

ANNEX D SURVEY ON POTENTIAL OPERATOR

Survey on the potential capacity of Senegalese private enterprises to participate in rural electrification concession tender calls to be launched by ASER

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SUMMARY RESULT OF THE INTERVIEW SURVEYS

- 1. Did you take part to the workshop for the validation of the procedures of ASER, that were held on March 27 and 28, 2001? Did the result of the seminar change your opinion about the rural electrification development scheme proposed by ASER?**
 - 1.1 All the sample enterprises took part to the validation seminar sponsored by ASER and all of them hold a copy of "Manuel des Procédures de l'ASER".
 - 1.2 Basically, the seminar did not change the opinions of the enterprises about the scheme drawn by ASER, for most of them had previously made some investigations and got some information about it. Nevertheless, the latter consider that the seminar itself has been a great event, because the rate of attendance from the private sector were important and furthermore the various actors could get the opportunity to meet and discuss.
 - 1.3 The executives of SENELEC contributed highly to the output of the various technical committees of the workshop. For some enterprises, this is a positive evolution of the opinion of SENELEC vis-à-vis the development scheme of ASER. Before the seminar, as it has been previously stated during the working sessions of ADER (Association for the Development of Rural Electrification), the opinion of SENELEC seemed to be more cautious.

2. Did you find among the commitments made by ASER any incentive to take more concrete interest to the RE development scheme drawn by ASER?

- 2.1 The response to that question is quite mitigated. On the one hand, some enterprises acknowledge that through the various presentations during the workshop and the provision of copies of the "Procedures Manuel", ASER is clearly expressing its willingness to collaborate with the rural electrifications stakeholders.
- 2.2 On the other hand, some others frankly state that they worry about the lack of conciseness in the position of ASER as regards key issues such as financing mechanisms or subsidy policy for the rural electrification program. These issues are further discussed here below.

3. Can you understand the intension of ASER that is to promote rural electrification under private sector initiative?

- 3.1 Globally, the enterprises acknowledge that ASER has clearly shown its willingness to promote rural electrification under the private sector's initiative.
- 3.2 However, some enterprises are wondering if the Government politically approves the rural electrification development strategy proposed by ASER. (check § 6.2).

4. Do you have any intention to be positively involved in that scheme?

- 4.1 Subject to further clarifications, the electrical works companies (MV lines, LV networks) seem to be more attracted by this concession scheme. Their opinion can be explained by various factors: (i) they belong to a consortium that have already experienced concession projects and may rely on its support (foreign consortium's branch office), (ii) they do consider that they necessarily have to become concession holders to remain competitive within the frame of electrical works' market.
- 4.2 The commercial enterprises "generalists" operating in several technical fields (energy, hydraulics, solar, farming equipments, etc.) also announced that they are interested but the latter are more cautious. They consider the provision of the expected clarifications to be the necessary condition for their involvement.

- 4.3 The commercial enterprises that are specialized in the sales of solar photovoltaic equipment seems to be the most cautious. Generally speaking, they are not intending to submit in a proper noun, to the tender calls for concessions, since they do not wish to intervene in fields other than the one relating to their basic activities. Their priority remains classical commercial development based on: cash or credit purchase through specialized institutions, possibly supported by the conditional bilateral financial aid provided to promote exports in the country from where the equipment originate. Alternatively, some enterprises consider that there is a high possibility that they should offer their services, in terms of requested skill in the fields of solar energy, to candidate concession holders.
- 4.4 Globally, all of the enterprises acknowledge that for effective and sustainable operation of rural electrification business, they necessarily have to set up organizations that will be supported by decentralized rural operators under their own responsibility and to whom they will provided any kind of necessary support. However, let us say that so far none of them has investigated the approach to be used to reach such objective.

5. Which 3 major items in the procedures' manual do you consider ASER should further confirm?

- 5.1 The future role to be plaid by SENELEC in the rural electrification program, is by far the first item to be confirmed. The enterprises are eager to know how concession holders and SENELEC will "cohabit" (intervene at the same time) on both operational (two different electricity sale systems), technical (i.e. procedures end standards for connection to SENELEC MV line) and financial scales (i.e. MV tariffs applied by SENELEC to concession holders, etc.), in the same area.
- 5.2 The second item to be confirmed is the description of the financing mechanisms.

Even though they could understand the outlines of the financing procedure proposed by ASER (own funds + loan + subsidy), the enterprises consider not to have enough information on the financing mechanisms proposed by ASER. This could be explained by the fact that (i) generally the enterprises did not further examine the procedures manual, (ii) but also that some key

clauses are not yet clearly fixed by ASER (i.e. quantity level and procedure for subsidies payments).

- 5.3 The third item to be confirmed is the relation between ERIL and PPER project. Generally, the enterprises do not fully understand the status of ERIL projects as compared to PPER projects and furthermore cannot understand the role they could play in the promotion of ERIL projects. Under such circumstances, they consider ERIL projects as potential competitors rather than additional sources of activities (see. § 6.3).
- 5.4 The economic, administrative and legal rules governing the concessions are often cited as an item that needs to be confirmed by ASER: Concession size and period, guarantees, etc.

6. What do you consider as the 3 major potential constraints in the Procedures manual of ASER?

- 6.1 The most recurrent main worry of most enterprises is the intervention of SENELEC in a concession area. They mainly worry about the viability of the business run by concession holders, when they have to operate in areas covered by SENELEC, in villages currently supplied by the latter and that generally are the most important communities, therefore possibly more profitable among the concession area.
- 6.2 The confirmation of the political adherence to the principles dictated by the rural electrification development scheme is also considered as a crucial precondition. Even though convinced by the pertinence of ASER's procedures and schemes (see. § 3.1), the enterprises are still expecting that the latter should be clearly assumed and approved by the new political authorities. Unless this approval is made, they are afraid that some key clauses that are not politically sensitive (i.e. cancellation of the principle of unique electricity tariff) could be rejected later on.
- 6.3 The possible competition between ERIL and PPER projects is equally frequently cited as a potential constraint. The enterprises generally do not have a concise idea of ERIL mechanism and mainly worry about the risk for a concession holder to discover shortly before starting its project that the most attractive sites in his concession area are already covered by ERIL projects.

- 6.4 Without being presently considered as a constraint, the legal and economic viability of Senegal in the long term is for the enterprises a key factor that will condition long term commitment to be made by concession holders (10 to 15 years). This concern is more strongly expressed by subsidiary companies belonging to foreign industrial groups.
- 7. What kind of incentive would you like to enjoy in the case you positively participate to the RE promotion scheme drawn by ASER?**
- 7.1 The enterprises are expecting ASER to provide some incentives that are considered to be necessary for the success of rural electrification promotion under the scheme of concessions. Four major fields of intervention are identified: (i) provision of information to bidders participating to concessions tender calls, (ii) provision of information to the general public, (iii) capacity building on rural electrification, and (iv) the fiscal regulation to be applied to concessions areas.
- 7.2 Regarding the tender calls for the allocation of the concessions, the enterprises are expecting ASER to include in the Tender Documents some memo providing information relating to the granted areas. Those information should include as much as possible data relating to the physical, social and economic conditions of the concerned area. The memo should namely include the outputs of the surveys conducted to assess electricity demand, the topographic drawings or maps of the main villages, the location of the consumption centres as well as the future projects to be implemented in the area. In a nutshell, enterprises request that studies like the "Local Electrification Plan" as shown in the procedures manual should be conducted in the scale of each concession area. They consider these elements as necessary for the preparation of the offers while acknowledging that they will have to make investigations themselves.
- 7.3 The prior information of the general public on the rural electrification promotion scheme is considered as a key factor for the successful implementation of the first concessions. Actually, it seems unconceivable for the enterprises that a concession holder should be selected and start his project unless there previously have been an awareness campaign, effective enough to target the population living in the granted concession area.

Therefore, information campaign should be launched prior to the opening of tender calls for the allocation of concessions.

- 7.4 With the development of rural electrification, the enterprises will highly need skilled staff (technicians, managers, etc.). The enterprises are expecting ASER to anticipate those needs by supporting the set up of vocational training courses on rural electrification professions, for instance via existing training centres and institutes (CNQP, CNFP, ENSUT, etc).
- 7.5 The tax system to be applied to rural electrification business is a recurrent issue mainly focussing on solar photovoltaic components and systems, which, after having been tax exempted for several years, are presently subjected to import tax. The other complaints relates to the VAT on services: what VAT system will be applied to rural electrification business: 0%, 10%, 20%? Obviously, the enterprises wish that rural electrification business should be exempted from VAT, for rural users to have access as much as possible to those services.
- 8. Please describe specific issues or constraints other than the following.**
- 8.1 Beside of the issues or constraints listed in the questionnaire, no other important issue or constraint were pointed out.
- 9. More specifically talking about solar photovoltaic energy, did you happen to hear about the project, based on fee for service that is currently being carried out in Mar island by ASER and MMEH under the scheme of Japanese grant aid?**
- 9.1 All the sample enterprises know about the project in Mar island either through the Press or through the interviews carried out by the members of the Japanese consultant team.
- 9.2 Many enterprises are sceptical about the project, for they consider that the way it has been set up does not fully reflect the approach of ASER, namely because initially the project has been 100% funded from subsidies.
- 10. Do you have any idea of how ASER is intending to integrate photovoltaic systems in its RE promotion scheme, namely relating to the three commercial approaches generally considered: (i) cash purchasing of equipment, (ii) credit purchase of equipment coming with incentives supported by decentralized**

financial institutions, (iii) renting or leasing of equipment to private operators, holder of equipment under fee for service model?

10.1 Generally speaking, the enterprises do not have any clear idea of these different approaches.

11. How do you think about the pertinence of these models? More concisely, how do you consider about the role that you could play: (i) no technical commitment, (ii) confining activities mainly to the sales/after sale services of PV systems, (iii) sales/after sale services, including provision of specific services to business operators, (iv) direct involvement in business activities, (v) others?

11.1 Globally, the enterprises consider that cash or credit purchase (option [ii]) would be the most suitable option for them. As it is stated in § 4.3, they are not intending to be directly involved in business activities such as fee for service, but they will rather support private operators for the set up of those type of service models.

11.2 However, the enterprises fully understand that “fee for service” model is the one that better fits to the objectives of ASER, say, access to electricity for a bigger number of rural households. But they still don’t have any idea of how to manage photovoltaic systems scattered all throughout a concession area.

11.3 Some enterprises are wondering how these various models could be implemented in one same commercial market.

11.4 Finally, the enterprises that are not specialized in solar photovoltaic energy stated their conviction about the role to be plaid by that technology in the rural electrification process. This is highly showing the industrial maturity of this technology.

12. In the case you would be involved in business activities, how much do you intend to invest for a first operation, either directly or getting funds from partners that you have found (including all technological options): (i) 10 Million CFAF, (ii) 25 Million CFAF, (iii) 50 MCFAF, (iv) 100 Million CFAF?

12.1 The stated amounts vary from 100 Million CFAF to 1000 Million CFAF. The enterprises referring to some investments they already made in other projects.

12.2 It is to be noted that those investments generally cover short period (i.e. project pre-financing). Nevertheless, these sizes of investment fit to the levels of investment expected from operators within the scale of model concessions.

12.3 Further to our interview, after having had a better understanding of the concept of ERIL, many enterprises announce their willingness to finance very quickly, using their own funds some ERIL projects. For they consider that ERIL project are the best way for them to get experience and also display their technical know-how as regards rural electrification. Furthermore, they are even intending to submit some proposals to ASER.

KEY ISSUES

1. Key issues favourable to the commitment of the private sector

A global adhesion to the schemes proposed by ASER

1.1 Logically confirming the results of both the think tank on energy sector and the validation seminar, respectively held on February and March, 2001, the results of the interview survey show that the private sector is in favour of the rural electrification promotion scheme as proposed by ASER.

1.2 Besides, ASER could successfully convince the enterprises attending the validation seminar as far as its intension to promote rural electrification by private sector is concerned.

A clear willingness to be involved and a sound investment capacity.

1.3 Globally, beyond any commercial purpose, the surveyed enterprises show their willingness to be engaged in rural electrification concessions. Even if,

for the moment being they cannot fully appreciate it, they are aware of the constraints and risks inherent to these projects corresponding to a concept that is rather new here in Senegal and about which foreign countries have very little experience.

- 1.4 Most surveyed enterprises enjoy a sound financial capacity, some of them have already participated in some financial schemes representing several billions for grid projects implemented here in Senegal. Those capacities are fully in cope with the levels of equity (using their own funds) to be provided by the potential operators.

2. Risks and constraints liable to prevent the private sector's involvement

Queries relating to the role to be plaid by SENELEC in the rural electrification scheme

- 2.1 All the enterprises acknowledged that SENELEC is a key player and for the benefit of their business, rural electrification concession holders are advised to have some useful business relations with the latter.
- 2.2 A new Schedule of Conditions is being prepared for SENELEC. The scope of missions and attributions to be assigned to SENELEC within the rural electrification scheme will be a key factor in the decision of the other operators of the local private sector as regards the tender calls for the allocation of the concessions.
- 2.3 The response to the issue relating to the status of the areas presently under SENELEC management is equally a key decision factor for the enterprises.

Expectation from policy makers to approve the mechanisms proposed by ASER

- 2.4 The enterprises expect the new authorities to politically approve the rural electrification promotion scheme that is prepared by ASER.

Several technical and financial items requesting fast clarification

- 2.5 The enterprises are requesting a whole set of technical and financial clarifications. Besides of the aforementioned issues, relating to technical and operational relations with SENELEC, the latter mainly relate to financing mechanism and PPER-ERIL interface.

- 2.6 These clarifications are necessary for ASER and the potential concession holders to have mutual understanding on the objectives, the expected results and rural electrification procedures. It is the only condition to confirm that the private sector is really willing to engage in rural electrification business.

Some specific expectations, in terms of supporting actions

- 2.7 The sample enterprises stated some specific expectations, in terms of supporting actions. Those expectations remarkably match up, focussing mainly on provision of both information and training that is considered to be the basic role of ASER.
- 2.8 For the enterprises, information is clearly considered as a basic strategic element that will largely determine the success of the first bids to be open:
- quality of the technical, economic and social features of the granted areas, provided to bidders
 - large scale prior information of concerned population, to ensure favourable condition for the settling of future concession holders and for the launching of their activities.
- 2.9 The requested information mainly relate to the professional sector. The enterprises are expecting ASER to rather anticipate the needs for skilful personnel to undertake the rural electrification professions that will result from the implementation of the concessions.

ANNEX E COST COMPARISON OF GRID EXTENSION, DIESEL AND PV (SHS)

1. Objective

In view of the numerous number of non-electrified villages (about 12,600), the primal concern of rural electrification is to identify a group of villages under respective mode of RE, that is, grid extension, diesel and PV (SHS). Cost effectiveness in terms of FCFA per Kwh can be an useful indicator for such an objective. The detailed methodology is already explained in the chapter 3. This "Attachment" presents the method to calculate unit cost per Kwh shown in Table 3.1 of chapter 3.

2. Premise

Investment costs of grid extension, diesel and PV (SHS) as premise to calculate unit per Kwh are shown as follows.

Grid extension

Items	Base of calculation	Unit	Price
Extension of MT line	Distance of village	MFCFA/km*	12.906
Extension of LT line	35m/Beneficiary	MFCFA/km	7.336
Transformer MT/LT 25kVA	Per village	MFCFA	7.787
Transformer MT/LT 50kVA	Per village	MFCFA	8.327
Service wire and internal wiring	Per Beneficiary	MFCFA/ Beneficiary	0.100
Marginal cost of electricity	Consumption of Elec	FCFA/kWh	35

*MFCFA=Million FCFA

Cost of grid extension consist of i) MT line, ii) LT line, iii) transformer of MT/LT, iv) house wiring, and v) marginal cost of electricity. The fifth item (marginal cost) indicates marginal cost of the main trunk line sown to MT line.

Diesel generation

Number of Beneficiary	Nominal Capacity (kVA)	Capacity (kW)	Service life (year)	Fuel (L/hour) consumption	Price (MFCFA)	Civil work (MFCFA)
Less than 42	3	2.4	3	1.4	1.600	0.2
70	5	4	3	1.7	1.900	0.2
105	7.5	6	3	2.0	2.500	0.225
140	10	8	5	2.6	5.800	0.3
210	15	12	6	3.8	8.200	0.3
308	22	17.6	7	6.5	8.800	0.5

Other conditions for diesel generation

Items	Base of calculation	Unit	Price
Extension of LT line	35m/Beneficiary	MFCFA/km	7.336
Service wire and internal wiring	Per Beneficiary	MFCFA/ Beneficiary.	0.100
Diesel generator operator	Per Village	MFCFA/Month	0.050
Maintenance consumables	Initial investment	%	2.0
Fuel (Gas oil)		FCFA/Litter	344

Cost of generator and others such as fuel and civil works are estimated by scale of household demand (beneficiary) for RE.

Photovoltaic

Items	Spec.	Service life	Price (FCFA)
PV Panel	50W	20	180,000
Support	Steel	20	15,000
Battery	12V/50Ah	3	65,000
Charge Regulator	10A	10	35,000
Four lamps + Socket	7W FL	20	60,000
Miscellaneous		20	70,000
Installation		20	50,000
Total			475,000

Operation cost

Maintenance	FCFA/year/system
Miscellaneous	800
Distilled Water	400
Total	1,200

The type 50 wp is assumed as a standard SHS whose costs comprise instrument and operation costs.

3. Calculation

3.1 Grid extension

All component costs of grid extension are annualized by capital recovery factor corresponding to the life of components and the discount rate (12%). Annual cost of MT line is estimated by distance while those of others are done by size household demand (beneficiary) for RE.

a) Extension of MT line

Distance	Total cost (FCFA)	Life	Annual cost	Annual cost with 10% energy loss
1km	12,906,000	25	1,645,515	1,828,350
2km	25,812,000	25	3,291,029	3,656,699
3km	38,718,000	25	4,936,544	5,485,049
4 km	51,624,000	25	6,582,058	7,313,398
5 km	64,530,000	25	8,227,573	9,141,748
6 km	77,436,000	25	9,873,088	10,970,097
7 km	90,342,000	25	11,518,602	12,798,447
8 km	103,248,000	25	13,164,117	14,626,797
9 km	116,154,000	25	14,809,631	16,455,146
10 km	129,060,000	25	16,455,146	18,283,496
15 km	193,590,000	25	24,682,719	27,425,244
20 km	258,120,000	25	32,910,292	36,566,991
25 km	322,650,000	25	41,137,865	45,708,739

b) Transformer of MT/LT

Number of Beneficiary	Capacity of Transformer	Cost of Transformer (FCFA)	Life	Annual cost (FCFA)
5	25kVA	7,786,800	25	992,817
10	25kVA	7,786,800	25	992,817
15	25kVA	7,786,800	25	992,817
20	25kVA	7,786,800	25	992,817
25	25kVA	7,786,800	25	992,817
30	25kVA	7,786,800	25	992,817
42	25kVA	7,786,800	25	992,817
70	25kVA	7,786,800	25	992,817
105	25kVA	7,786,800	25	992,817
140	25kVA	7,786,800	25	992,817
210	50kVA	8,326,800	25	1,061,667
308	50kVA	8,326,800	25	1,061,667

c) Low tension grid in village

Number of Beneficiary	Cost of low tension grid (FCFA)	Life	Annual cost (FCFA)
5	1,283,800	25	163,684
10	2,567,600	25	327,369
15	3,851,400	25	491,053
20	5,135,200	25	654,738
25	6,419,000	25	818,422
30	7,702,800	25	982,107
42	10,783,920	25	1,374,949
70	17,973,200	25	2,291,582
105	26,959,800	25	3,437,374
140	35,946,400	25	4,583,165
210	53,919,600	25	6,874,747
308	79,082,080	25	10,082,963

d) Service wire and internal wiring

Number of Beneficiary	Cost of service wire and internal wiring (FCFA)	Life	Annual cost (FCFA)
5	500,000	20	66,939
10	1,000,000	20	133,879
15	1,500,000	20	200,818
20	2,000,000	20	267,758
25	2,500,000	20	334,697
30	3,000,000	20	401,636
42	4,200,000	20	562,291
70	7,000,000	20	937,151
105	10,500,000	20	1,405,727
140	14,000,000	20	1,874,303
210	21,000,000	20	2,811,454
308	30,800,000	20	4,123,466

e) Total cost of each village

Distance	Number of household					
	5	10	15	20	25	30
0km	1,223,441	1,454,064	1,684,688	1,915,312	2,145,936	2,376,560
1km	3,051,790	3,282,414	3,513,038	3,743,662	3,974,286	4,204,909
2km	4,880,140	5,110,764	5,341,387	5,572,011	5,802,635	6,033,259
3km	6,708,489	6,939,113	7,169,737	7,400,361	7,630,985	7,861,609
4 km	8,536,839	8,767,463	8,998,087	9,228,710	9,459,334	9,689,958
5 km	10,365,188	10,595,812	10,826,436	11,057,060	11,287,684	11,518,308
6 km	12,193,538	12,424,162	12,654,786	12,885,410	13,116,033	13,346,657
7 km	14,021,888	14,252,511	14,483,135	14,713,759	14,944,383	15,175,007
8 km	15,850,237	16,080,861	16,311,485	16,542,109	16,772,733	17,003,356
9 km	17,678,587	17,909,211	18,139,834	18,370,458	18,601,082	18,831,706
10 km	19,506,936	19,737,560	19,968,184	20,198,808	20,429,432	20,660,056
15 km	28,648,684	28,879,308	29,109,932	29,340,556	29,571,180	29,801,803
20 km	37,790,432	38,021,056	38,251,680	38,482,304	38,712,927	38,943,551
25 km	46,932,180	47,162,804	47,393,427	47,624,051	47,854,675	48,085,299

Distance	Number of household					
	42	70	105	140	210	308
0km	2,930,057	4,221,551	5,835,918	7,450,285	10,747,869	15,268,096
1km	4,758,407	6,049,900	7,664,267	9,278,634	12,576,218	17,096,446
2km	6,586,756	7,878,250	9,492,617	11,106,984	14,404,568	18,924,795
3km	8,415,106	9,706,599	11,320,966	12,935,333	16,232,917	20,753,145
4 km	10,243,455	11,534,949	13,149,316	14,763,683	18,061,267	22,581,494
5 km	12,071,805	13,363,299	14,977,665	16,592,032	19,889,616	24,409,844
6 km	13,900,155	15,191,648	16,806,015	18,420,382	21,717,966	26,238,193
7 km	15,728,504	17,019,998	18,634,365	20,248,732	23,546,315	28,066,543
8 km	17,556,854	18,848,347	20,462,714	22,077,081	25,374,665	29,894,893
9 km	19,385,203	20,676,697	22,291,064	23,905,431	27,203,015	31,723,242
10 km	21,213,553	22,505,046	24,119,413	25,733,780	29,031,364	33,551,592
15 km	30,355,301	31,646,794	33,261,161	34,875,528	38,173,112	42,693,339
20 km	39,497,048	40,788,542	42,402,909	44,017,276	47,314,860	51,835,087
25 km	48,638,796	49,930,290	51,544,657	53,159,024	56,456,608	60,976,835

f) Annual consumption of electricity (0.2kWh/day/Beneficiary)

Number of Beneficiary	5	10	15	20	25	30
Electricity consumption	365	730	1,095	1,460	1,825	2,190

Number of Beneficiary	42	70	105	140	210	308
Electricity consumption	3,066	5,110	7,665	10,220	15,330	22,484

g) kWh cost with marginal cost of electricity

Total cost of each village is divided by annual consumption of each village, then add the marginal cost of electricity (35FCFA/kWh)

Distance	Number of household					
	5	10	15	20	25	30
0km	3,387	2,027	1,574	1,347	1,211	1,120
1km	8,396	4,531	3,243	2,599	2,213	1,955
2km	13,405	7,036	4,913	3,851	3,215	2,790
3km	18,414	9,541	6,583	5,104	4,216	3,625
4 km	23,424	12,045	8,252	6,356	5,218	4,460
5 km	28,433	14,550	9,922	7,608	6,220	5,295
6 km	33,442	17,054	11,592	8,861	7,222	6,129
7 km	38,451	19,559	13,262	10,113	8,224	6,964
8 km	43,460	22,064	14,931	11,365	9,226	7,799
9 km	48,469	24,568	16,601	12,618	10,227	8,634
10 km	53,479	27,073	18,271	13,870	11,229	9,469
15 km	78,525	39,596	26,619	20,131	16,238	13,643
20 km	103,570	52,119	34,968	26,393	21,248	17,817
25 km	128,616	64,642	43,317	32,654	26,257	21,992

Distance	Number of household					
	42	70	105	140	210	308
0km	991	861	796	764	736	714
1km	1,587	1,219	1,035	943	855	795
2km	2,183	1,577	1,273	1,122	975	877
3km	2,780	1,935	1,512	1,301	1,094	958
4 km	3,376	2,292	1,751	1,480	1,213	1,039
5 km	3,972	2,650	1,989	1,658	1,332	1,121
6 km	4,569	3,008	2,228	1,837	1,452	1,202
7 km	5,165	3,366	2,466	2,016	1,571	1,283
8 km	5,761	3,724	2,705	2,195	1,690	1,365
9 km	6,358	4,081	2,943	2,374	1,809	1,446
10 km	6,954	4,439	3,182	2,553	1,929	1,527
15 km	9,936	6,228	4,374	3,447	2,525	1,934
20 km	12,917	8,017	5,567	4,342	3,121	2,340
25 km	15,899	9,806	6,760	5,236	3,718	2,747

3.2 Cost of Diesel generator electrification

The costs fo diesel generators electrification are assumed to increase in proportion to size of beneficiaries. The component costs comprising generator, LT extension and fuel are annualized by using the capital recovery factor corresponding to the life of components and the discount rate (12%).

a) Investment of diesel generator

Number of Beneficiary	Nominal Capacity (kVA)	Capacity (kW)	Life (Years)	Price of Generator (FCFA)	Annual cost (FCFA)
5	3	2.4	3	1,600,000	666,158
10	3	2.4	3	1,600,000	666,158
15	3	2.4	3	1,600,000	666,158
20	3	2.4	3	1,600,000	666,158
25	3	2.4	3	1,600,000	666,158
30	3	2.4	3	1,600,000	666,158
42	3	2.4	3	1,600,000	666,158
70	5	4	3	1,900,000	791,063
105	7.5	6	3	2,500,000	1,040,872
140	10	8	5	5,800,000	1,608,976
210	15	12	6	8,200,000	1,994,451
308	22	17.6	7	8,800,000	1,928,236

b) Civil works of installation

Number of Beneficiary	Capacity (kW)	Cost of civil work (FCFA)	Life (Years)	Annual cost (FCFA)
5	2.4	200,000	25	25,500
10	2.4	200,000	25	25,500
15	2.4	200,000	25	25,500
20	2.4	200,000	25	25,500
25	2.4	200,000	25	25,500
30	2.4	200,000	25	25,500
42	2.4	200,000	25	25,500
70	4.0	200,000	25	25,500
105	6.0	225,000	25	28,687
140	8.0	300,000	25	38,250
210	12.0	300,000	25	38,250
308	17.6	500,000	25	63,750

c) Low tension grid in village

Number of Beneficiary	Capacity (kW)	Cost of LT in FCFA	Life (Years)	Annual cost of LT (FCFA)
5	2.4	1,283,800	25	163,684
10	2.4	2,567,600	25	327,369
15	2.4	3,851,400	25	491,053
20	2.4	5,135,200	25	654,738
25	2.4	6,419,000	25	818,422
30	2.4	7,702,800	25	982,107
42	2.4	10,783,920	25	1,374,949
70	4	17,973,200	25	2,291,582
105	6	26,959,800	25	3,437,374
140	8	35,946,400	25	4,583,165
210	12	53,919,600	25	6,874,747
308	17.6	79,082,080	25	10,082,963

d) Service wire and internal wiring

Number of Beneficiary	Capacity (kW)	Service Wire and internal Wiring (FCFA)	Life (Years)	Annual cost (FCFA)
5	2.4	500,000	20	66,939
10	2.4	1,000,000	20	133,879
15	2.4	1,500,000	20	200,818
20	2.4	2,000,000	20	267,758
25	2.4	2,500,000	20	334,697
30	2.4	3,000,000	20	401,636
42	2.4	4,200,000	20	562,291
70	4	7,000,000	20	937,151
105	6	10,500,000	20	1,405,727
140	8	14,000,000	20	1,874,303
210	12	21,000,000	20	2,811,454
308	17.6	30,800,000	20	4,123,466

e) Cost of fuel

Number of Beneficiary	Capacity (kW)	Fuel Consumption (Liter/hour)	Annual Consumption (4hour/day) (Liter)	Cost of Fuel	Cost of Fuel as grid efficiency is 95%
5	2.4	1.4	2,044	703,136	740,143
10	2.4	1.4	2,044	703,136	740,143
15	2.4	1.4	2,044	703,136	740,143
20	2.4	1.4	2,044	703,136	740,143
25	2.4	1.4	2,044	703,136	740,143
30	2.4	1.4	2,044	703,136	740,143
42	2.4	1.4	2,044	703,136	740,143
70	4	1.7	2,482	853,808	898,745
105	6	2	2,920	1,004,480	1,057,347
140	8	2.6	3,796	1,305,824	1,374,552
210	12	3.8	5,548	1,908,512	2,008,960
308	17.6	6.5	9,490	3,264,560	3,436,379

f) Cost of operation

Cost of operation and maintenance is calculated as one operator in village whose monthly payment is 50,000FCFA and cost of material for maintenance is 2% of diesel generator price per each year.

Number of Beneficiary	Capacity (kW)	Cost of Operation and Maintenance (FCFA)
5	2.4	632,000
10	2.4	632,000
15	2.4	632,000
20	2.4	632,000
25	2.4	632,000
30	2.4	632,000
42	2.4	632,000
70	4	638,000
105	6	650,000
140	8	716,000
210	12	764,000
308	17.6	776,000

g) kWh cost of diesel generation

Number of Beneficiary	Capacity (kW)	Annual Demand of Electricity (kWh)	Annual cost (FCFA)	kWh cost (FCFA/kWh)
5	2.4	365	2,294,425	6,286
10	2.4	730	2,525,049	3,459
15	2.4	1095	2,755,673	2,517
20	2.4	1460	2,986,297	2,045
25	2.4	1825	3,216,921	1,763
30	2.4	2190	3,447,545	1,574
42	2.4	3066	4,001,042	1,305
70	4	5110	5,582,042	1,092
105	6	7665	7,620,008	994
140	8	10220	10,195,246	998
210	12	15330	14,491,863	945
308	17.6	22484	20,410,794	908

3.3 Cost of Photovoltaic generation

Cost of Photovoltaic generation is consisting of a) annualized cost of system components and b) current cost of maintenance.

a) Cost of system component

Items	Price (FCFA)	Interest rate (%)	Life (year)	Annual cost (FCFA)
Panel(50Wp)	180,000	12	20	24,098
Support	15,000	12	20	2,008
Battery 12V/50AH	65,000	12	3	27,063
Charge Controller	35,000	12	10	6,194
4lamps 7watts/12V/1socket	60,000	12	20	8,033
Miscellaneous	70,000	12	20	9,372
Installation cost	50,000	12	20	6,694
Total	475,000			83,462

b) Current cost of maintenance

Miscellaneous	800
Distilled water	400
Total	1,200

c) kWh cost of Photovoltaic

Annual total cost	83,462+1,200	84,662 FCFA
Annual generated electricity	0.2 x 365	73 kWh
KWh cost	84,662 / 73	1160 FCFA/kWh

4. Conclusion

4.1 Photovoltaic and grid extension

Electrification cost of grid extension increases in proportion to the distance from existing grid and decreases in disproportion to size of beneficiaries. Electrification cost of PV (SHS) is assumed to be constant, with no relation to size of beneficiaries.

The shaded area indicates unit costs per Kwh of grid extension lower than that of PV (SHS). The break-even point that PV cost is equal to cost of grid extension can be identified in the distance range from zero (0) to 1 km and 30 beneficiaries. Then the break-even distance can be calculated by size of beneficiary.

	Number of Beneficiary											
	5	10	15	20	25	30	42	70	105	140	210	308
Photovoltaic	1,160	1,160	1,160	1,160	1,160	1,160	1,160	1,160	1,160	1,160	1,160	1,160
Grid extension												
0 km	3,387	2,027	1,574	1,347	1,211	1,120	991	861	796	764	736	714
1 km	8,396	4,531	3,243	2,599	2,213	1,955	1,587	1,219	1,035	943	855	795
2 km	13,405	7,036	4,913	3,851	3,215	2,790	2,183	1,577	1,273	1,122	975	877
3 km	18,414	9,541	6,583	5,104	4,216	3,625	2,780	1,935	1,512	1,301	1,094	958
4 km	23,424	12,045	8,252	6,356	5,218	4,460	3,376	2,292	1,751	1,480	1,213	1,039
5 km	28,433	14,550	9,922	7,608	6,220	5,295	3,972	2,650	1,989	1,658	1,332	1,121
6 km	33,442	17,054	11,592	8,861	7,222	6,129	4,569	3,008	2,228	1,837	1,452	1,202

	Number of Beneficiary											
	5	10	15	20	25	30	42	70	105	140	210	308
BE* distance (km)	0.00	0.00	0.00	0.00	0.00	0.05	0.28	0.83	1.52	2.21	3.55	5.48

*BE=Break Even

4.2 Photovoltaic and diesel generation

The break-even point is identified in the range of 42 to 70 beneficiaries.

Number of Beneficiary	Capacity (kW)	Diesel generation kWh cost (FCFA/kWh)	Photovoltaic kWh cost (FCFA/kWh)
5	2.4	6,286	1,160
10	2.4	3,459	1,160
15	2.4	2,517	1,160
20	2.4	2,045	1,160
25	2.4	1,763	1,160
30	2.4	1,574	1,160
42	2.4	1,305	1,160
70	4	1,092	1,160
105	6	994	1,160
140	8	998	1,160
210	12	945	1,160
308	17.6	908	1,160

The break-even number of customer in village is 61

4.3 Diesel generation and grid extension

The shaded area indicates unit costs per Kwh of diesel generator lower than that of grid extension. Then, the break-even distance of grid extension and diesel generator can be calculated by size of beneficiary.

	Number of Beneficiary											
	5	10	15	20	25	30	42	70	105	140	210	308
Diesel generation	6,286	3,459	2,517	2,045	1,763	1,574	1,305	1,092	994	998	945	908
Grid extension												
0 km	3,387	2,027	1,574	1,347	1,211	1,120	991	861	796	764	736	714
1 km	8,396	4,531	3,243	2,599	2,213	1,955	1,587	1,219	1,035	943	855	795
2 km	13,405	7,036	4,913	3,851	3,215	2,790	2,183	1,577	1,273	1,122	975	877
3 km	18,414	9,541	6,583	5,104	4,216	3,625	2,780	1,935	1,512	1,301	1,094	958
4 km	23,424	12,045	8,252	6,356	5,218	4,460	3,376	2,292	1,751	1,480	1,213	1,039
5 km	28,433	14,550	9,922	7,608	6,220	5,295	3,972	2,650	1,989	1,658	1,332	1,121
6 km	33,442	17,054	11,592	8,861	7,222	6,129	4,569	3,008	2,228	1,837	1,452	1,202

	Number of Beneficiary											
	5	10	15	20	25	30	42	70	105	140	210	308
BE of DG and GE	0.58	0.58	0.57	0.56	0.56	0.55	0.54	0.53	0.65	1.31	1.75	2.38

ANNEX F FINANCIAL STATEMENTS OF STANDARD PROJECT

Provisional Financial Plan for PV Rural Electrification
1 English, 0 French

Pre-Conditions

1 System Unit Cost (55 Wp) 450 (1,000 FCFA)

2 O & M Cost for Private Operator

A. Administration Cost for Private Operator (PMC)

	No.	FCFA/month	Installation Units			
			100	200	300	500
Manager	0.3	500,000	0.3	0.1	0.3	0.3
Solar Engineer	1.0	200,000	1.0	0.5	1.0	1.5
Field Technician	2.0	50,000	2.0	1.0	2.0	2.0

1. Annual Direct Cost Expenses 5,400
2. Indirect Cost 810 15% of the administrative cost as maintenance is included in the annual expenses.
Total O & M Cost 6,210 4.6% as % of the initial investment cost

3 Capital Structure

Initial Investment Cost 135,000 0.21 US\$ million

	% of initial cost	Amount	Notes
User's contribution	10%	13,500	← 0% for HTV. The ratio is subject to the average income of the village concerned, which should be determined by ASER.
Operator's equity	20%	27,000	← The ratio shall be proposed by the operator with an assistance of local financial institution.
Loan	20%	27,000	
Interest	7.0%		
Repayment	1,800 x 1,000 CFA/year		← The operator's equity should be fixed at more than 15%, exclusive of the working capital.
Grace period	5 years		
Repayment period	20 years		
Subsidy	50%	67,500	← 94,500 Amount (= Subsidy + Loan). The ratio will be proposed by the operator. ROE = 21.7% for reference.

4 Others

Depreciation method A straight-line method
Income tax rate 30%
Minimum Income Tax 0 for the annual turn-over less than 500 million FCFA

5 Revenues

45,000 FCFA For the initial payment which may be regarded as 'User's Contribution'
5,000 FCFA/Unit/month For the monthly payment
65,010 Accu. Cashflow after 20 years' operation **Not round** 67,411 In case of consideration of bank deposit effect
5% Management Fee 8,550 Minimum Accu. Cashflow
67,500 50% of the initial investment

If say 't is 20 years', who will take care of the operation after the expiration of 20 years concession period?

6 No. of Subscribers

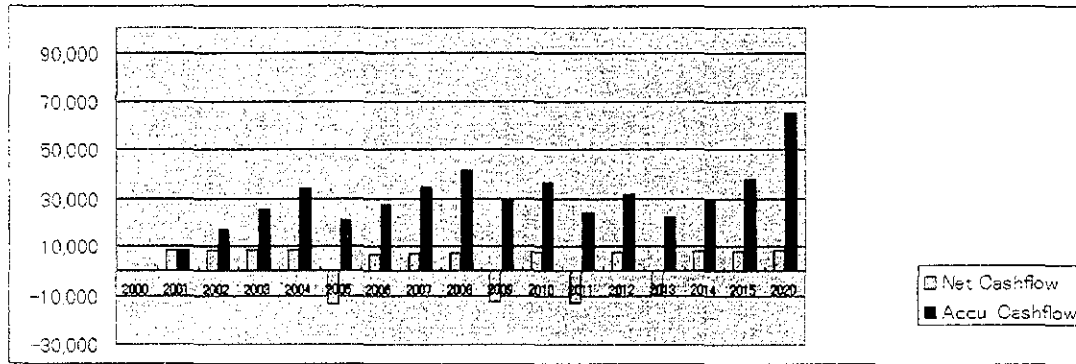
4.9% 300 Units 12,000 Population 35% Electrified rate in terms of household

7 Depreciation (US\$ = 650 FCFA)

	FCFA/System	Life	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2020	
PV Module (Wp)	55	200,000	20	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	200,000
Charge controller (A)	8	40,000	10	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	2,900	2,900	2,900	2,900	2,900	69,000
Battery (Ah)	100	83,000	4	20,750	20,750	20,750	20,750	18,156	18,156	18,156	18,156	16,081	16,081	16,081	16,081	14,006	14,006	14,006	323,700
Lamps	4	52,000	10	5,200	5,200	5,200	5,200	5,200	5,200	5,200	5,200	3,770	3,770	3,770	3,770	3,770	3,770	3,770	89,700
Pole, Cable, etc	1	75,000	20	3,750	3,750	3,750	3,750	3,750	3,750	3,750	3,750	3,750	3,750	3,750	3,750	3,750	3,750	3,750	75,000
Installation, Transport	1	50,000	20	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	50,000
Sub-total		500,000		46,200	46,200	46,200	46,200	43,606	43,606	43,606	43,606	41,531	41,531	39,001	39,001	36,926	36,926	36,926	34,851
Difference		-50,000	20	-2,500	-2,500	-2,500	-2,500	-2,500	-2,500	-2,500	-2,500	-2,500	-2,500	-2,500	-2,500	-2,500	-2,500	-2,500	-50,000
Total		500,000		43,700	43,700	43,700	43,700	41,106	41,106	41,106	41,106	39,031	39,031	36,501	36,501	34,426	34,426	34,426	32,351
Depreciation				13,110	13,110	13,110	13,110	12,332	12,332	12,332	12,332	11,709	11,709	10,950	10,328	10,328	10,328	9,705	

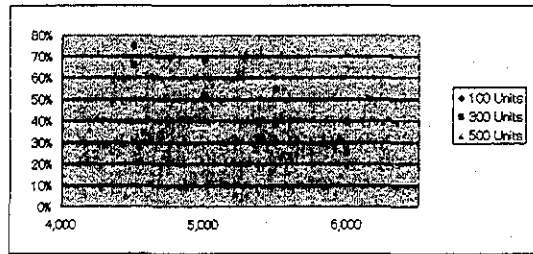
§ Projection of Income		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2020		
	Revenue	0	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	369,000
	Expenses		5,400	5,400	5,400	5,400	5,400	5,400	5,400	5,400	5,400	5,400	5,400	5,400	5,400	5,400	5,400	5,400	5,400	108,000
	System maintenance		810	810	810	810	810	810	810	810	810	810	810	810	810	810	810	810	810	16,200
	Gross Profit	0	11,790	11,790	11,790	11,790	11,790	11,790	11,790	11,790	11,790	11,790	11,790	11,790	11,790	11,790	11,790	11,790	11,790	235,800
	Management Fee to the Operator 5% (modified on July 3)		1,350	1,350	1,350	1,350	1,350	1,350	1,350	1,350	1,350	1,350	1,350	1,350	1,350	1,350	1,350	1,350	1,350	27,000
	Depreciation		13,110	13,110	13,110	13,110	12,332	12,332	12,332	12,332	11,709	11,709	10,950	10,950	10,328	10,328	10,328	9,705	9,705	227,220
	Interest	0	1,890	1,890	1,890	1,890	1,890	1,890	1,764	1,638	1,512	1,386	1,260	1,134	1,008	882	756	126	126	24,570
	Management Fee to the Operator		1,350	1,350	1,350	1,350	1,350	1,350	1,350	1,350	1,350	1,350	1,350	1,350	1,350	1,350	1,350	1,350	1,350	27,000
	Net Profit	0	-4,560	-4,560	-4,560	-4,560	-3,782	-3,782	-3,656	-3,530	-2,781	-2,655	-1,770	-1,644	-896	-770	-644	609	609	-42,990
	Income tax	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Minimum income tax	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Net Income	-0	-4,560	-4,560	-4,560	-4,560	-3,782	-3,782	-3,656	-3,530	-2,781	-2,655	-1,770	-1,644	-896	-770	-644	609	609	-42,990
	Accumulated Profit	0	-4,560	-9,120	-13,680	-18,240	-22,022	-25,804	-29,460	-32,990	-35,771	-38,427	-40,197	-41,841	-42,737	-43,507	-44,151	-44,990	-44,990	-42,990
	Debt Financing	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	20	20	
	Loan at beg		27,000	27,000	27,000	27,000	27,000	27,000	25,200	23,400	21,600	19,800	18,000	16,200	14,400	12,600	10,800	1,800	1,800	
	Repayment								1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	27,000
	Interest	0	1,890	1,890	1,890	1,890	1,890	1,890	1,764	1,638	1,512	1,386	1,260	1,134	1,008	882	756	126	126	24,570
	Loan at end	27,000	27,000	27,000	27,000	27,000	27,000	25,200	23,400	21,600	19,800	18,000	16,200	14,400	12,600	10,800	9,000	0	0	
	Cash-Flow	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2020	2020	
	Net income	-0	-4,560	-4,560	-4,560	-4,560	-3,782	-3,782	-3,656	-3,530	-2,781	-2,655	-1,770	-1,644	-896	-770	-644	609	609	-42,990
plus	Depreciation	0	13,110	13,110	13,110	13,110	12,332	12,332	12,332	12,332	11,709	11,709	10,950	10,950	10,328	10,328	10,328	9,705	9,705	227,220
plus	User's contribution	13,500																		
plus	Equity	27,000																		27,000
plus	Additional equity (Work)	0													0					0
plus	Loan	27,000																		27,000
plus	Subsidy	67,500																		67,500
minus	Repayment	0	0	0	0	0	0	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	27,000
minus	Initial Investment	135,000																		135,000
minus	Replacement	0	0	0	0	0	21,788	0	0	0	19,298	0	20,010	0	16,808	0	0	0	0	
	Net Cashflow	-0	8,550	8,550	8,550	8,550	-13,238	6,750	6,876	7,002	-12,170	7,254	-12,630	7,506	-9,175	7,758	7,884	8,514	8,514	65,010
	Accu. Cashflow	-0	8,550	17,100	25,650	34,200	20,962	27,712	34,588	41,590	29,421	36,675	24,045	31,551	22,375	30,133	38,017	65,010	65,010	
	Deposit bank rate 4.25%		8,550	17,463	26,376	35,290	22,416	38,603	35,766	43,060	31,188	37,925	25,609	32,573	23,716	31,084	39,298	67,411	67,411	
	ROE = 21.7%																			
	Equity Portion	-27,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Management Fee to the Operator	0	1,350	1,350	1,350	1,350	1,350	1,350	1,350	1,350	1,350	1,350	1,350	1,350	1,350	1,350	1,350	1,350	1,350	27,000
	Cash-Flow	-27,000	9,900	9,900	9,900	9,900	-11,888	8,100	8,226	8,352	-10,820	8,604	-11,280	8,856	-7,825	9,108	9,234	9,864	9,864	65,010
	FIRR = 1.7%																			
	Cash outflow	-135,000	0	0	0	0	-21,788	0	0	0	-19,298	0	-20,010	0	-16,808	0	0	0	0	
	Cash inflow	13,500	11,790	11,790	11,790	11,790	11,790	11,790	11,790	11,790	11,790	11,790	11,790	11,790	11,790	11,790	11,790	11,790	11,790	11,790
		-121,500	11,790	11,790	11,790	11,790	-9,998	11,790	11,790	11,790	-7,508	11,790	-8,220	11,790	-5,017	11,790	11,790	11,790	11,790	

Balance Sheets		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2020
Loan		27,000	27,000	27,000	27,000	27,000	27,000	25,200	23,400	21,600	19,800	18,000	16,200	14,400	12,600	10,800	9,000	0
User's contribution		13,500	13,500	13,500	13,500	13,500	13,500	13,500	13,500	13,500	13,500	13,500	13,500	13,500	13,500	13,500	13,500	13,500
Additional equity		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Equity		27,000	27,000	27,000	27,000	27,000	27,000	27,000	27,000	27,000	27,000	27,000	27,000	27,000	27,000	27,000	27,000	27,000
Net profit		-0	-4,560	-9,120	-13,680	-18,240	-22,802	-25,804	-28,460	-32,990	-35,771	-38,427	-40,197	-41,841	-42,737	-42,507	-44,151	-42,990
Subsidy		67,500	67,500	67,500	67,500	67,500	67,500	67,500	67,500	67,500	67,500	67,500	67,500	67,500	67,500	67,500	67,500	67,500
Liabilities & Equity		135,000	130,440	125,880	121,320	116,760	112,978	107,396	101,940	95,610	92,029	87,573	84,003	80,559	77,863	75,293	72,849	65,010
Cash		-0	8,560	17,100	25,650	34,200	20,962	27,712	34,588	41,590	29,421	36,675	24,045	21,551	22,375	30,133	38,017	65,010
Assets		135,000	121,890	108,780	95,670	82,560	92,016	79,684	67,352	55,020	62,608	50,895	59,958	49,008	55,488	45,160	34,832	-0
Assets		135,000	130,440	125,880	121,320	116,760	112,978	107,396	101,940	95,610	92,029	87,573	84,003	80,559	77,863	75,293	72,849	65,010



Pre-Conditions for Financial Analysis			
1 Monthly Payment	Case I	4500	FCFA/Unit/Month
	Case II	5,000	FCFA/Unit/Month
	Case III	5,500	FCFA/Unit/Month
	Case IV	6,000	FCFA/Unit/Month
2 Initial Investment Cost		450,000	CFPA/Unit
3 Users' Financial Contribution (equal to Initial Payment)		10%	of 2 Initial Investment Cost
4 Operator's Equity		30%	of 2 Initial Investment Cost
5 Annual O & M Expenses	100 Units	5.1%	of 2 Initial Investment Cost
	300 Units	4.8%	of 2 Initial Investment Cost
	500 Units	4.0%	of 2 Initial Investment Cost
6 Management Fee		5%	of 4 Operator's Equity
7 Replacement Period	PV Module		20 years
	Charge Controller		10 years
	Battery		4 years
8 Interest Rate for Bank Loan		7%	
9 Interest Rate for Saving Deposit		4.25%	
10 Price of PV Equipment after 20 years operation		50%	of 2 Initial Investment Cost

Summary Results for Financial Analysis											
Case Study											
1	PV Units	300	Units								
2	Monthly Payment	5,000	FCFA/Unit/Month								
3	Operator's Equity	20%									
4	Subsidy	50%									
5	Loan	20%									
6	Amount of (Subsidy + Loan)	94,500	x 1,000 CFA								
7	FIRR	1.7%									
8	ROE	21.7%									
9	Accu. Cashflow after 20 Years	67,411	x 1,000 CFA								
10	50 % of Initial Investment Cost	67,500	x 1,000 CFA								
Summary Results for Financial Analysis											
(Operator's Equity = 19%)											
Case I					Case II						
	Monthly Payment	4,500	FCFA/Unit/Month				Monthly Payment	5,000	FCFA/Unit/Month		
	PV Units	500	300	100		PV Units	500	300	100		
1	Operator's Equity	10%	10%	10%		1 Operator's Equity	10%	10%	10%		
2	Subsidy	60%	66%	75%		2 Subsidy	46%	52%	68%		
3	Loan	15%	9%	0%		3 Loan	29%	23%	7%		
4	Amount of (Subsidy + Loan)	168,750	101,250	33,750		4 Amount of (Subsidy + Loan)	168,750	101,250	33,750		
5	FIRR	0.2%	-1.1%	#NUM!		5 FIRR	2.8%	1.7%	-1.6%		
6	ROE	31.1%	29.9%	21.6%		6 ROE	32.9%	31.7%	29.6%		
7	Accu. Cashflow after 20 Years	112,714	66,504	15,863		7 Accu. Cashflow after 20 Years	112,510	66,381	22,084		
8	50 % of Initial Investment Cost	112,500	67,500	22,500		8 50 % of Initial Investment Cost	112,500	67,500	22,500		
Case III					Case IV						
	Monthly Payment	5,500	FCFA/Unit/Month				Monthly Payment	6,000	FCFA/Unit/Month		
	PV Units	500	300	100		PV Units	500	300	100		
1	Operator's Equity	10%	10%	10%		1 Operator's Equity	19%	10%	10%		
2	Subsidy	32%	38%	59%		2 Subsidy	19%	25%	40%		
3	Loan	43%	37%	20%		3 Loan	56%	50%	35%		
4	Amount of (Subsidy + Loan)	168,750	101,250	33,750		4 Amount of (Subsidy + Loan)	168,750	101,250	33,750		
5	FIRR	5.2%	4.1%	1.3%		5 FIRR	7.4%	6.4%	3.8%		
6	ROE	34.9%	33.6%	32.2%		6 ROE	37.9%	36.5%	33.2%		
7	Accu. Cashflow after 20 Years	112,306	66,259	22,938		7 Accu. Cashflow after 20 Years	112,466	68,820	22,003		
8	50 % of Initial Investment Cost	112,500	67,500	22,500		8 50 % of Initial Investment Cost	112,500	67,500	22,500		
Subsidy as % of Initial Investment Cost against Monthly Payment											
	Monthly Payment	4,500	5,000	5,500	6,000						
	100 Units	75%	68%	55%	40%						
	300 Units	66%	52%	38%	25%						
	500 Units	60%	46%	32%	19%						



Summary Results for Financial Analysis

(Operator's Equity = 20%)

Case I

Monthly Payment	4,500	FCFA/Unit/Month	
PV Units	500	300	100
1 Operator's equity	20%	20%	20%
2 Subsidy	58%	64%	70%
3 Loan	12%	6%	0%
4 Amount of (Subsidy + Loan)	157,500	94,500	31,500
5 FIRR	0.2%	-1.1%	#NUM!
6 ROE	21.5%	20.9%	13.0%
7 Accu. Cashflow after 20 Years	114,430	67,533	13,522
8 50 % of Initial Investment Cost	112,500	67,500	22,500

Case II

Monthly Payment	5,000	FCFA/Unit/Month	
PV Units	500	300	100
1 Operator's equity	20%	20%	20%
2 Subsidy	44%	50%	66%
3 Loan	26%	20%	4%
4 Amount of (Subsidy + Loan)	157,500	94,500	31,500
5 FIRR	2.8%	1.7%	-1.6%
6 ROE	22.4%	21.7%	20.7%
7 Accu. Cashflow after 20 Years	114,226	67,411	22,428
8 50 % of Initial Investment Cost	112,500	67,500	22,500

Case III

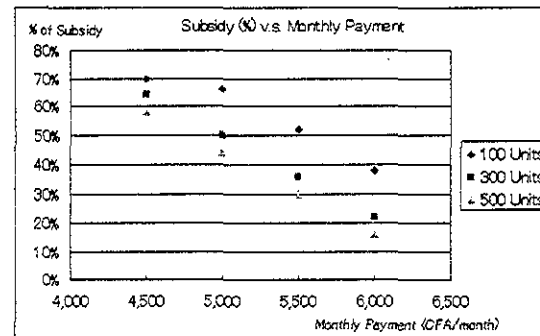
Monthly Payment	5,500	FCFA/Unit/Month	
PV Units	500	300	100
1 Operator's equity	20%	20%	20%
2 Subsidy	30%	36%	52%
3 Loan	40%	34%	18%
4 Amount of (Subsidy + Loan)	157,500	94,500	31,500
5 FIRR	5.2%	4.1%	1.3%
6 ROE	23.3%	22.5%	21.5%
7 Accu. Cashflow after 20 Years	114,022	67,288	22,387
8 50 % of Initial Investment Cost	112,500	67,500	22,500

Case IV

Monthly Payment	6,000	FCFA/Unit/Month	
PV Units	500	300	100
1 Operator's equity	20%	20%	20%
2 Subsidy	16%	22%	38%
3 Loan	54%	48%	32%
4 Amount of (Subsidy + Loan)	157,500	94,500	31,500
5 FIRR	7.4%	6.4%	3.8%
6 ROE	24.3%	23.3%	22.3%
7 Accu. Cashflow after 20 Years	111,917	67,166	22,346
8 50 % of Initial Investment Cost	112,500	67,500	22,500

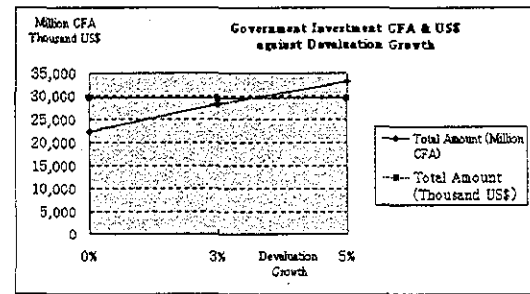
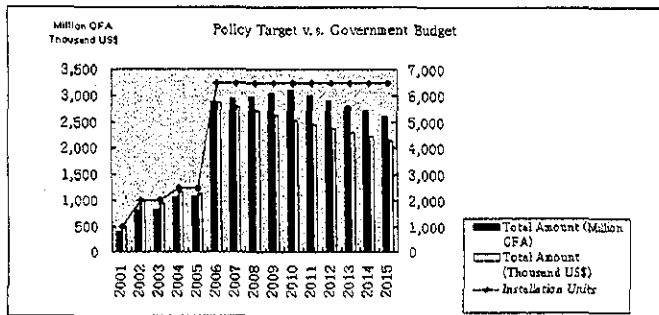
Subsidy as % of Initial Investment Cost against Monthly Payment

Monthly Payment	4,500	5,000	5,500	6,000
100 Units	70%	66%	52%	38%
300 Units	64%	50%	36%	22%
500 Units	58%	44%	30%	16%



ANNEX G FINANCIAL PLAN OF PV RURAL ELECTRIFICATION

1 Financial Plan for PV Rural Electrification Case III																	
1 English, 0 French																	
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Total
Installation Units (\$5 Wp)	1,000	2,000	2,000	2,500	2,500	6,500	6,500	6,500	6,500	6,500	6,500	6,500	6,500	6,500	6,500	6,500	75,000
Price of PV System in US\$	600	585	570	555	540	525	510	495	480	465	450	435	420	405	390	390	
Annual reduction in PV price	2.5%	1.00	0.98	0.95	0.93	0.90	0.88	0.85	0.83	0.80	0.78	0.75	0.73	0.70	0.68	0.65	
Exchange rate US\$=	750	788	827	868	912	957	1,005	1,055	1,108	1,163	1,222	1,222	1,222	1,222	1,222	1,222	
Price of PV system in CFA	450,000	472,500	483,722	494,885	505,954	516,894	527,663	538,216	548,505	558,478	568,077	549,752	531,427	513,102	494,777	476,452	
Subsidy	50%	50%	49%	48%	47%	46%	45%	44%	43%	42%	41%	40%	39%	38%	37%	36%	
Annual reduction in subsidy %	0%	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	11%	12%	13%	14%		
Loan	20%	20%	21%	22%	23%	24%	25%	26%	27%	28%	29%	30%	31%	32%	33%	34%	
(Subsidy + Loan) (%)	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%	
Total Amount of Financial Support from ASER (A) (Million CFA)	331	677	693	885	905	2,401	2,449	2,496	2,541	2,585	2,501	2,418	2,335	2,251	2,168	2,085	27,685
Total Amount of Technical Support from ASER (B) (Million CFA)	66	135	139	177	181	480	490	499	508	517	500	484	467	450	434	418	5,527
(B)/(A) =	20%																
Total Amount (Million CFA)	397	813	831	1,063	1,085	2,881	2,939	2,995	3,049	3,102	3,002	2,902	2,802	2,701	2,601	2,503	33,162
Exchange Rate US\$ =	750	788	827	868	912	957	1,005	1,055	1,108	1,163	1,222	1,222	1,222	1,222	1,222	1,222	
Devaluation growth of CFA =	5.0%																
Total Amount (Million US\$)	0.50	0.58	0.56	0.96	1.17	1.13	2.87	2.78	2.70	2.62	2.54	2.46	2.38	2.29	2.21	2.13	29.7
Accumulated Amount (Million US\$)	0.5	1.5	2.4	3.6	4.7	7.6	10.4	13.3	15.7	18.3	20.7	23.1	25.4	27.6	29.7		
		2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	
Total Amount (Million CFA)	397	813	831	1,063	1,085	2,881	2,939	2,995	3,049	3,102	3,002	2,902	2,802	2,701	2,601	2,503	33,162
Total Amount (Thousand US\$)	504	983	958	1,166	1,134	2,867	2,785	2,703	2,621	2,539	2,457	2,375	2,293	2,211	2,129	2,047	29,723
Installation Units	1,000	2,000	2,000	2,500	2,500	6,500	6,500	6,500	6,500	6,500	6,500	6,500	6,500	6,500	6,500	6,500	75,000
Accumulated Units	1,000	3,000	5,000	7,500	10,000	16,500	23,000	29,500	36,000	42,500	49,000	55,500	62,000	68,500	75,000		
Major parameters																	
Devaluation growth of CFA =	5.0%	0.0%	3.0%	5.0%	(No change of exchange rate is applied for the years after 2010)												
Annual reduction in PV price =	2.5%	2.0%	2.5%	4.0%													
Case Study																	
Devaluation growth of CFA =	0%	3%	5%														
Total Amount (Million CFA)	33,162	22,293	28,310	33,162													
Total Amount (Thousand US\$)	29,723	29,723	29,723	29,723													



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