdoulaye GNING	X				X		P	O	B	5.3	17.49	0.5	0.55	B	B		13.64	13.16	F	B	B	B	B	B	B	B	B
El Lamine DIOM	X						P	PO	B	6.58	18.52	2.72	2.99	B	B		13.7	13.48	F	B	B	B	B	B	B	B	B
Faby SENGHOR							P	PO	B	5.73	18.13	0.96	1.01	B	B		13.67	13.15	F	B	B	B	B	B	B	B	B
Mamadou Hamadou SARR I	X						P	PO	B	1.58	18.4	2.7	2.89	B	B		13.75	13.38	F	B	B	B	B	B	B	B	B
Mamadou Hamadou SARR II	X						P	PO	B	13.6	18.02	2.34	2.46	B	B		13.49	13.14	F	B	B	B	B	B	B	B	B
Mamadou Madiang FAYE		X					P	PO	B	13.4	18.66	2.3	2.44	B	B		13.37	13.09	F	B	B	B	B	B	B	B	B
Mady FAYE		X					P	PO	B	13.4	18.66	2.18	2.33	B	B		13.34	13.13	F	B	B	B	B	B	B	B	B
Ousmane DIOUF		X				X	P	PO	B	13.3	18.12	1.01	1.06	B	B		13.3	13.12			B	B	B	B	B	B	B
Mmadou Rooj SARR		X					P	PO	B	12.5	18.28	2.24	2.35	B	B		12.45	12.46	F	B	B	B	B	B	B	B	B
Mady DIOUF		X					P	PO	B	13.3	19.1	2.32	2.4	B	B		13.21	12.97	F	B	B	B	B	B	B	B	B
Lamine Daba DIOM		X					P	PO	B	13.1	18.8	1.37	1.51	B	B		13.07	12.92			B	B	B	B	B	B	B
Faly DIONE		X					P	PO	B	13.6	18.49	2.25	2.73	B	B		13.64	13.25	F	B	B	B	B	B	B	B	B
Mamadou BARRO I		X					P	PO	B	13.6	17.93	1.6	2.13	B	B		13.55	13.24	F	B	B	B	B	B	B	B	B
Mamadou BARRO II		X					P	PO	B	13.4	18.45	1.39	1.48	B	B		13.36	13.12	F	B	B	B	B	B	B	B	B
Abdou SARR	X						P	PO	B	13.6	18.11	2.3	3.02	B	B		13.48	13.12	F	B	B	B	B	B	B	B	B
Aliou THIARE I		X					P	PO	B	3.89	17.77	1.55	1.65	B	B		13.84	13.33	F	B	B	B	B	B	B	B	B
Aliou THIARE II		X					P	PO	B	10.8	18.65	1.85	2.05	B	B		13.79	13.46	F	B	B	B	B	B	B	B	B
Hamet FALL	X						P	PO	B	13.2	18.8	3.23	3.41	B	B		13.07	12.78	F	B	B	B	B	B	B	B	B
Mamadou KALING							P	PO	B	13.5	17.63	2.22	2.57	B	B		13.48	13.2	F	B	B	B	B	B	B	B	B
Ibrahima NDIONG		X					P	PO	B	13.1	18.6	3.19	3.44	B	B		12.98	12.73	F	B	B	B	B	B	B	B	B
Book DIOM I	X						P	PO	B	5.06	18.5	3.41	3.93	B	B		14.66	13.49	F	B	B	B	B	B	B	B	B
Book DIOM II		X					P	PO	B	1.9	17.82	1.65	1.8	B	B		13.72	13.28	F	B	B	B	B	B	B	B	B
Lamine DIONE I		X					P	PO	B	7.35	18.04	1.88	2.11	B	B		14.68	13.52	F	B	B	B	B	B	B	B	B
Lamine DIONE II							P	PO	B	13.5	17.84	1.61	1.75	B	B		13.47	13.26	F	B	B	B	B	B	B	B	B
Arfang NDONG		X					P	PO	B	3.19	17.9	1.63	1.86	B	B		13.76	13.35	F	B	B	B	B	B	B	B	B
Ousmane Tamsir NDIAYE		X					P	PO	B	4.29	18.4	2.51	2.62	B	B		13.68	13.04			B	B	B	B	B	B	B
Birama FAYE		X					P	PO	B	13.6	18.22	1.58	1.65	B	B		13.58	13.32	F	B	B	B	B	B	B	B	B
Aliou THIAM I	X						P	PO	B	0.93	18.34	3.24	3.48	B	B		13.7	13.31	F	B	B	B	B	B	B	B	B
Aliou THIAM II	X						P	PO	B	4.56	17.82	2.2	2.41	B	B		13.67	13.2	F	B	B	B	B	B	B	B	B
Moussa DIOM	X				X		P	PO	B	13.7	18.49	3.39	3.82	B	B		13.73	13.25	F	B	B	B	B	B	B	B	B
El H. Ousmane DIOM I							P	PO	B	3.16	18.15	1.73	1.9	B	B		13.74	13.3	F	B	B	B	B	B	B	B	B
El H. Ousmane DIOM II		X					P	PO	B	9.1	18.6	3.3	3.66	B	B		13.77	13.29	F	B	B	B	B	B	B	B	B
Habibou SARR	X				X		P	PO	B	1.77	17.86	1.5	1.63	B	B		13.69	13.3	F	B	B	B	B	B	B	B	B
Issa KANE	X						P	PO	B	13.1	17.84	1.37	1.49	B	B		13.08	12.92	F	B	B	B	B	B	B	B	B
Abdou KALLING	X						P	PO	B	3.55	18.19	1.66	1.78	B	B		13.7	13.16	F	B	B	B	B	B	B	B	B
Lamine THIOR I	X						P	PO	B	1.29	18.31	2.84	2.95	B	B		13.75	13.28	F	B	B	B	B	B	B	B	B
Lamine THIOR II	X						P	PO	B	1.8	18.19	2.02	2.39	B	B		13.73	13.19	F	B	B	B	B	B	B	B	B
Ousmane F. NDIAYE							P	PO	B	1.9	17.35	0.9	1.06	B	B		13.85	13.44	F	B	B	B	B	B	B	B	B
Mady SARR		X					P	PO	B	7.69	16.93	2.53	2.66	B	B		13.77	12.99			B	B	B	B	B	B	B
Yakhya Sene SARR	X						P	PO	B	1.54	18.6	2.46	2.56	B	B		13.65	12.58	F	B	B	B	B	B	B	B	B

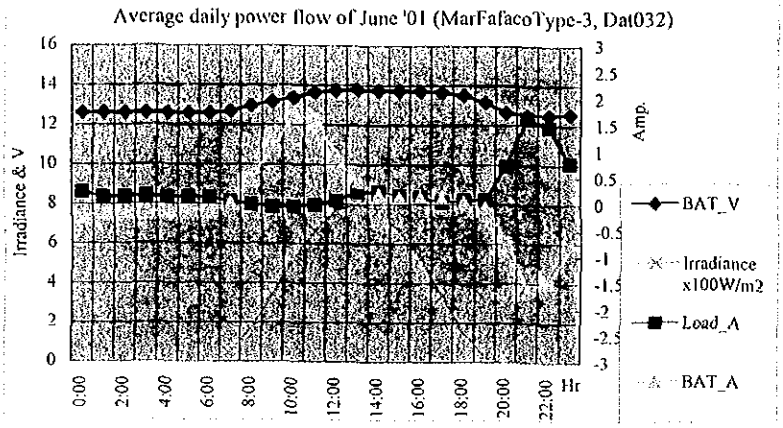
Annex E

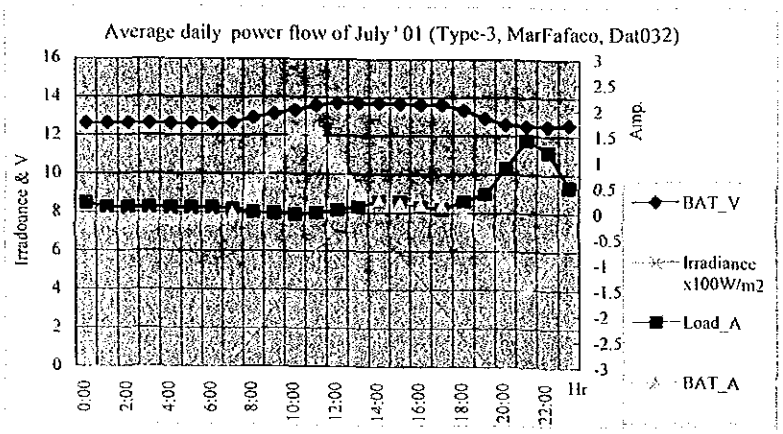

Average daily power flow of June '01 (Type-1, MarFafaco, Dat031)
Irradiance & V
Amp.
Hr
BAT_V
Irradiance x100W/m2
Load_A
BAT_A

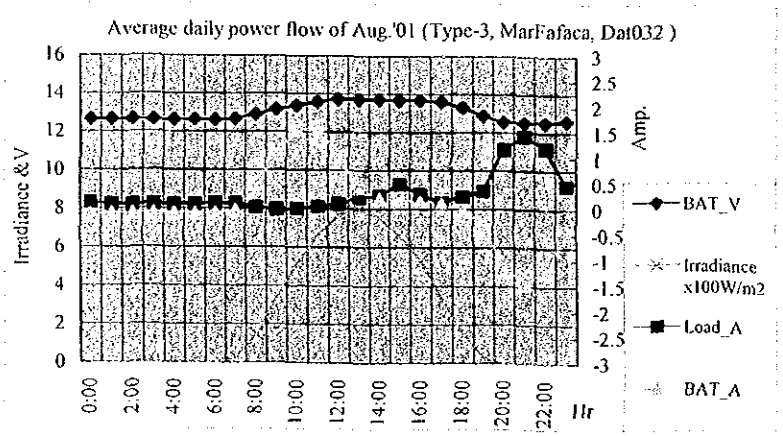

Average daily power flow of July '01 (Type-1, MarFafaco, Dat031)
Irradiance & V
Amp.
Hr.
BAT_V
Irradiance x100W/m2
Load_A
BAT_A

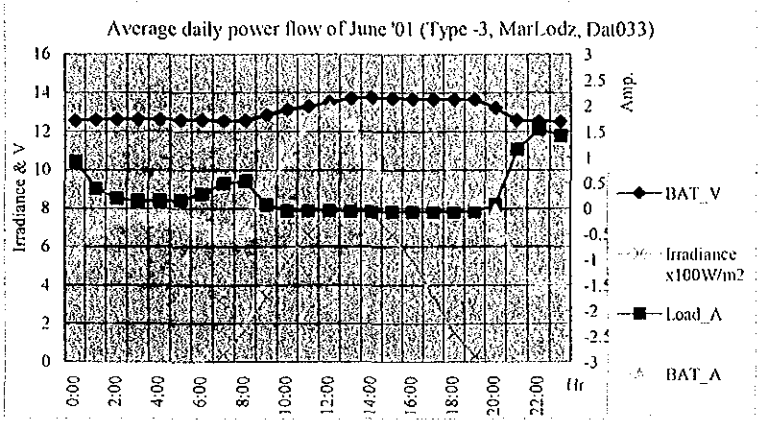

Average daily power flow of Aug. '01 (Type-1, MarFafaco, Dat031)
Irradiance & V
Amp.
Hr
BAT_V
Irradiance x100W/m2
Load_A
BAT_A

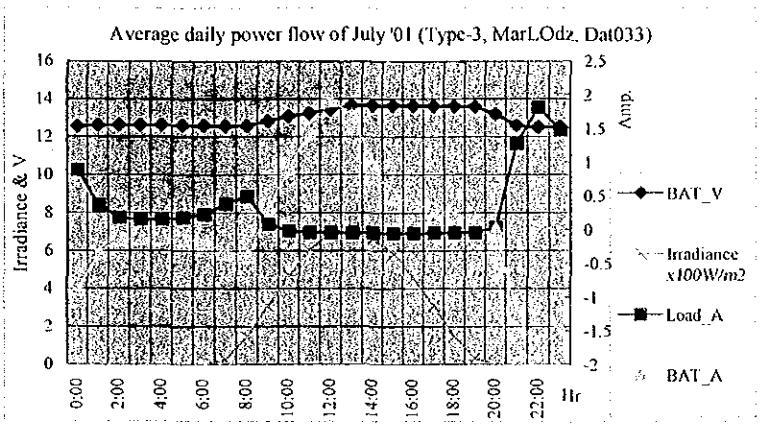
Annex E

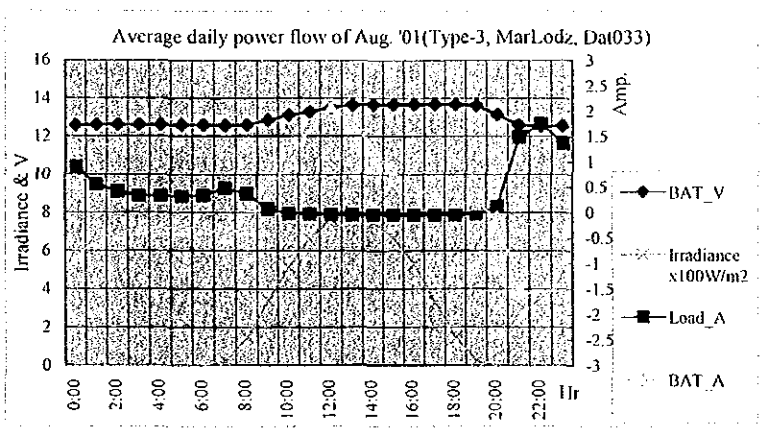

Average daily power flow of June '01 (MarFafacoType-3, Dat032)
Irradiance & V
Amp.
Hr
BAT_V
Irradiance x100W/m2
Load_A
BAT_A


Average daily power flow of July '01 (Type-3, MarFafaco, Dat032)
Irradiance & V
Amp.
Hr
BAT_V
Irradiance x100W/m2
Load_A
BAT_A

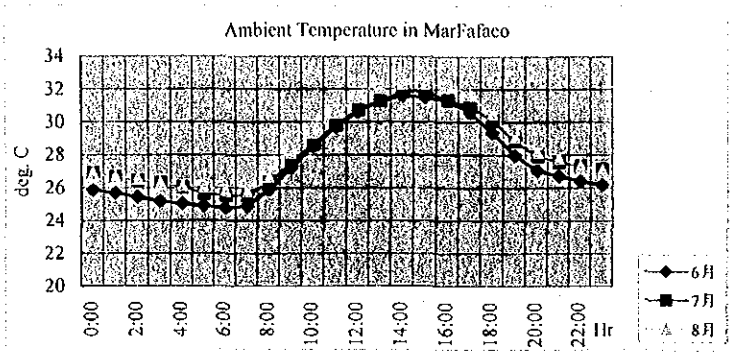

Average daily power flow of Aug.'01 (Type-3, MarFafaca, Dat032)
Irradiance &V
Amp.
Hr
BAT_V
Irradiance x100W/m2
Load_A
BAT_A

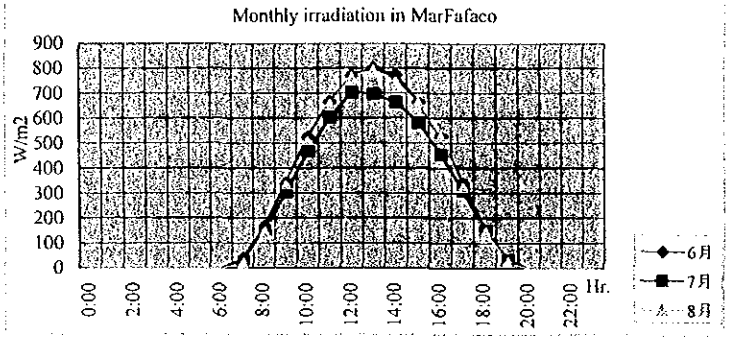

Average daily power flow of June '01 (Type -3, MarLodz, Dat033)
Irradiance & V
Amp.
Hr
BAT_V
Irradiance x100W/m2
Load_A
BAT_A

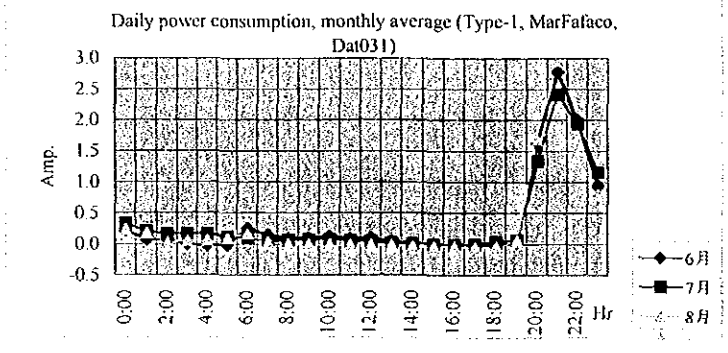

Average daily power flow of July '01 (Type-3, MarLOdz, Dat033)
Irradiance & V
Amp.
Hr
BAT_V
Irradiance x100W/m2
Load_A
BAT_A

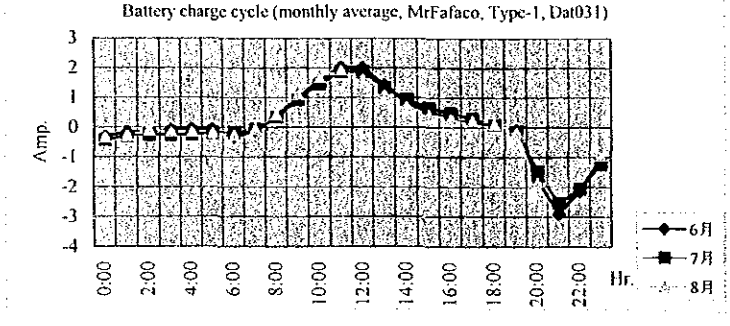

Average daily power flow of Aug. '01(Type-3, MarLodz, Dat033)
Irradiance & V
Amp.
Hr
BAT_V
Irradiance x100W/m2
Load_A
BAT_A

Annex E


Ambient Temperature in MarFafaco
deg. C
34
32
30
28
26
24
22
20
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Hr
6月
7月
8月


Monthly irradiation in MarFafaco
W/m2
900
800
700
600
500
400
300
200
100
0
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Hr.
6月
7月
8月


Daily power consumption, monthly average (Type-1, MarFafaco, Dat031)
Amp.
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Hr
6月
7月
8月


Battery charge cycle (monthly average, MrFafaco, Type-1, Dat031)
Amp.
3
2
1
0
-1
-2
-3
-4
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Hr.
6月
7月
8月