

PROJECT BRIEF

1. IDENTIFIERS

PROJECT NUMBER	P051356
PROJECT NAME	Senegal: Energy Sector Investment Project
IMPLEMENTING AGENCY	MEMI
EXECUTING AGENCY	ASER
REQUESTING COUNTRY OR COUNTRIES	Senegal
ELIGIBILITY	Senegal ratified FCCC convention Oct 1994
GEF FOCAL AREA	Climate Change
GEF PROGRAMMING FRAMEWORK	OP6

2. SUMMARY

The proposed GEF support would complement the IDA Energy Sector Adjustment Credit by helping implement the Government's strategy for energy sector reform and liberalization that is spelled out in the Letter of Sector Development Policy issued in 1997. The GEF supported activities would contribute to (a) promote social equity between urban and rural areas by increasing access to electricity in rural areas, through private providers; and (b) remove the barriers to the development of renewable energy sources. These development objectives would be achieved by (i) supporting the establishment of a national agency for rural electrification, (ii) providing financing for a decentralized rural energy fund, aimed at attracting private investment and mobilizing significant internal and external resources, (iii) contributing to Senelec's investment program for grid-connected rural electrification; and (iv) strengthening the newly created power sector regulatory authority. Specifically, the GEF contribution (i) would buy-down the relatively high cost of renewable energy technology (RET); (ii) raise public awareness to the advantages of using RETs; and (iii) reduce initial high transaction costs that result from lack of market knowledge, small market size, and dispersed consumer base. It is expected that by completion, the Project would have demonstrated RET to be viable business opportunity in Senegal, and as such contribute to spreading this message throughout Africa.

3. COST AND FINANCING (Million US\$)

GEF:	Project	5.000
	PDF	0.000
	Subtotal GEF	5.000
CO-FINANCING	World Bank	60.000
	Other International	30.580
	Government of Senegal	5.000
	Private	20.000
	Subtotal Co- Financing	115.580
TOTAL PROJECT COST		120.580

4. OPERATIONAL FOCAL POINT ENDORSEMENT

Name: Fatimata Dia Touré **Title** Director of Environment

Organization: Direction de l' Energie Ministry of Environment

Date: December 6, 2000

5. IA CONTACT

Christophe Crepin, Africa Region; Tel # 202-473-9727; FAX 202-473-8185

Internet: ccrepin@worldbank.org

OFFICE MEMORANDUM

DATE: February 8, 2001

TO: Ken King, Assistant CEO, GEF Secretariat
Att: GEF PROGRAM COORDINATION

FROM: Lars Vidaeus, GEF Executive Coordinator



EXTENSION: 34188

**SUBJECT Senegal: Energy Sector Investment Project
Submission for Work Program Inclusion**

Please find enclosed the electronic attachment of the above mentioned project brief for work program inclusion. We would appreciate receiving any comments by January 24, 2000.

The proposal is consistent with the *Criteria for Review of GEF Projects* as presented in the following sections of the project brief:

- Country Drivenness: See Section B.2. page 2 and D.4. page 11.
- Endorsement: Endorsement letter by GEF operational focal point is annexed to the project brief.
- Program Designation & Conformity: B1a. page 1.
- Project Design: C.1. pages 4-10.
- Sustainability: E.3. page 13 and F.1. pages 15-16.
- Replicability: F.1. page 16.
- Stakeholder Involvement: E.6.2 page 15.
- Monitoring & Evaluation: C.1. page 5 and C.4. pages 9-10.
- Financing Plan: Cover page
- Cost-effectiveness: Incremental Cost Analysis (Annex 4).
- Core Commitments and Linkages: D.4. page 11.
- Consultation, Coordination and Collaboration between IAs: C.4. page 9.
- Response to STAP Review: Annex 5B page 36.

At the time of pipeline entry, the OP manager had recommended that inclusion in the work program would be subject to:

(a) *addition of specific activities/budgets to develop a comprehensive monitoring and evaluation plan and a dissemination/replication strategy*: The activity has been specified and an appropriate budget allocation for the activity has been made (pages 5 and 22). As presently envisaged, these activities will form an integral part of the implementation manual that will guide ASER's operations. The implementation manual will be finalized during project appraisal. Monitoring and evaluation will accorded high priority in order to adjust the project's operational modalities, as and when necessary. The lessons learned will be fully incorporated in the replication strategy and widely distributed both within the country and in the region.

(b) *clarification of co-financing contributions*: During project preparation, several donors have expressed their interest to the Government in co-financing the project, including the financing mechanism to be established under the project. Availability of this financing was subject to agreement with the Government on an overall strategy for the sector, in order to rationalize investments and maximize the benefits to be derived from the assistance. Through direct and regular contacts with Senegalese agencies and NGOs as well as with donors active in supporting the sector such a strategy as been agreed, as outlined in the project brief. In April 2001, a donors meeting will be organized by the Government to firm-up the financing commitments from donors, investors and the beneficiaries.

In addition to the above, the OP manager had recommended that at work program inclusion, additional information be provided on the following:

(a) *Problems/risks preventing generation of viable global benefits*: The major issue in the power sector is limited access to power supply and high costs of supply. The Bank has provided support under an Energy Sector Adjustment Credit to improve efficiency and competition, mobilize private sector financing and establish an effective regulatory framework with suitable monitoring to create equal access to increase access to energy, while protecting the environment. Progress in implementing these reforms has been satisfactory, but barriers to promoting RE technologies remain. These include: lack of private technical capacity to develop and implement decentralized RE equipment; lack of capacity to finance such investments, high first costs, etc. The proposed Project, by addressing these barriers, will create the environment necessary for generating viable global benefits over the longer term.

(b) *System boundaries for the intervention with quantitative indicators*: Annex 4 (page 24) reflects the available information on physical project achievements in terms of quantitative indicators over the project period of 5 years as well as over the medium term. In 1998, electrification coverage, defined as the percentage of population living in areas that have been electrified, was 15% in rural Senegal. Within these areas, the 27,000 clients of Senelec represented an electrification rate of 30%, giving a national rural electrification rate of 4,5%. The year 2015 electrification targets which the Government has fixed for ASER call for the following results to be achieved:

- Connection of an additional 80,000 households through intensification of the LV grid served by Senelec;
- Electrification of 1,000 villages having more than 1,000 inhabitants;
- 200 of these through connection to the MV grid being located at 2 km distance from the nearest MV transmission line;
- the other 800 through isolated grids connected to local diesel generators. 120,000 households will be served this way;
- Electrification through sales or leasing of about 20,000 solar home systems by project completion and about 70,000 solar home systems over the medium term.

The above targets are ambitious, but not unrealistic. The objective amounts to about 18,000 new rural clients per year, which given the experience to be gained under this project, the delivery mechanisms to be created should be able to handle.

(c) *Determination of best ways and means to address regulatory and capacity problems and their incremental costs:* To achieve global benefits, the proposed operation would: (i) create the Agence Senegalaise d' Electrification Rurale (ASER) and put in place an innovative rural financing mechanism (REFM) to reduce the high front-end capital and transaction costs. The creation of ASER, along with consumers' willingness to pay on a full cost recovery basis would ensure the technical and financial sustainability of the proposed project; and (ii) put in place a mechanism to monitor and evaluate the RE operations. Based on this monitoring system, which will focus on operational, financial and environmental performance indicators, future RE operations will be adjusted as necessary to take advantage of lessons learned; and (iii) ensure the replicability of the systems to other villages and provide a model for replication in other African countries for further GEF assistance. To this end, a mechanism will be put in place for sharing lessons learned with countries in the Region, in which ASER will keep contact with equivalent agencies in these countries. These activities are incremental and eligible for GEF support for an amount estimated at US\$5.0 million. However, taking into account that rural electrification use is indeed associated with a wide range of domestic benefits, a cost sharing arrangements has been put in place. GEF contribution would represent about 4% of total project cost. (pages 5, 6,7, 9-10, 13, 15-16).

(d) *availability of mainstream financing:* Under the proposed Project, provision has been made to test on a pilot basis the prospects of rural consumer subsidizing rural access. Should the pilot prove successful, a mechanism would be established for transferring the subsidy ex ante on a transparent basis for a larger program.

Please let me know if you require any additional information to complete your review prior to inclusion in the work program. Many thanks.

Messrs.: R. Asenjo, UNDP
A. Djoghlaif, UNEP (Nairobi)
K. Elliott, UNEP (Washington DC)
M. Gadgil, STAP
M. Griffith, STAP (Nairobi)
C Parker/M Perdomo, FCCC Secretariat

cc: Messrs./Mmes. A. Kiss, R. Sullivan, C. Crepin (AFTES), A. Covindassamy (AFTEG), Khanna, Aryal (ENV); ENVGC ISC, Relevant Regional Files

A. Project Development Objective

1. Project development objective: (see Annex 1)

The proposed project would complement ongoing IDA support (through the Energy sector Adjustment Credit) to the Government strategy for energy sector reform and liberalization that is spelled out in the Letter of Sector Development Policy issued in 1997.

The project development objectives are to:

- (a) promote social equity between urban and rural areas by increasing access to electricity in rural areas, through private providers;
- (b) ensure proper regulation as well as competition in the energy sector, leading to affordable and reliable energy supply to urban and rural population;
- (c) lessen the barriers to development of renewable energy sources.

These development objectives would be achieved by (i) supporting the establishment of a national agency for rural electrification, (ii) providing financing for a decentralized rural energy fund, aimed at attracting private investment and mobilize significant internal and external resources, and (iii) contributing to Senelec's investment program for grid-connected electrification.

2. Key performance indicators: (see Annex 1)

- (1) Rural electrification coverage increases by 5% (outside of Senelec's concession) by 2007
- (2) Regulatory agency in the electricity sector is operating properly
- (3) At least 20 diesel powered mini-grids and 20,000 solar powered energy systems installed by 2007

B. Strategic Context

1. Sector-related Country Assistance Strategy (CAS) goal supported by the project:

The project would support two out of three key objectives of the CAS: (i) alleviate poverty, (ii) create an environment attractive to private sector investment; and (iii) employment generation. The project would support the main goal of improving the quality of life of low income population by increasing household access to affordable electricity services, and improve access to commercial fuels. Educational benefits would accrue through better lighting and household income can be supplemented by productive activities day or night. It is expected that health conditions would also improve with access to cleaner water supply through electric pumping.

The project would attract, sustain and amplify private sector investment by (i) establishing a new rural electrification (RE) program, with strong incentives for private sector involvement, (ii) facilitating and promoting the private sector to start investing in village electrification, and (iii) providing direct financing (and catalyzing donor's financing) for the launching of a large grid connected rural and peri-urban electrification expansion program through the privatized national utility. Furthermore, the project would help remove cost and administrative barriers to the development of renewable energy sources.

1a. Global Operational strategy/Program objective addressed by the project:

The proposed project is fully consistent with GEF Operational Program Number 6 (OP 6); *Climate Change: Promoting the Adoption of Renewable Energy by Removing Barriers and Reducing Implementation Costs*. Removal of barriers will make it attractive for the private sector to start investing in decentralized rural electrification schemes, and operate these on a fully commercial basis. Specifically, the Project would (i) lower the relatively high investment costs of renewable energy; (ii) raise public awareness to the benefits of using renewable energy, and (iii) reduce initial high transaction costs that result from imperfect market information, small market size, and dispersed consumer base.

2. Main sector issues and Government strategy:

The energy sector plays an important role in the Senegalese economy as the country is highly dependent on oil imports, the population makes extensive use of wood fuels for cooking and electricity supply is underdeveloped. Major issues in the energy sector include excessive control on oil imports by the refinery shareholders in spite of the 1998 liberalization trade law, continued subsidy to the refinery shareholders, lack of competition in product marketing, increasing depletion of forestry resources, limited access to power supply and the high cost of electric power and petroleum products. The Government strategy, for which the Bank provides support through the Energy Sector Adjustment Credit (ESAC) (Cr.3069-SE) seeks to improve the efficiency and the competition of the energy sector, introduce private sector participation in the financing of the sector, establish an effective regulatory framework with suitable monitoring to create equal access to all operators in the petroleum downstream operation and increase the access of the population to energy, while protecting the environment. The ESAC supports the establishment of a comprehensive legal and regulatory framework for the hydrocarbons, power and rural energy sectors, the privatization of SENELEC and a comprehensive set of measures which are spelled out in a Sector Development Policy letter issued by the Government in January 1997. The proposed investment credit would address complementary issues which are described below:

A major issue in the power sector is the low level of coverage. Access to electricity is largely confined to the capital city of Dakar and other major urban centers. Grid connected village electrification is limited to areas in the immediate vicinity of large population centers and some tertiary centers. The vast majority of the population living in nearly 13,000 smaller centers (with less than 1,000 inhabitants) are without electricity supply: at present, about 268 of these villages are electrified and it is expected that subsequent to the privatization of SENELEC another 39 (or a total of 307) will be electrified by 2003.

The total rate of rural electrification is low (about 4.1%), and this is actually decreasing due to the high population growth in relation to the incremental electrification effort. The reasons for the low coverage are: (i) weak institutions; (ii) inadequate investment policy that did not focus on type of services and standards more appropriate to rural areas and tariffs policies which did not provide for adequate cost-recovery; and (iv) the utility lack of financial resources to finance a reasonable portion of its investment program.

The Government strategy for addressing power sector issues includes demonopolization, divestiture of state-owned public utility (Senelec was privatized in March 1999, through the sale of 33% of its capital to a strategic investor that has full control over management and operations) and a major emphasis on participation of the private sector in the provision of public services. The major structural issues are being addressed with Bank support under the ESAC.

The proposed operation would complement the program of reforms by: (i) strengthening the Electricity Sector Regulatory Commission (*Commission de Régulation du Secteur de l'Electricité*) (CRSE), created by Law No. 98-29 (*Loi d'orientation relative au secteur de l'électricité*) and the National Committee for Hydrocarbons, (ii) supporting the national agency for rural electrification (*Agence Sénégalaise d'Electrification Rurale*) (ASER), which was also established by Law no. 98-29, (iii) supporting the establishment and financing of an autonomous Rural Electrification Financing Mechanism (REFM), and providing financial assistance for its operation, and (v) channeling Bank and donors financial assistance to increase electrification coverage under least expensive technologies and appropriate type of services.

3. Sector issues to be addressed by the project and strategic choices:

The proposed project would address issues regarding low access to electricity.

Establishing a regulatory authority for the electricity sector . The CRSE created by the 1998 electricity law is in the process of being established. Its constitution, duties and procedures, as expressed

in the law and the corresponding regulations are sound (Decree No 98-334, regarding the constitution and functioning of CRSE, fixes the conditions for issuing licenses; decree No. 98-335 establishing principles for setting tariffs; and decree No. 98-336 aimed at ensuring competition in the sector). However, Senegal lacks regulatory tradition and trained professionals are scarce. To ensure that the CRSE is well established, properly staffed and has adequate implementation guidelines, the proposed project includes a comprehensive program of technical assistance that covers provision of expert advice and training on the regulatory functions, tariffs, concessions, computing and managing information.

Improving access to electricity . The project would increase electric coverage both in the rural and in the urban areas. **Rural electrification** service is minimal in Senegal. The 5.3 million people living in about 13,000 rural centers could obtain access to electricity from: (i) SENELEC if they live close enough to a distribution system; or (ii) by other means through decentralized solutions: mainly Photovoltaic (PV) and diesel systems. By 1998 SENELEC provided grid connected electricity service in 295 centers, or 2% of the rural villages. But, the average electrification ratio of these centers, of which the total population is about 820,000, is only about 30%. Thus, SENELEC serves only about 27,000 village connections covering a population of 240,000 people. Village electrification by communities or independent providers is practically non-existent as, until very recently, SENELEC had national monopoly for electrification. Moreover, given SENELEC's limited capability to expand services, the population increase outnumbers the increase in the number of connections, and access to electricity would at best remain stagnant or more likely decrease.

Several issues hamper expansion of grid connected services, particularly in rural areas. Among the barriers are: (i) a tariff system which is insufficient for cost recovery, (ii) price structures that do not recognize that types of services for RE should be designed for low utilization, low capacity consumption, and (iii) inappropriate technologies for expanding grids. At the moment, very little is in place to develop electricity service other than through grid connections. Though solar energy resources are abundant in most of the country (at about 5-6 kWh/day/m²), PV systems are estimated at only at 2,000-3,000 units. Although the numbers of additional units are increasing, at about 800 new units per year, these systems still do not contribute significantly to improving electrification rates.

Because large-scale use of solar PV home systems will not happen spontaneously, as past experience in Senegal and elsewhere has shown, the proposed credit, with financial assistance from GEF, will in addition to grid extension, also address the barriers that prevent the development of the solar home systems market. These barriers include: lack of private technical capacity to develop (business plan) and implement (technical, managerial) decentralized rural electrification activities; lack of capacity to finance such activities; unawareness of targeted beneficiaries of the benefits of decentralized electrification; and the high up-front cost of decentralized RE equipment. In addition, the most effective delivery mechanisms (financial, technical, managerial, and institutional) will be tested in the market, and, if need be, adjusted based on monitoring and evaluation of the experience gained with the first wave of activities.

The Government's strategy, as reflected in the letter of development policy for the power sector include a number of specific actions to increase electrification ratios in rural areas. The overall strategy is aimed at fostering development of village electrification by demonopolizing electrification activities and stimulating participation of communities and private providers. The Electricity Act has created ASER (Agence Sénégalaise d'Électrification Rurale), a national, autonomous entity responsible for promoting rural electrification by (i) disseminating information and training, (ii) providing technical support, (iii) providing financial assistance, and (iv) acting as institutional facilitator.

The proposed credit would support ASER's establishment and consolidation through: (i) supporting ASER and its operation as well as providing technical and financial assistance to implement the first four years' RE program, and (ii) providing technical and financial assistance to design, implement and finance an autonomous REFM.

Urban electrification is also weak in Senegal. About 40% of the dwellings in cities currently served by SENELEC are not connected to the grid and large peri-urban areas remain fully without services. This has mainly resulted from SENELEC's lack of financial capability.

To implement Government policies to increase access to electricity, the concession agreement with the privatized SENELEC spells out specific targets for increasing connections both in the urban and the rural areas. The project would include a component which would provide financing from project cofinanciers (and possibly IDA) to the newly privatized SENELEC (where the GOS would retain 41% of capital) for specific works of expansion in the rural and peri-urban areas, as was indicated in the bidding documents for the selection of Senelec's strategic partner. Proceeds from the IDA credit and other sources would be applied to co-finance the investment component of rural and urban grid extensions and the connections to low income consumers. Such expansions would be implemented under revised, low cost technologies. IDA would act as a catalytic factor in securing financing to be provided by donors for these projects.

The **Ministry of Environment**, in direct collaboration with ASER, will take the lead in the design and implementation of the publicity campaign to show the environmental and other advantages of the use of solar PV systems as well as to monitor and evaluate the due diligence demonstrated by rural energy system operators in respecting the environmental guidelines as formulated in the RE program's procedures manual.

C. Project Description Summary

1. Project components (see Annex 2 for a detailed description and Annex 3 for a detailed cost breakdown):

The proposed Project comprises four components: (i) operationalize ASER; (ii) create REFM; (iii) finance TA & equipment for the regulatory agencies, MEMI and the Ministry of Environment; and (iv) finance grid extension through SENELEC. The rural electrification component supported by GEF provides for supplying electricity services to some 20,000 households in about 100 villages through photovoltaic systems.

The Rural Electrification component has to overcome several barriers to more widespread use of RE activities, which are:

- (i) Capacity & Rural Infrastructure Building. Because of the lack of experience with RE, private providers and investors will be assisted in the identification and setting up of electricity service delivery in rural areas under concession arrangements. Village associations are also invited to organize service delivery through an operator. Technical assistance will focus on two separate issues: technical capacity to create village electrification systems, and financial capacity through a refinancing mechanism to pay for the service delivery. Information campaigns will be launched to make the target population aware of the opportunities that are available.
- (ii) Financing Mechanism. The lack of long-term credit as well as the high up-front cost of renewable energy systems necessitate an innovative financing mechanism. Local commercial banks will manage such mechanism.
- (iii) SENELEC will be able to use project funds for grid extension into rural and peri-urban areas. Third parties will in principle be able to make use of these funds, if they are able to demonstrate that they can provide similar services at lower cost than SENELEC.

- (iv) Administration. An autonomous agency (ASER) has already been set up. Its main tasks are to promote and facilitate the above RE activities. Assistance will be provided to assist ASER in developing a national rural electrification program.
- (v) Monitoring and Evaluation. A mechanism to monitor and evaluate the RE operations will be created. Based on this monitoring system, which will focus on operational, financial and environmental performance indicators, future RE operations will be adjusted.

AFD and AFDB have expressed their interest in co-financing rural electrification activities, although no definite commitments have as yet been made. A donor coordination cum investors' meeting will be organized by GoS in April 2001. Private investors and beneficiaries are also expected to contribute an amount of about \$20 million to the rural electrification component.

Component	Sector	Indicative Costs (US\$M)	% of Total	Bank financing (US\$M)	% of Bank financing	GEF financing (US\$M)	% of GEF financing
1. Technical Assistance to ASER, incl. Monit&Eval., Dissemination/Replication, and staff training		1.82	1.5	0.82	1.4	1.00	20.0
2. Establishment and financing of the REFM		45.45	37.7	41.45	69.1	4.00	80.0
3. Technical assistance & equipment for the training and strengthening of the regulatory agency, the Direction de l'Energie and the Direction de l'Environnement		1.82	1.5	1.82	3.0	0.00	0.0
4. Financing through SENELEC of grid extension in urban and rural areas		59.09	49.0	10.00	16.7	0.00	0.0
Total Baseline Cost		108.18	89.7				
Contingencies		12.40	10.3	5.91	9.8		
Total Project Costs		120.58	100.0	60.0	100	5.00	100
Total Financing Required		120.58		60.0		5.00	

Institutional and implementation arrangements:

SENELEC will be responsible for grid based electrification.

Ministère de l'Energie, des Mines, et de l'Industrie will be responsible for coordination of all activities, except for those executed by ASER. To this end, a Project Implementation Unit (PIU) will be located in MEMI. MEMI will be directly responsible for the assistance to the newly created electricity regulatory agency.

Ministère de l'Environnement, in direct collaboration with ASER, will take the lead in the design and implementation of the publicity campaign to show the environmental and other advantages of the use of solar PV systems as well as to monitor and evaluate the due diligence demonstrated by rural energy system operators in respecting the environmental guidelines as formulated in the RE program's procedures manual. The Direction de l'Environnement of the Ministry of Environment will be supported through: (i) a capacity building in the evaluation of air emissions; (ii) software and training; and (iii) the implementation of appropriate country wide measures for control and follow up.

The proposed institutional arrangements for rural electrification rely on two organizations that will coordinate their activities; (i) the "Agence Sénégalaise d'Electrification Rurale" (ASER), and (ii) the commercial bank(s) that will manage the "Rural Electrification Financing mechanism/*Fonds d'Electrification Rurale*" (REFM). The project will be implemented over a five-year period.

Ministère de l'Energie, des Mines, et de l'Industrie (MEMI) main role through its *Direction Nationale de l'Energie* (DNE) is to ensure that appropriate sector policies exist, to evaluate their impact and, if necessary, adjust these. It would award RE concessions for each project based on ASER's proposals. Finally, it should ensure the creation of mechanisms to make RE a sustainable activity, including continued mobilization of funds from urban electricity consumers, and ensure replicability over the implementation period and over the long run..

Two Committees will oversee ASER's operations: a Management Committee, and an Approval Committee. *According to ASER's operational manual representatives of the private sector (operators, banks, NGOs, consultants and consumers) will be in the majority in each of these committees.* The committees do not have any specific budgets and members are not remunerated for their involvement. Meetings and secretariat are organized by ASER, and operational costs (but no presence fees) will be paid for by ASER.

The "Agence Sénégalaise d'Electrification Rurale" ASER: The ASER team is contracted by the MEMI to implement and monitor day-to-day activities of the Rural Electrification Program (REP). ASER is autonomous in terms of project decision-making, determination of awarding subsidies, and management. Appropriate control mechanisms are in place (see aforementioned two committees).

ASER's role is five-fold: (i) to promote *the funding and* the development of RE (ii) to identify, catalyze, and supervise development of RE activities; (iii) train stakeholders (potential RE operators) in the development of business plans and the actual development of projects; (iv) assist, through REFM, to the financing of rural electrification activities; and (v) monitor and evaluate the operational, financial and environmental impact and progress of the project.

A local commercial bank (or banks) will be responsible for managing the Rural Electrification Financing mechanism (REFM): The REFM will:

- (i) Demonstrate the commercial feasibility of launching and financing rural electrification activities, and create a momentum among commercial banks to provide co-financing for such activities. Banks will be assisted to adapt their own type of loans for application in rural areas (for electrification only). This means adapting existing financing mechanisms to include decentralized electrification in their portfolio; international experience has shown that such adaptation is more efficient than developing a mechanism (or creating an institution) from scratch.
- (ii) Take into account constraints of financial institutions, including; (a) available assets and savings; (b) risk aversion, and (c) profitability of loans allocated. In particular, the reimbursement risk is very high for long-term loans in Senegal. In fact, loans longer than 5

years are not offered at all. Therefore, commercial banks will not commit themselves to financing RE projects that require long-term loans (10 - 15 years). These type of loans will therefore be provided with project assistance.

(iii) Provide three different financial contributions (the exact mix for each project will be established by ASER):

(a) a short-term commercial credit (maximum five years) at prevailing "best" interest rates. It is expected that the interest rate will be around 15 percent excluding tax. This part may initially be financed from REFM, but should gradually become the contribution of local banks.
 (b) a long-term loan at nominal interest rate (10 to 15 years, with a delay equal to the duration of the short-term credit; thus, the provider begins to reimburse the long-term loan only after his short-term commercial credit has been fully paid off). The interest rate is equal to the costs of managing the REFM, or about 6 percent; and (c) a subsidy that will depend on the technology to be applied.

The GEF funds, like any other funds, will be spent on the basis of the submission of a business plan. Because GEF funds will be only used for renewable energy equipment, the funds will be spent as follows: It is assumed that the service providers pay a minimum of 30% of the installed cost of the system up front at the time of the purchase. The remaining cost, after deduction of the subsidy, is financed by a loan from the financial mechanism, REFM, but it could also be a local commercial credit institution, or a combination thereof) with three years maturity and an interest of around 15 per cent. The modalities may change as a function of market development. REFM will be managed by a local commercial bank.

Private enterprises, NGO's, and local community organizations will be responsible for identifying, implementing, and operating decentralized electrification projects in addition to RE concessions that will be identified and tendered by ASER.

To obtain a financial contribution under the project, potential investors (whether this is a private firm, or an NGO) must submit business proposals to ASER in two phases:

First, the potential investor will submit a draft business plan. ASER will pre-assess the feasibility of the proposal and indicate the possible level of financial contribution (long-term concessional loan + subsidy if applicable). If the stakeholders agree to continue with the project, they have to prepare a final business proposal. ASER may assist with this, through co-financing of detailed preparatory studies by local consultants.

Second, once ASER has approved the final business proposal, it authorizes REFM's contribution to the provider. Before the project can become active, the RE investor will need to obtain financial closure with the bank of his choice or finance his share of the investment with his own funds. Once financial closure is obtained, ASER will ask DNE to sign the concession contract covering the project. It is expected that beneficiaries contribute about 20 percent of total financing, the investor 30 percent, the REFM the remainder (with a mix of commercial short-term credit, long-term concessional loan, and subsidy if applicable).

Private management : the development and operation of the RE schemes are entirely left to the private sector, in terms of ownership and management. This is an important political option of the Government included in the Electricity Law. This allows the creation of private utilities in peri-urban and rural areas.

Tariffs will be based on the business plans. ASER will verify that these tariffs are appropriate (i.e. that they provide sufficient financial incentives) and that they reflect economic cost. In addition, the Government has decided that it will contribute to promoting RE by exempting RE equipment from import taxes and VAT, as well as RE services from VAT.

Primary target group and duration of concessions : the target group for intervention are local investors. They need an attractive and secure environment for developing and implementing their projects. Attractiveness means sufficient return (above classical rates for public projects) to provide benefits to the investor. Security means a sufficient duration of an acceptable business climate. A concession is a time bound arrangement whereby an investor commits to provide certain services in a certain geographical area (for example, 1- 20 villages) outlined in the business plan. It is the project's goal to develop as many concessions as possible (please note that concessions here are at the village level, and not at the national or regional level). Concessions of 10 years appear a lower limit, for three reasons:

- (i) The stakeholder needs to be sure of a sufficient return on its investment, and this requires a long enough period;
- (ii) 10 years provide a reasonable goal to have an investor reinvest in the project area; he needs to have some secure footing in his business before he starts to develop new efforts;
- (iii) 10-15 years duration is also the average lifetime of RE equipment.

Rural consumers have an essential role to play: if they do not participate, for any reason, i.e. if they break service contracts, refuse payments, the RE scheme will not work profitably and the investor will go bankrupt. Several parallel measures are planned to ensure appropriate payments at all levels: peer pressure at the village level, professional operators of the equipment, commercial approach to service delivery with appropriate margins at all levels, and involvement of a commercial bank. The population have to understand that during several decades to come they will not benefit from any public grid-connected electricity facilities. They have two alternatives: (i) not having access to electricity, just as now, or (ii) to buy services on a strictly commercial basis from a private investor who is willing to serve the area, the survival of which will depend on their regular payments.

The choice of technology is at the discretion of the operators. GEF funds (apart from that which will be used for M&E) will only be used for renewable technologies. The project aims to electrify 74,000 new consumers. Of this number, 20,000 are expected to be lighted up by solar PV systems, of which 15,000 systems for small and 5,000 systems for large consumers. This sale of this number of PV systems will be assisted by \$4 million of GEF funds. There are two solutions actively promoted under the project: (i) solar home systems (photovoltaic electricity) in case of low-density areas where it is not economic to develop a small distribution network; and (ii) community based generation with small distribution networks, mainly diesel generators.

2. Key policy and institutional reforms supported by the project:

See sections B.2.1 and B.2.2 above.

3. Benefits and target population:

The main benefit of this project is that it will create the basis for a longer-term program to increase access to electricity as a basic measure to combat poverty and increase living standards. The RE implementation and financing schemes, prototypes and models developed under this project would significantly increase the institutional, technical, economic and financial capability for DE at the national level.

Expected benefits include: (i) improved quality of life for the rural and peri-urban target population through increased access to RE services; (ii) increased private sector development through decentralized supply of least-cost, reliable energy; (iii) increased private investments; (iv) design and selection of sustainable and replicable RE schemes, to serve as a model for an increased RE programs in other African countries; and (v) reduction of greenhouse gas emissions with associated global environmental benefits.

The project is targeting people who don't have access to electricity, either because they are living in isolated households that are likely to be excluded from a modern supply of electricity in the medium term, or because they are living in peri-urban areas and the connection fee is too high. The project also targets children and women through improvements in quality of household lighting and access to radio, TV and electric appliances.

Additional benefits includes the abatement of CO₂ as a result of reduced consumption of kerosene and its displacement with clean renewable energy resources.

The project will provide both domestic benefits to the affected population but also global benefits in terms of abated CO₂. Domestic benefits include access to lighting and (in some cases) power for certain household activities. Although these are undeniably benefits they are difficult to accurately quantify and although several multi-country studies are now underway to quantify the value of better access to lighting and electricity there are as yet no accurate means of measuring such benefits.

4. Institutional and implementation arrangements:

Implementation Agencies . The project would be implemented by the Ministry of Energy and Mines, ASER, and private operators (Senelec and others). Within MEMI a project implementation unit (PIU) has been formed, which would be in charge of day-to-day management of the project, except for those activities managed by ASER. The head of the PIU is answerable to the MEMI. The PIU and ASER, each for their respective component, would be responsible for: (a) project implementation performance, (b) financial management as well as disbursement and procurement operations, (c) providing external auditors with the necessary information for audit of project accounts, and (d) relations with Government agencies, SENELEC, donors, the private sector, NGOs and all stakeholders.

The Government has created ASER, a semi-public agency which is charged with the promotion and financing of rural electrification activities (RE). ASER would prepare implementation guidelines, promote DE, review proposals submitted to it by commercial enterprises and/or individuals for the financing of RE. These proposals would be judged based on their technical and financial merits (sustainability) and whether they satisfy the parameters of the implementation guidelines. The normal political aspects of project selection will have been minimized by this commercial focus. Disbursement of funds and repayment of loans would be handled by (a) commercial bank(s) who would act as agent(s) for ASER to manage DEFM funds under a contract.

Private operators would implement the rural electrification component. Consultation has taken place with UNDP under the leadership of the GEF Focal Point during the preparation of the Project Brief.

Implementation Period . The project would be implemented over a five-year period (2002-2007).

Auditing and Reporting . MEMI and ASER would establish and maintain adequate computerized financial management systems, including accounting, financial reporting and auditing, to ensure that accurate and timely information regarding project resources and expenditures is made available. MEMI and ASER's accounts would be audited annually by independent external auditors acceptable to IDA. The audited accounts and the auditor's report, including a separate opinion with respect to statements of expenditures and the Special Accounts, would be submitted to IDA within six months of the end of the fiscal year. The sound establishment of sound accounting and financial management systems would be a condition of Board presentation.

Project Monitoring . Monitoring, evaluating and permanent learning would be an important dimension of the project as RE delivery mechanisms need to be field tested to make sure that these can be applied on a sustainable basis and on a large scale. Lessons learned during this process would be immediately applied. Two performance reviews would be undertaken by independent consultants, respectively at the end of the twelfth month and at the end of the thirtieth month of the project to enable the Borrower and IDA to evaluate the implementation experience. Independent consultants would be used to perform these evaluations.

The key performance indicators for monitoring achievement of the project objectives are: (a) Rural electrification coverage increases by 5% (outside of Senelec's concession) by 2007; (b) Regulatory agency in the electricity sector is operating properly; (c) the number of SHS units sold per year and the cumulative number of people served by the project; (d) fossil fuel conserved, which is a measure of the reduction of the sector's dependence on fossil fuels; (e) customer timely repayment rates as an indicator of customers' satisfaction with their SHS systems and the extent of cost recovery; (f) number of dealers as a measure of market development; and (g) number of problem loans as a measure of the extent to which the project has been successful in establishing a sustainable delivery mechanism.

ASER is responsible for all RE monitoring and evaluation and will, if necessary, complete the performance indicators as well as the mechanism for monitoring, in collaboration with the Direction de l'Environnement, during project appraisal. For the rural electrification component there are three beneficiary groups: (i) rural households and businesses; (ii) providers and suppliers of equipment and/or investors; and (iii) the banking sector. Initial performance indicators to measure the impact on these three groups resulting from the implementation of the project have been developed and will be discussed and agreed during project appraisal. Monitoring of project performance includes measuring economic, financial, technical, social, and environmental changes on each of these groups as applicable. Monitoring is the responsibility of ASER, and is guided by the Operational Manual that outlines the specific activities to be undertaken, which will be finalized during appraisal.

Procurement . Procurement of consultant services (Category 1) and goods (category 2) for supporting ASER, the regulatory agency and MEMI would be done in agreement with Bank guidelines. Specific arrangements would be determined during project preparation for the provision of financial assistance to the Rural Electrification fund (Category 3), and the financing through SENELEC of grid extension in urban and rural areas (Category 4).

D. Project Rationale

1. Project alternatives considered and reasons for rejection:

Alternative to the proposed project would be direct financing to the national utility. This was discarded because of the Government policies of private sector participation. In addition, until now the national utility has not shown strong achievements in rural areas. Conventional grid extensions and centralized

thermal diesel plants would continue to be developed in the rural areas where they are economically feasible, although this now would be left to the initiative of private investors.

The proposed RE alternatives concern remote areas and low-income households in peri-urban areas, where grid extension or installation of new grids are not economic options. Direct financial support to private retailers and/or to final users of RE equipment (direct support the equipment manufacturers of solar lamps, solar home systems) was also discarded because the bureaucratic complications, room for corruption and perverse economic incentives. The RE financing mechanism is not intended to provide financial facilities to private retailers/final users, because: (i) mainly the well-off could take advantage of such facilities as they are creditworthy and well informed; (ii) the technical sustainability issues are not addressed, because retailers have no interest to provide spare-parts and know-how, and users are not well aware of the importance of maintenance; and (iii) this approach does not provide incentives for innovative RE delivery schemes, based on the professionalization of the RE sector, investments by private entrepreneurs, and by local management.

To date, typical financing sources have often not been available for the financing of rural energy projects, in part due to a lending preference and need for power generation capacity and distribution in urban and peri-urban areas. State utilities in Africa have had limited budgets often insufficient to meet distribution expansion in urban and as a result have looked to rural areas as a second priority. The World Bank is beginning to make more money available for RE projects, though the proposed project is unlikely to attract significant funding beyond its current size given in inherent risks associated with the project and a need to build sufficient capacity to support the proposed RE project.

2. Major related projects financed by the Bank and/or other development agencies (completed, ongoing and planned).

Sector Issue	Project	Latest Supervision (PSR) Ratings (Bank-financed projects only)	
		Implementation Progress (IP)	Development Objective (DO)
Bank-financed Liberalize and privatize the energy sector	Senegal Energy Sector Adjustment Credit	S	S

IP/DO Ratings: HS (Highly Satisfactory), S (Satisfactory), U (Unsatisfactory), HU (Highly Unsatisfactory)

3. Lessons learned and reflected in the project design:

(a) Solar home systems projects must: (i) overcome the first cost barrier created by their high initial cost (relative to conventional alternatives) to gain an adequate potential market size, (ii) establish responsive and sustainable PV sales and distribution infrastructure, and (iii) provide quality products and services. (World Bank Technical Paper # 324, Best Practices for Photovoltaic Household Electrification Programs, 1996; The Use of Non-Grant Mechanisms as an Incremental Cost - Financing in GEF sponsored World Bank Projects; Thematic Review of the GEF Solar Portfolio by E. Martinot, R. Ramankutty and F. Rittner).

(b) Solar home systems projects should: (i) operate on a full cost-recovery basis, (ii) provide adequate consumer information about service delivery to avoid unrealistic expectations, and (iii) ensure adequate

management skills in local implementing organizations. (World Bank Technical Paper #304, Photovoltaic Applications in Rural Areas of the Developing World, 1995).

(c) Rigorous economic and financial analysis of rural electrification projects and an increased attention to cost recovery are the key to successful project implementation. (OED Report #13291, Rural Electrification in Asia, A review of Bank experience, June 1994).

(d) Government incentives, including taxes, duties, and subsidies, must be consistent with national and sector objectives for maximum long-term impact. (mid-term Evaluation Report on the India Renewable Resources Development Project, November 1995).

(e) Conventional grid extension is costly and the investment cannot easily be recouped in areas with scattered populations because of low power loads, the provision of subsidies should be restricted, however, to the investment component (initial cost).

4. Indications of borrower and recipient commitment and ownership:

The most important indication of the Government's commitment to the project is the letter of energy policy issued in the framework of the ongoing ESAC and the passing of the Electricity and the Petroleum Laws and the publication of the implementation decrees. Also, ASER has been created which shows client commitment in view that it established the basis for this investment operation. The PIU, which was created to prepare the ESAC, assisted by a number of local and international consultants, is providing a sound management structure for this project reflecting best practices that have been applied with success elsewhere.

5. Value added of Bank and Global support in this project:

The Bank support would act as a catalyst to strengthen Government's partnership with other donors and mobilize financing. Injection of foreign funds are needed to reach the Government's objectives to promote sustainable economic development in rural areas. IDA's experience in other countries offers comparative advantage and allows sound policy advice to the Government in building public and private partnerships to promote private sector growth and in addressing long term human resources issues. The Bank's support to the Government in developing a legal and regulatory framework and improving the institution and capacity building would bring knowledge of successful reforms of the power and petroleum sectors elsewhere and would augur increased participation of the private sector which is one of the important decisions which the Government would like to take in the infrastructure sector. The Bank brings together the experience of other countries in RE that could result in increasing confidence of potential private investors.

GEF will provide financing to cover (i) incremental costs associated with PV options, and (ii) support for information campaigns, training, and technical assistance. Without GEF financing to remove the barriers, this market is not likely to develop spontaneously.

E. Summary Project Analysis (Detailed assessments are in the project file, see Annex 8)

1. Economic:

Economic analysis to be done by Bank staff in the pre-appraisal and appraisal, using standard Bank methodology.

Cost Benefit analysis is essential to enable GEF involvement in accordance with sustainability criteria. As a result, the mainstream financing covers the bulk of investment costs, with GEF only covering a portion of the incremental costs associated with the solar systems and providing financing to local businessmen. See Annex 4 for more details about incremental cost analysis.

2. Financial

The Rural Electrification Financing mechanism within a commercial bank would require careful selection and monitoring particularly to adapt the credit procurement agreement and ensure the repayment objectives are met (*during appraisal*). Import duties on PV and other RE equipment would be reviewed and agreement would be reached on rates that facilitate the dissemination of this technology (*condition of negotiations*). Internal tax (TVA - Taxes sur la Valeur Ajoutée) on equipment and services would be reviewed and agreement would be reached on tax rates that facilitate the feasibility of RE schemes (*condition of negotiations*). Tax (TVA - Taxes sur la Valeur Ajoutée) on the interest of the credits would be reviewed and agreement would be reached on tax rates that facilitate the feasibility of RE scheme financing (*condition of negotiations*).

Fiscal Impact:

Bank staff will assess this impact in the pre-appraisal and appraisal phase.

3. Technical:

To ensure the success of ASER and the corresponding financial mechanisms, the Government, with IDA support has decided to create a lean and efficient institution. Technical assistance would be dedicated to establish a core team of well trained professionals and to prepare implementation guidelines.

The sustainability of the grid extension program through SENELEC is ensured by the selection of a suitable private operator. The long term sustainability of RE program would depend on the degree of its decentralization, on the sustained publicity campaign, on the demonstration effect from installations made during the first few months of the program, and above all on the commitment of private operators to provide RE services at prices that rural consumers can afford.

With regard to the PV equipment, sustainability would depend on quality of the components, well-designed systems (including proper assembly and installation procedures) and good management of the plants that meet consumer' s expectations and capacity to pay. These constraints lead to consider a well structured set of only a few standardized PV systems. A number of promising techniques including those adaptable to the resources and management capabilities of small isolated schemes, already exist on the shelf, thus only requiring an appropriate dissemination methodology.

4. Institutional:

4.1 Executing agencies:

The project would be implemented by the Ministry of Energy and Mines, ASER, and private operators (Senelec and others). Within MEMI a project implementation unit (PIU) has been formed, which would be in charge of day-to-day management of the project, except for those activities for which ASER is responsible.

ASER is the agency promoting rural electrification, with implementation through private sector entrepreneurs. ASER would prepare implementation guidelines, promote the financing (contacts with donors and Government) and development of RE, review proposals submitted to it by commercial enterprises and/or individuals for the financing of RE. ASER will have its own budget, and is accountable through its two committees.

4.2 Project management:

A major focus of this project is to develop sound institutional arrangements. The functions of ASER and the RE financing mechanism have to be defined for the first step of the program and with a long term view. The inter-relationship between them, the ministries and donors would also have to be defined during project preparation.

4.3 Procurement issues:

Procurement of consultant services (Category 1) and goods (category 2) for supporting ASER, the regulatory agencies and MIME would be done in agreement with Bank guidelines. Specific arrangements would be determined during project preparation for the provision of financial assistance to the Rural Electrification fund (Category 3), and the financing through SENELEC of grid extension in urban and rural areas (Category 4).

4.4 Financial management issues:

A computerized financial management systems, including accounting, financial reporting and auditing, would be established to ensure that accurate and timely information regarding project resources and expenditures is made available. MIME/PIU's and ASER's accounts would be audited annually by independent external auditors acceptable to IDA. The audited accounts and the auditor's report, including a separate opinion with respect to statements of expenditures and the Special Accounts, would be submitted to IDA within six months of the end of the fiscal year. The sound establishment of sound accounting and financial management systems would be a condition of Board presentation.

5. Environmental: Environmental Category: B (Partial Assessment)

5.1 Summarize the steps undertaken for environmental assessment and EMP preparation (including consultation and disclosure) and the significant issues and their treatment emerging from this analysis.

The project would have favorable effects on the environment as PV systems would replace thermal based generation. Other environmental concerns with regard to the power sector in general are being addressed in the framework of the privatization of SENELEC, where environmental liabilities have been evaluated and mitigation measures entrusted to the new operator.

5.2 What are the main features of the EMP and are they adequate?

This does not apply to the rural electrification component.

5.3 For Category A and B projects, timeline and status of EA:

Date of receipt of final draft:

To be done.

5.4 How have stakeholders been consulted at the stage of (a) environmental screening and (b) draft EA report on the environmental impacts and proposed environment management plan? Describe mechanisms of consultation that were used and which groups were consulted?

ASER will mount an information campaign to ensure full and adequate participation by the stakeholders throughout the project development process. During the identification of concessions, the potential consumers will be consulted about their interest in RE projects. This consultation will also include discussions about what RE means, and what drawbacks or inconveniences (mini-grid, etc.) it may entail. The handling and disposal of pollutants (e.g. batteries, etc.) will also be discussed.

5.5 What mechanisms have been established to monitor and evaluate the impact of the project on the environment? Do the indicators reflect the objectives and results of the EMP?

As to rural electrification, the ASER implementation manual includes an environmental guidelines package. Application of those guidelines will be monitored.

6. Social:

6.1 Summarize key social issues relevant to the project objectives, and specify the project's social development outcomes.

Implementation guidelines for ASER ensure that the proposed project is primarily targeting isolated rural populations. Community-based provision of public services in Senegal is an innovation, and it may be difficult to organize and gain its acceptance initially. Equally, all private supply arrangements may encounter resistance from some sections of the population due to a preference for subsidized public supply as was common in the past by SENELEC. Consumer awareness programs would be carried out and as a fee-for-service simplified tariff scheme would be applied .

6.2 Participatory Approach: How are key stakeholders participating in the project?

The stake-holders are the RE operators and the consumers. the private sector operators are those that implement the project, under the supervision of ASER, they also will monitor it (i.e. keep environmental and other data, as stated in their contract with ASER), but the evaluation will be done by ASER. Many discussions were held with the GoS and the private sector (potential investors, consultant firms, NGOs). A number of these discussions were also held with potential consumers, within the context of the preparation of the first four rural concessions. Stakeholders, as defined above, are the most important actors in the project, they will make RE happen, or not. They are not involved in decision making on project approval, that is ASER's and the commercial banks' prerogative. A workshop will be held in March 2001 with stakeholders on the contents of ASER's operational manual, in particular its eligibility guidelines.

The main function of ASER is to promote RE. This means, amongst many other things, that a considerable part of its energy will be spent on sensitizing potential consumers and operators, as well as NGOs, as to the possibilities that the RE program has opened for them. ASER has to publish an annual report with a results oriented business plan and will have to explain why it fell short, if it did, in achieving its objectives, and what it intends to do about it. Apart from the publicity campaign, ASER also monitors and evaluates the impact of the program that it has promoted and co-financed. Based on analysis of the results it will decide what, if any, additional outreach activities to undertake. Finally, ASER launches each year one or more rural RE concessions, whose preparation requires direct contact with the potential consumers. In addition, the RE operator also will have contacts with civil society in the area that s/he wants to operate.

6.3 How does the project involve consultations or collaboration with NGOs or other civil society organizations?

The project initiation involved preliminary discussions with NGOs, private sector operators, and other impacted groups.

6.4 What institutional arrangements have been provided to ensure the project achieves its social development outcomes?

Increased access to electrification will be monitored throughout project implementation and statistics will be made available.

6.5 How will the project monitor performance in terms of social development outcomes?

Increased benefits will be monitored throughout the project implementation to determine achievement of the social development objectives.

7. Safeguard Policies:

7.1 Do any of the following safeguard policies apply to the project?

Policy	Applicability
Environmental Assessment (OP 4.01, BP 4.01, GP 4.01)	Yes
Natural habitats (OP 4.04, BP 4.04, GP 4.04)	No
Forestry (OP 4.36, GP 4.36)	No
Pest Management (OP 4.09)	No
Cultural Property (OPN 11.03)	No
Indigenous Peoples (OD 4.20)	No
Involuntary Resettlement (OD 4.30)	No
Safety of Dams (OP 4.37, BP 4.37)	No
Projects in International Waters (OP 7.50, BP 7.50, GP 7.50)	No
Projects in Disputed Areas (OP 7.60, BP 7.60, GP 7.60)	No

7.2 Describe provisions made by the project to ensure compliance with applicable safeguard policies.

Not applicable for the RE component.

F. Sustainability and Risks

1. Sustainability:

The project would implement an innovative approach to RE and must therefore have an effective monitoring and evaluation mechanism so as to make adjustments as required and to test alternatives during implementation. It is expected to build up institutional capability in ASER and generate sound implementation guidelines and standardized models of RE community schemes. The entrepreneurial culture and capacity developed through the actions financed under this project would permit the private operators to fund consequent part of the extension RE program. The cost-effectiveness of these private electricity service delivery model would be an important determinant of affordability and sustainability. This would be closely monitored and evaluated by a team of independent evaluators.

The RE schemes would help demonstrate the affordability of a commercial RE delivery by (i) designing appropriate, minimal technical specifications for equipment; (ii) requiring project operators to develop credible servicing plans; and (iii) certifying sub-project commissioning. Future village electrification systems are expected to benefit from cost reductions due to economies of scale and learning curve cost reductions, mainly in the delivery and financing mechanisms but also

from locally manufactured components. Specifically the creation of ASER would ensure the technical and financial sustainability of the proposed project. Consumers' willingness to pay on a full cost recovery basis would ensure the overall project's long-term sustainability. The project is expected to provide a model for replication in other African countries for further GEF assistance. To this end, a mechanism will be put in place for sharing of early lessons learnt with countries in the Region, in which ASER will keep contact with equivalent agencies in these countries.

The subsidies will remain a structural part of the RE program of the GoS. How does the project ensure financial sustainability? The financing consists of two parts: [a] subsidy, for which the GoS receives grant money from donors and/or uses the contribution made by urban electricity consumers via a surcharge on the tariff, and [b] a commercial part, which is either paid for in cash up front, or for which the operator (or consumer) borrows money at rates, which allow commercial banks to participate in the program. The borrowed part will be lent at commercial rates, and if need be partly at concessional rates. In the latter case part of the grant money available to the GoS will make this also financially sustainable for commercial operators. In short, the sustainability is guaranteed by the financing of RE through [i] own contribution; [ii] grant and/or concessional funds from donors; and [iii] contributions by the GoS, both budgetary and non-budgetary, in the latter case this means funds mobilized through the surcharge on the power tariff.

2. Critical Risks (reflecting the failure of critical assumptions found in the fourth column of Annex 1):

Risk	Risk Rating	Risk Mitigation Measure
From Outputs to Objective		
Insufficient local responsiveness/initiative for project	M	Communication and lobbying by local authorities to change public opinion. Strengthen ASER team in charge of process
Lack of willingness for the private sector to take financial risk in RE systems.	S	Ensure long term commitment from the Government and guarantee benefits from private sector investments
From Components to Outputs		
New rules are not well understood by RA, sector operators, and government services;	M	Adequate communication/information actions
Incentives are insufficient for extension of urban distribution networks and for development of DRE village units by private operators	M	Appropriate design of incentives ("smart subsidies")
Counterpart funds are not made available in a timely manner	M	Include adequate allocations in GOS yearly budget
Overall Risk Rating	S	

Risk Rating - H (High Risk), S (Substantial Risk), M (Modest Risk), N(Negligible or Low Risk)

There are a number of potential problems and risks associated with achieving the projects proposed targets and accompanying benefits. These potential risks include a lack of market experience with solar energy and renewable energy products, inability of government to meet its obligations in terms of creating a conducive environment through supporting mechanisms, failure of the government sponsored RE program, and a lack of technical capacity to support systems operation in the field.

3. Possible Controversial Aspects:

n/a

G. Main Conditions

1. Effectiveness Condition

To be agreed during Appraisal.

2. Other [classify according to covenant types used in the Legal Agreements.]

Most conditions will be conditions of Negotiations, and will follow a logical path toward project development whereby the conditions are normal but necessary steps in implementing the activity. Therefore they should already be met at negotiation stage, reflecting the GoS' interest in the project.

H. Readiness for Implementation

The engineering design documents for the first year's activities are complete and ready for the start of project implementation.

1. b) Not applicable.

The procurement documents for the first year's activities are complete and ready for the start of project implementation.

The Project Implementation Plan has been appraised and found to be realistic and of satisfactory quality. The following items are lacking and are discussed under loan conditions (Section G):

The Operational Manual will be discussed during Appraisal, and so will the Financial Management Manual.

I. Compliance with Bank Policies

1. This project complies with all applicable Bank policies.

The following exceptions to Bank policies are recommended for approval. The project complies with all other applicable Bank policies.

Willem Floor		Ananda Covindassamy	John McIntire
Team Leader		Sector Manager	Country Manager

Annex 1: Project Design Summary

SENEGAL: ENERGY SECTOR INVESTMENT PROJECT

Hierarchy of Objectives	Key Performance Indicators	Monitoring & Evaluation	Critical Assumptions
Sector-related CAS Goal:	Sector Indicators:	Sector/ country reports:	(from Goal to Bank Mission)
1.To support policies and programs aimed at more rapid and sustained growth, which would involve deepening the reform in the fiscal, trade, financial, and external debt sustainability areas; stepping up efforts to improve the environment of the private sector development and accelerating of the privatization program; strengthening infrastructure to make Senegal more competitive.	<p>1.1 An effective regulatory authority that provides incentives for the private sector to invest in expanding access to electricity, in particular in rural areas, is implemented.</p> <p>1.2. Improved household conditions due to provision of decentralized electricity</p> <p>1.3. Promotion of renewable energy technologies</p>	Continuing Bank dialogue on power sector restructuring.	<p>1.1. Lack of commitment from MIME and SENELEC (electricity utility) to encourage the local private sector.</p> <p>1.2. Lack of interest from villages and private sector.</p> <p>1.3. Political, social and economic stability.</p>
	1.4 The revolving fund for RE, managed by ASER, is sustainable and self-financing.		

Global Objective:	Outcome / Impact Indicators:	Project reports:	(from Objective to Goal)
<p>1.1. (i) to promote social equity between urban and rural areas by increasing access to electricity and kerosene in rural areas, through private operators and (ii) to reduce the barriers to the development of renewable energy sources.</p>	<p>1.1. The Government commits itself to support the establishment of ASER and provide a structural long-term financing source for the ASER Fund in conjunction with assistance of the donor community.</p> <p>1.2. 50% increase of access to electricity services by 2005.</p> <p>1.3 Elimination of import duties, TVA and other taxes on energy technologies for RE</p> <p>1.4 Liberalisation of tariffs/taxes on rural electrification services.</p>	<p>·ASER annual reports</p> <p>Direction de l' Energie annual reports, supervision reports</p> <p>Publication of appropriate legal texts</p>	<p>Retention of the rural electricity framework under appropriate standards, norms, and tariffs.</p> <p>Sustained willingness of stakeholders to be involved in financing and in managing of electrification schemes.</p> <p>Affordable electrification units.</p> <p>Consumer' s willingness to pay for electricity services.</p> <p>Stable inflation rate.</p> <p>Government' s commitment in contributing to DRE funds</p>
<p>2.1 to ensure proper regulation as well as competition in the energy sector, leading to affordable and reliable energy supply to urban and rural areas;</p>	<p>2.1 new regulatory rules well formulated, well-known and publicized</p> <p>2.2 RA established with competent staff</p> <p>2.3 extension of urban distribution networks co-financed by private sector.</p>	<p>published texts;</p> <p>RA annual report</p> <p>supervision reports</p>	

Output from each Component:	Output Indicators:	Project reports:	(from Outputs to Objective)
<p>1. A regulatory authority (RA) for the electricity and hydrocarbons sector has been established and is functioning effectively; Direction de l'Energie has been strengthened.</p>	<p>1.1 (a) the corporate restructuring of SENELEC is reflecting the aimed for progressive unbundling of the sector structure; (b) the quality and reliability of modern energy services has improved at relative prices that reflect economic cost.</p>	<p>1. Annual Reports by the RA; independent outside review.</p>	<p>Security in the sub-region General economic and political stability in the country, Sustained political commitment to address electric issues, The new regulatory framework is well accepted by the private sector and creates a good business climate for successful private investment for RE projects; RA continues to be autonomous and independent from political pressure</p>
<p>2. Private entrepreneurs, NGOs, municipalities, organized consumers, village associations have access to financing, training facilities and technical support from ASER to design DRE schemes, prepare bankable business plans, implement and manage DRE projects on sustainable commercial basis.</p>	<p>2.1 access to electricity services, in particular by rural and peri-urban consumers, would be significantly increased; (b) private operators and investors enter into smaller urban centers; 2.2 At least 20.000 solar home systems are financed, through cost recovery basis 2.3 Import tariffs and tax on specific DRE equipment and delivery services are eliminated or reduced. 2.4 At least 20 diesel generators (less than 50 kW) with local grid are financed, through cost recovery basis</p>	<p>2. 1 Progress reports, 2.2 ASER disbursement reports, supervision reports</p>	<p>Rural population is able and willing to pay, on a sustainable basis, for improved electric services, Affordable prices for the poor are compatible with the economic feasibility of commercial DRE schemes, ASER continues to be autonomous and independent from political pressure. new fiscal regime for RE technologies and services successfully implemented by customs and other fiscal officials tariffs of RE schemes compatible with their economic feasibility;</p>

Project Components / Sub-components:	Inputs: (budget for each component)	Project reports:	(from Components to Outputs)
<p><u>1. Establishment of the Regulatory Authorities and strengthening of Direction de l'Energie:</u> Technical Assistance (TA) to: 1.1. get good understanding of regulation instruments and international experience 1.2. acquaint sector operators, including governmental services, with the new rules, 1.3. monitor, evaluate and adjust own's performance, 1.4. execute targeted studies on specific regulatory issues.</p>	<p>1. Establish RA : 2.0</p>	<p>1.1Supervision and disbursement reports 1.2 Outside evaluation</p>	<p>1.1.New rules are well understood by RA, sector operators, and government services; 1.2.good communication between RA and sector operators; 1.3.willingness to learn from mistakes and maintain independence</p>
<p><u>2. Establishment and Operation of ASER Agence d' Electrification Rurale including the RE investment fund;</u> TA and FA 2.1. Inform all beneficiaries about RE policy and assistance and investment mechanisms available; 2.2. Finance grid extension through SENELEC in urban and rural areas. 2.3. monitor and evaluate implementation of electrification schemes</p>	<p>2. Establish and Operate ASER as well as the RE investment fund: 52</p>	<p>2.1 ASER progress reports and disbursement reports; supervision reports</p>	<p>2.1. Incentives are sufficient for extension of urban distribution networks; 2.2. Incentives are sufficient for development of DRE village units by private operators 2.3. Counterpart funds made available in a timely manner</p>

Annex 2: Detailed Project Description

SENEGAL: ENERGY SECTOR INVESTMENT PROJECT

By Component (excluding contingencies):

Project Component 1 - US\$1.82 million

Setting up ASER. This consists mainly of capacity building to enable ASER's autonomous functioning. Technical and financial capacity needs to be created in Senegal to develop village level electrification projects and ASER will play a pivotal role in this. It is expected that it will take several years before sufficient professional players exist that can continue to provide and expand rural electricity services without Project assistance.

Under the project, a framework will be created that provides the right incentives for providers to start developing rural electrification services. The autonomous agency, the "*Agence Sénégalaise d'Electrification Rurale*" has been established to promote rural electrification in Senegal. This will be done in three overlapping phases:

Phase I - Initiating pilot & demonstration activities by bringing together the provider, financier, and village for a specific activity that addresses the village's priority energy needs and ability to pay. Electricity is likely delivered only for 3-4 hours at night and possibly to small businesses during the day; tariffs are agreed on between the different parties. Direct subsidies are transparent, limited, and at the same level for all three Phases; indirect subsidies through providing technical assistance to develop viable activities will be larger in this Phase than the other.

Phase II: Learn by doing. As under Phase I, ASER requests business proposals from providers, NGOs, and villages for the specific village-based projects, but does not be proactive in this. Submitted business plans are evaluated (and if needed, strengthened), and contributions from project funds are awarded as under Phase I.

Phase III: Regulation. When the sector becomes more professional, less attention is needed for developing projects – this is already being done by the interested parties – but more to monitoring of operations and verifying ground rules; “Concessions” will be awarded to certain providers for larger sized projects, for which a mechanism needs to be worked out between ASER and the regulation agency, CRSE.

Project Component 2 - US\$ 45.45 million

Establishment and financing of REFM. The creation, and functioning, of the REFM will be financed in such a way that it has a good chance of becoming self sustaining within the project period. A monitoring mechanism will be developed as well. The first tranche of financing will be fed into the REFM once it becomes operational and starts financing RE operations. Any subsequent donor contributions will also flow into the REFM. The REFM can only be used for decentralized applications; any grid extension will need to be done under Component 4.

Project Component 3 - US\$1.82 million

TA & equipment for training & strengthening of the regulatory agency in the electricity sector, and the Direction de l'Energie to enable them to carry out their tasks of project management, monitoring, and/or regulation. This includes assistance for setting up the PIU and creating capacity in MEMI to award and supervise contracts financed under this project.

Project Component 4 - US\$59.09 million

Grid extension (through SENELEC) in urban and rural areas. This consists mainly of densifying the distribution network in urban and peri-urban areas, and extending the grid in rural areas with a relatively high demand for electricity for commercial or productive purposes.

Annex 3: Estimated Project Costs

SENEGAL: ENERGY SECTOR INVESTMENT PROJECT

	Local	Foreign	Total
Project Cost By Component	US \$million	US \$million	US \$million
ASER	1.38	0.44	1.82
REFM	45.22	0.23	45.45
TA& equipment	0.71	1.11	1.82
Grid extension	13.00	46.09	59.09
Total Baseline Cost	60.31	47.87	108.18
Physical Contingencies	3.14	3.06	6.20
Price Contingencies	3.14	3.06	6.20
Total Project Costs	66.59	53.99	120.58
Interest during construction		0.00	0.00
Front-end fee		0.00	0.00
Total Financing Required	66.59	53.99	120.58

Project Cost By Category	Local	Foreign	Total
	US \$million	US \$million	US \$million
Goods & Equipment	10.5	41.18	51.68
Works	1.10	0.22	1.32
Services	3.56	11.56	15.12
Training	0.36	0.78	1.14
REFM	49.74	0.25	49.99
Operational Costs	1.33	0.00	1.33
Total Project Costs	66.59	53.99	120.58
Interest during construction		0.00	0.00
Front-end fee		0.00	0.00
Total Financing Required	66.59	53.99	120.58

Annex 4

SENEGAL : ENERGY SECTOR INVESTMENT PROJECT

Incremental Costs and Global Environmental Benefits

Broad development goals and Baseline

Development Goals

The proposed activities will support the government strategy to promote access to electricity especially in remote/rural areas by encouraging private entrepreneurs to invest in rural electrification schemes. Specific project objectives include promoting the development of clean, renewable energy sources, such as solar.

Baseline

There is a very low rate of rural electrification in Senegal (less than 10%) with most rural households meeting their lighting and small power needs with kerosene and dry cell batteries. Rural electrification has not been successful in Senegal for a number of reasons, principally the low density of rural population results in an extremely high cost for grid extension, high consumer connection costs, and a lack of investment capital to expand distribution systems.

Kerosene represents the primary source of lighting in rural areas with an average household expenditure on commercial energy of US\$ 6 to US\$ 7 per month. The dry cell batteries is the second source of lighting (flashlight) and the only one for radio, with an average household expenditure on commercial energy of US\$ 4 to US\$ 5 per month. Senegalese households have an ability to pay of about US\$ 10 to 12 per month for a sustainable access to electricity based upon current expenditures on modern forms of energy. There is therefore good evidence to suggest that the potential for decentralized electrification is high.

Consequently, the baseline scenario is that these households/communities will continue to rely on fossil fuel for their basic electricity needs.

SHS are offered for sale in the current market though they are relatively costly as compared to some other countries. For example, countries with established and competitive markets such as the Dominican Republic or Sri Lanka have much lower system costs.

Even though households have a significant willingness to pay for a grid-based electricity supply at prevailing tariffs, they are not likely to be connected to the grid in the foreseeable future. Although the SHS is likely to be best option to meet their needs most cannot afford the high start-up costs of such systems. Studies have shown that households are willing to spend the same proportion of their income (or even more) on better energy services to enable them to become more productive and improve their quality of life. But they can only do so if they receive credit and are allowed to pay back the costs in small monthly installments over many years. The difficulties of

obtaining credit and local technical support compounds households' problems in obtaining access to electricity.

Global Environment Objectives

The global environment objective is to mitigate carbon emissions resulting from the use of kerosene for lighting by rural households in Senegal. Total carbon emissions are expected to be reduced by about 74,110 tons of CO₂ over a 15 year period (corresponding to the lifetime of the equipment). Note that this is a conservative estimate, as the lifetime of solar systems could well exceed 20 years. This mitigation is the rationale for the GEF grant and indicates the international community's WTP for avoided CO₂ emissions.

The project supports the GEF climate change Operational Program #6 aimed at promoting the adoption of renewable energy by removing barriers and reducing implementation costs. By making it possible for private entrepreneurs to invest and manage at the village level electricity schemes, the project will open the way for a fully commercial, market-driven, decentralized electrification scheme.

The current baseline is for continued use of kerosene lanterns and disposable batteries to meet the lighting needs of the rural population. All rural consumers would continue to use these two options to meet their primary lighting needs. Despite the existence of some marketing of SHSs they would not successfully be introduced into rural areas due to a lack of sufficient financing and scale to facilitate a successful penetration into the targeted rural markets.

GEF Alternative

The renewable activities of this project represent 80% or more of the total households concerned by the DEP. The GEF alternative to the baseline scenario is the provision of "electricity services" to about 20,000 households over a five-year period through the promotion of SHS. This objective will be reached through the creation of specific technical, financial and institutional supports that will remain in existence well after the GEF financial assistance is completed. To succeed in this main objective, the GEF alternative will also include capacity building, market development activities, and sub-sector policy reform which all are necessary to remove the identified barriers.

The role of the GEF funding would be to meet the incremental costs of supplying renewable energy and support for the market development activities. The GEF alternative is described in Annex 2 (Project Description).

Scope of the analysis

There are two sets of project benefits, those that accrue directly to the households and those which accrue to the global environment and both of these are considered in the analysis. The analysis is made from the point of view of the country and of the beneficiary households. The point of view of the concessionaire is not covered in the scope of the analysis as the nature of the concession has yet to be determined.

Direct benefits to households

Households benefit in numerous ways, many of which are difficult to quantify since other factors are also implicated. Generally, however, the following benefits result from the availability of electricity in the home:

- (i) Access to electricity allows the use of radio and television, connecting individuals with the social and economic mainstream of Senegal;
- (ii) Improvements in lighting quality and quantity extend the working day (especially for women) and permit the possibility of income generating activities after dark;
- (iii) Improvements in lighting quality and quantity lead to better conditions under which children are able to read and study. There is a long-term positive effect on education and learning experienced by children;
- (iv) Contributing to improved health by reducing the risks associated with indoor pollution and fire.

The benefits to households can be measured by their willingness to pay (WTP) for the improved electricity service. Deriving a figure for households' WTP is complex since it is the sum of the actual payments made for the SHS by the household plus the consumer surplus. While actual payments can be determined, it is not possible to measure the consumer surplus. Hence the project benefits will be somewhat understated.

Direct Benefits to the Global Environment

Global environment benefits accrue from the reduction in CO₂ emissions which are avoided when kerosene, is replaced by renewable energy. The mitigation is the rationale for the GEF grant and indicates the international community's WTP for avoided CO₂ emissions. The CO₂ emissions resulting from the manufacture, transport, and erection of the equipment were not considered. The overall avoided emissions are 15,242 tons of CO₂ over the 5 year life of the project. Mitigation of other pollutants (such as SO₂ and Nox, which are negligible) was not considered.

Costs

Baseline and GEF Alternative Uses and Costs Compared

The current costs associated with the delivery of energy services to rural populations are based upon continued use of kerosene lanterns and disposable batteries by rural communities. It is assumed that project benefits of electrification is equivalent to the avoided baseline costs. WTP was not used because of a lack of accurate data.

For small consumers, the first cost associated with the purchase of two kerosene lanterns is \$30, total consumption of about 88 liters annually and a net present value of operating costs of about \$470 over a fifteen year equipment life. The levelized cost is about \$6/month. Energy output is equivalent to a 20 watt SHS.

Medium consumers will use both lanterns and disposable batteries. The first cost associated with the purchase of three kerosene lanterns is \$45, total consumption of about 135 liters annually and a net present value of operating costs of about \$900 over a fifteen year equipment life. Disposable dry cell battery use is about \$28/year. The levelized cost is about \$12/month. Energy output is equivalent to a 50 watt SHS.

Renewable energy solutions are more expensive than the baseline solutions and their costs are unlikely to decrease until local capacity increases and economies of scale lower the price as the market grows. A national program of innovative decentralized electrification schemes is expected to induce private entrepreneurs to invest in this sector. The improved service provided by PV in comparison with kerosene can be expected to increase willingness to pay of at least some buyers. Current use of energy equipment is given below.

Based on ESMAP survey data, the incremental cost of PV systems for households, as compared to baseline solutions, reveals a 15-year life cost of US\$ 245 for the 20 Wp systems and a cost of US\$ 427 for the 50 Wp systems. The Table below provides a summary of incremental cost per unit.

Incremental Cost per System US\$		
	Incremental	Incremental
System	Cost/Unit	Cost/W
20Wp	245	12.25
50Wp	427	8.54

The incremental cost was calculated using the following baseline assumptions as compared to the GEF option, as noted in the Table below.

Household type	Baseline Provision	GEF Provision
	Light	Electricity
Small consumer	2 kerosene wick lamps	-20Wp SHS
Medium consumer	3 kerosene wick lamps	- 8 R20 batteries/m - 50Wp SHS

The concessionaire/DE provider will be given latitude to meet the demands of the market in terms of system type and size. It is difficult to make exact comparisons between the light provided by a kerosene or LPG lamp and that from a fluorescent bulb as may be used in an SHS because quality of light and convenience is not taken into account. Incremental costs have been based on estimated prices of equipment a concessionaire might be expected to pay for equipment.

Levelized Monthly Cost (LMC) is used for comparison with existing levels of payment. Investment costs are expressed as sum of the first cost of the system and the present value of the running costs. A discount rate of 12% and a lifetime of 15 years is used.

System	LMC (\$)	LMC of Baseline (\$)	NPV, Lifecycle Cost, GEF (\$)	NPV, Lifecycle Cost, Baseline (\$)
20Wp SHS	7.80	4.80	639	394
50Wp SHS	15.10	9.90	1,234	807

Incremental costs

The incremental costs of each system can be calculated from the information in the table above. The table below presents the incremental cost and the expected rates of deployment for each type of system.

System	Annual Deployment, Year					Incremental Cost(US\$)/unit
	1	2	3	4	5	
20Wp SHS	1,000	2,500	2,500	3,000	3,000	245
50Wp SHS	500	1,500	2,000	2,000	2,000	427

Small Consumers. These consumers typically would like to acquire systems of 20Wp in size. The system carries a significant incremental cost at the moment because of the weakness of the market. It is expected that over the coming years, market growth will bring about a significant reduction in system cost and hence incremental cost. Reductions in system cost of the range of 10-20% can be expected over the lifetime of the project, which would bring them to the same level as those in other countries. It is therefore proposed that a 'first cost grant' is used, payable to the concessionaire to absorb the incremental cost in the initial years

20Wp System	Year 1 (\$)	Year 2 (\$)	Year 3 (\$)	Year 4 (\$)	Year 5 (\$)
First cost grant payable	245	245	245	245	245
Proportion of incremental cost (%)	75	75	75	50	50

Medium Consumers. Medium consumers are expected to wish to acquire systems of 50Wp. The consumers who acquire the 50Wp system will have either kerosene, gas and batteries or a gasoline generator as the alternative. As with the 20Wp systems reductions in system cost of the range of 10-20% can be expected over the lifetime of the project, which would bring them to the same level as those in other countries. To account for the existence of a lower cost option in the 20Wp system and to avoid the subsidy benefiting those who obtain a larger system (and who will tend to be better off) it is proposed that the first cost grant cover 100% of the incremental cost.

50Wp System	Year 1 (\$)	Year 2 (\$)	Year 3 (\$)	Year 4 (\$)	Year 5 (\$)
First cost grant payable	427	427	427	427	427
Proportion of incremental cost (%)	75	75	75	50	50

The GEF alternative to the baseline scenario is expanding new renewable technology, principally SHS and pico-hydro-generators associated wherever needed with low cost distribution grids and innovative tariff systems.

Technical Assistance and Startup Costs for ASER. To support ASER, the national rural electrification agency, in the launching of the bidding process, monitoring, oversight and independent evaluation, technical assistance is required for the first five years costing a total of US\$1.82 million, of which US1 million will be financed by GEF for

the monitoring program and the training and capacity building of the Direction de l' Environnement in the evaluation of air emissions (see page 6), broken down as follows:

Activity	Investment (\$)
• Bidding preparation	50,000
• Training for ASER staff	50,000
• Support to monitoring and evaluation, and dissemination/replication strategy	1,670,000
• Regulatory assistance	50,000

The total GEF Grant is therefore determined as follows:

Item	GEF Grant
20Wp SHS	1,9
50Wp SHS	2,1
TA for ASER	1,0
Total	5,0

Incremental Cost Calculation Matrix

	Baseline	GEF Alternative	Increment
Domestic Benefit	Lighting and small power needs provided by fossil fuels	Lighting and other appliances provided from renewable sources	
Global Environment Benefit	74,110 tons/CO2 (1)	0 ton of CO2	Abatement of 74,110 tons of CO2
Costs (US\$):	20 Wp \$394 50 Wp \$807	20 Wp \$639 50 Wp \$1,234	20 Wp \$245 50 Wp \$427

(1) Russel de Lucia, Indonesia RED, Global Environmental Calculus Note

GEF Calculation

Incremental Cost Buydown

Year	20Wp systems deployed	Incremental Cost, e US\$/unit	Cumulative	Assumed GEF sp of incremental cost	GEF Sp req	50Wp systems deployed	Incremental Cost, e US\$/unit	Cumulative	Assumed GEF sp of incremental cost	GEF sp req	Total Incremental Cost	GEF Technical Assistance	Total GEF support req
2000	0	245	-	0%	-	0	427	-	0%	-	0	0	-
2001	1000	245	1,000	75%	183,750	500	427	500	75%	160,125	343,875	500,000	843,875
2002	2500	245	3,500	75%	459,375	1500	427	2,000	75%	480,375	939,750	500,000	1,439,750
2003	2500	245	6,000	75%	459,375	2000	427	4,000	75%	640,500	1,099,875	0	1,099,875
2004	3000	245	9,000	50%	367,500	2000	427	6,000	50%	427,000	794,500	0	794,500
2005	3000	245	12,000	50%	367,500	2000	427	8,000	50%	427,000	794,500	0	794,500
	12,000												
Installed Capacity	120 kW				1,837,500	8,000				2,135,000	3,972,500	1,000,000	4,972,500
						200 kW							

Carbon Emissions Avoided

Deployments: annual

	BASE CASE: Alternatives		PROJECT: Cumulative Carbon Abated (tons of CO2)			
	20W SHS	50W SHS#2	20W SHS	50W SHS#2	TOTAL	YEAR
2000	0	0	0	0	0	2000
2001	1000	500	210	210	420	2001
2002	2500	1500	736	841	1577	2002
2003	2500	2000	1261	1682	2943	2003
2004	3000	2000	1892	2523	4415	2004
2005	3000	2000	2523	3364	5887	2005
2006	0	0	2523	3364	5887	2006
2007	0	0	2523	3364	5887	2007
2008	0	0	2523	3364	5887	2008
2009	0	0	2523	3364	5887	2009
2010	0	0	2523	3364	5887	2010
2011	0	0	2523	3364	5887	2011
2012	0	0	2523	3364	5887	2012
2013	0	0	2523	3364	5887	2013
2014	0	0	2523	3364	5887	2014
2015	0	0	2523	3364	5887	2015
	12000	8000	31851	42258	74110	

NET CO2 Emissions Abated, 2001-2015
74,110

NET CO2 Emissions: Abated, 2001-2005
15,242

	20W SHS	50W SHS#2	
Households	1	1	
Kerosene: Consumption	0.04	0.04	l/hr hrs/day
Run time	3	3	
No lamps	2	4	l/yr
Per unit CO2	87.6	175.2	kg/l burned
	2.4	2.4	

Gasoline: Consumption		l/kWh kWh/mth
No kWh		l/yr

Annex 5

SENEGAL: ENERGY SECTOR INVESTMENT PROJECT

STAP Review

Annex 5A Comments from the STAP Reviewer - – Daniel M. Kammen (University of California, Berkeley, CA)

Summary

This is an important, generally well-conceived, project that will provide a critical service. If implemented in a fashion that truly requires private-sector buy-in, the chances of success are excellent, and the project should be approved and supported. There is a need for the Senegal project to evaluate and benefit from the experience in other regional settings. To that end, an advisory/oversight board is needed to review the ongoing success/issues with the drive for private sector engagement and project leadership. It is recommended that an advisory and review board be constituted. This group would consist of a majority of individuals from the private sector, several academics and NGO representatives, and a minority from the multinational development community. The tasks of this group would consist of both charting and advising the project team, and to provide a private-sector study team that could look at other renewable energy/electrification projects, *and* to develop increase expertise within the private sector to facilitate future efforts.

Major Comments:

(i) Concession Models (page 1ff):

This program utilizes the concession approach as the primary mechanism to support private sector entry in the renewable energy market. There are a number of compelling arguments for this approach, particularly in rural/areas of low population density in poor regions of developing nations. However, the primary examples of concession-based approaches, in South Africa and the Caribbean, are not anticipated to build diverse, competitive, markets. Instead, they will likely develop localized, hopefully sustained, markets, but there is no clear reason to think that the investment of public funds in these concessions. In the South African case, for example, pre-existing companies interested to enter the market (RAPS) wanted to begin providing service, and the use of public – ESKOM – funds provided an initial impetus for action. Sustained use of public, or GEF, funds was not considered viable.

This is not to say that the concession model *can not* work in Senegal, but a more detailed plan to develop competitive businesses may be required. The focus on financing mechanisms, as well as the existence of an independent agency (ASER) to operate the project are both good starts. To make this model not only work operationally, but to

build groundwork for future competitive markets, greater attention should be given to issues of fee-for-service and other mechanisms.

The anticipate co-financing level, \$20 million, is impressive and needed. However, with a total project budget of over \$130 million, a larger percentage share from the private sector is recommended. A more specific break-down of the multinational vs. true private-sector financing is needed as the majority of the \$20 million are likely to from regional development banks.

SENELEC is providing the largest share of financing. The source(s) of this support need to be specified if not wholly GoS allocations.

(ii) Page 3:

The two committees charged with the oversight of ASER, a Management Committee, and an Approval Committee, should be considered in the context of my comments on the need for an oversight/review panel that has a balanced Senegalese and international membership. The purpose of this group is not to ‘micro-manage’ or to critique ASER/SENELEC operations, but to use this important project to build added private sector, regional, and international experience to facilitate this and future renewable energy electrification projects.

This broader, private-sector review and advisory group becomes particularly important given the intended management of the REFM fund. Again, in the context of an advisory panel, groups such as ENDA-TM (Dakar) and AFREPREN (Nairobi, pan-African) could provide critical input and guidance on issues of income generation, local entrepreneurial involvement, and questions of equity and access. [See the comment below, as well.]

(iii) Page 4:

The mechanisms and role for NGOs and community organizations appears to charge them with much of the critical project leg-work, but an insufficient role in the subsequent management, leadership, and decision-making. One can not utilize the organizations in civil society to do the ‘work’, and not then empower them with real oversight and decision-making power. The management/oversight board recommended above provides one mechanism to remedy this major issue. The well-documented problems with the GEF Zimbabwe-PV loan provides a critical example of the problems that can arise when public sector/NGO constituents are not sufficiently empowered in a project of this nature. As a related comment (page 4ff), it seems unlikely that NGOs would choose to bid/submit proposals under the present project structure. This, too, could be addressed with the oversight and input mechanisms that I have recommended.

Minor Comments:

PADGEF.doc:

Page 1, paragraph 1:

The phrase, ‘fine grid extension’ has no meaning.

(iv) Page 4:

Further analysis of the 10+ year concession lifespan. Little relevant data exists from the energy sector. Cases from non-energy services could be used to evaluate the veracity of the conclusion that this is a lower-limit on the necessary concession period. A significant amount of lock-in/future monopoly is highly likely with this long duration, particularly as per capita energy use in Senegal is expected to change so dramatically during this time.

(v) Page 5:

The ‘critical’ role of rural consumers discussed in the document is, in fact, a critical, argument that non-concession models – or concessions based on fee-for-service and not so heavily on sales – would benefit the end users far more. As stated in the ‘major comments’ section, this issue needs to be examined in greater detail, preferably via a workshop with local NGO and community group participation. I would be willing to serve as part of an independent external review and convening group for this purpose.

(vi) Page 6:

Carbon dioxide abatement is likely to be a minor aspect of the project for the next many years (see, for example, Duke and Kammen, 1999; Duke, et al., 2000). While transformation of the energy sector is a critical goal of this and other renewable energy projects, one should be clear that most of the energy use will be new energy, not significantly wood, charcoal, or kerosene substitution.

(vii) Page 7:

The statement below needs further explanation, as well as a plan to address this problem:

The World Bank is beginning to make more money available for RE projects, though the proposed project is unlikely to attract significant funding beyond its current size given inherent risks associated with the project and a need to build sufficient capacity to support the proposed RE project.

(viii) The ‘Lessons Learned’ section (3):

Several issues arise here, namely the true need for full cost-recovery of SHS installation. This is inconsistent with how *non-renewable* energy provision is provided by SENELEC as well as by most other national/regional utilities. Second, ‘rigorous economic and financial analysis’ (see, eg. Duke, et al, 2000, for the case of Kenya) suggests that this project is not evaluating all logical options, such as fee-for-service, and fully competitive private sector businesses but supported strongly by public sector and NGO training, financing, etc ...

(ix) Page 9 -:

Annex 4: missing. Annex 4 is missing, and is needed for a full evaluation of section E.

(x) Page 11:

The social analysis/participatory evaluation is too incomplete for full commentary. It would clearly benefit from the NGO/civil society review, commentary, and input that the review/oversight board I suggested in the ‘Overview’ at the beginning of this document.

(xi) Page 16ff:

A number of the *Key Performance Indicators* are clearly unrealistic (1.2 - 50% electrification by 2005; 1.4 – liberalization of taxes, unless a very minimal ‘ liberalization’ is all that is demanded). It makes more sense to develop a realistic set of indicators, and to provide specific funding and local support to help these to be realized.

(xii) Page 20:

Greater detail is needed to specify the function of the REFM. The statement:

Project Component 2 - US\$ 50.00 million

Establishment and financing of REFM. The creation, and functioning, of the REFM will be financed in such a way that it has a good chance of becoming self sustaining within the project period. A monitoring mechanism will be developed as well. The first tranche of financing will be fed into the REFM once it becomes operational and starts financing RE operations. Any subsequent donor contributions will also flow into the REFM. The REFM can only be used for decentralized applications; any grid extension will need to be done under Component 4.

does not sufficiently specify how NGOs and private sector groups will: (a) learn of this opportunity; (b) be assisted in the preparation of acceptable documents to be competitive; (c) will clearly lead to private-sector buy in and action; and (d) how SENELEC grid extension will interact with renewable energy stand-alone systems. Item (d), for example, has been critical to the slow pace of renewable energy/DE expansion in South Africa.

Annex 4 :

Page 1, paragraph 1;

Edit the sentence, “solar and hydraulic ...’ . Incorrect: perhaps the intended meaning is, ‘hydropower’ , or most likely, ‘ hybrid’ .

(xiii) The assumptions in the Annex for various customers all appear reasonable, although faster cost-declines are possible, and – critically – no induced demand effect (Duke and Kammen, 1999) is taken into account in the calculations of NPV. Including these items would reduce the expected costs significantly.

(xiv) Page 2 – 5:

The kerosene costs, as for many alternatives do not include any penalty for the fact that in rural Senegal these items are not always available *and* costs in local markets can vary widely. An inflator should be applied to fossil-fuel and traditional fuel prices to reflect this.

(xv) (Main document) Page 28:

The LMC’ s for the PV systems appear to be taken from older cost estimates. More recent values are available from ESMAP.

References

- Duke, R. D., Graham, S., Hankins, M., Jacobson, A., Kammen, D. M., Khisa, D., Kithokoi, D., Ochieng, F., Osawa, B., Pulver, S. and Walther, E. (2000) *Field Performance Evaluation of Amorphous Silicon (a-Si) Photovoltaic Systems in Kenya: Methods and Measurements in Support of a Sustainable Commercial Solar Energy Industry*, ESMAP Technical Report No. 005 (World Bank: Washington, DC).
- Duke, R. D., and Kammen, D. M. (1999) “The economics of energy market transformation initiatives”, *The Energy Journal*, **20 (4)**, 15 – 64.

Annex 5B: Response to STAP Review

Major Comments

(i) This project has evaluated all options, and fee-for-service and fully competitive private sector businesses supported by the public sector etc. is part of parcel of the package that ASER is able to offer the market. The Electricity Law, for example, clearly states that all grid extension will be done by competitive tendering. This means that the national power company has not first choice, but will have to compete like any other interested investor. Only when Senelec will increase connection rates within its own concession area there will be no competition.

The co-financing element of \$20 million by the private sector is only for rural electrification not for the Senelec grid extension component. As is explained in section C1 of the project brief, 50% of the RE investment cost will have to be financed by the beneficiaries and operators with their own funds. The fact that these funds may be borrowed by the investors from local Senegalese bank does not change the fact that it is an investment by the private sector. Senelec is not providing the largest share of the investment. According to the concession agreement with the private operator of Senelec, the utility has to connect 33,000 households over roughly the same period as that of the project. It may be that Senelec uses its own funds and/or borrows from local banks. It is also possible that the GoS participates in that investment, because it is majority shareholder in the national utility.

(ii) The two oversight committees will consist of both public and private sector representatives. According to ASER’s operational manual representatives of the private sector (operators, banks, NGOs, consultants and consumers) will be in the majority in each of these committees. Whether groups such as ENDA and AFPEPREN should have a role to play is the prerogative of the Government.

(iii) Most of the legwork will be done by ASER (promotion, monitoring, etc) and the private sector (project identification and management). NGOs, as are other representatives of civil society, are invited to participate in making RE a success in Senegal. If they want a role in management, leadership, and decision-making they only have to propose a business plan for the electrification of one or more villages. Or, if they have shown that they have actual experience in this area, ASER may invite one to participate in one of its oversight committees. ASER is in

contact with civil society and based on its feed-back will make a justified choice of its optimal inclusion in decision-making.

Minor Comments

(iv) The text (pp. 8-9) clearly spells out the reasons why a 10 year period for a concession was chosen, one of which is the lifetime of non-renewable energy systems such as diesel groups. The main reason for the length of the period is to attract serious investors by giving them the opportunity to make money in rural areas, while at the same time offering rural consumers with a reliable electricity service they want and need, which is of an acceptable quality, and at a price that consumers can afford.

(v) The consumers have indeed a role to play in both the concession model and the spontaneous business plan proposals. In the methodology that describes how rural concessions need to be developed (see ASER implementation manual, vol. 1) consultation with the consumers constitutes one of the design features. After all, it is the GoS' s objective to develop a sustainable RE program, from a technical, financial and institutional point of view.

(vi) Based on the representative rural energy consumption and expenditure survey carried out in July 2000 the CO2 abatement scenario is based on the expected replacement of kerosene and other energy forms that were identified during that survey. How significant this abatement is as compared to the use of new energy is still open to question, but the text clearly states that it is an additional not the major benefit.

(vii) Given the fact that IDA intends to finance US\$59 million of the cost of the project there does not seem to be a need for further explanation. What the relevant text wants to convey is that if the GoS wants to count on future investment in RE, this project needs to demonstrate that it really will be able to establish RE as a sustainable activity.

(viii) The reviewer probably has only experience with power tariffs in anglophone Africa. However, in Senegal, as in many of its neighbors, tariffs reflect economic cost and are not subsidized. As to the economic analysis comments see (i).

(ix) Annex 4 is not missing, but was just misnumbered.

(x) As pointed out above in (ii) civil society has been and will be involved in project development. ASER' s oversight committees will not consist only of public sector representatives, but as has been laid down in ASER' s implementation manual, will have a majority of representatives of civil society.

(xi) The text does not state that there will a 50% electrification rate in rural areas, but rather a 50% increase to electricity services by 2005. Liberalization of taxes means the exemption of import duties and VAT on RET for RE so as to bring the technology within easier reach of the rural consumers.

(xii) NGOs and other interested parties have already been informed about ASER' s program during project preparation. In addition, ASER aims to organize a two-day workshop for all interested parties in February 2001 to acquaint them with its rules and regulations as formulated

in its voluminous implementation manual as well as to get fed back, so as to adjust its manual. This manual contains all the information and guidelines needed, while ASER's past and future activities have and will sensitize interested parties about the RE financing opportunity, what kind of technical and financial assistance is available and under what conditions in preparing business plans as well as how to operate rural power 'utilities,' how grid extension will interact with renewable stand-alone systems.

(xiii) The reviewer may be right that faster cost reduction will be possible. However, the experience he refers to (a well developed RET market, where market barriers have been overcome) cannot be applied blindly to Senegal, where the RET market needs to be developed and the market barriers still loom large and constitute a major constraint for market development.

(xiv) To have as reliable data as possible a representative survey has been carried out in the rural areas in July 2000 to gather data on actual current energy expenditures by households. It is therefore not necessary to apply an inflator to fossil-fuel and traditional fuel prices, which would be warranted if no reliable data base reflecting cost in local rural markets would not have been available.

(xv) The LMCs for PV systems were taken from the most recent Bank project in neighboring Cape Verde, which reflect Senegalese reality more than that of Kenya. Moreover, there is an unwillingness in Senegal to use amorphous panels given the very negative experience with that technology in West Africa. It is therefore considered more prudent to maintain figures that reflect regional rather than international and even African experience.