

**AFRICAN DEVELOPMENT BANK GROUP**



**OPERATIONS EVALUATION DEPARTMENT (OPEV)**

**BENIN**

**PROJECT FOR THE ELECTRIFICATION OF 17 RURAL  
CENTRES**

**PROJECT PERFORMANCE EVALUATION REPORT (PPER)**

**PROJECT/PROGRAMME EVALUATION DIVISION (OPEV.1)**

**MAY 2011**

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## CURRENCY EQUIVALENTS AND ABBREVIATIONS

Currency Unit	CURRENCY EQUIVALENTS		
	April 2000 (at Appraisal)	November 2005 (at Completion)	December 2009 (retrospective evaluation)
UA 1	XOF (CFAF) 904.374	XOF (CFAF) 788.808	XOF (CFAF) 703.061
UA 1	USD 1.3604	USD 1.4458	USD 1.6102
UA 1	-	EUR 1.20253	EUR 1.07181
UA 1	FRF 9.04374	-	-
EUR 1		XOF (CFAF) 655.957	XOF (CFAF) 655.957
USD 1		XOF (CFAF) 545.586	XOF (CFAF) 436.635

### UNITS OF MEASUREMENT

1 km	=	1 kilometre	=	1,000 metres
1 km <sup>2</sup>	=	1 kilometre-square	=	1,000,000 m <sup>2</sup>
1 kV	=	1 kilovolt	=	1,000 Volts
1 VA	=	1 Volt-ampere		
1 kVA	=	1 Kilovolt ampere	=	1,000 VA
1 kW	=	1 Kilowatt	=	1,000 watts
1 MW	=	1 Megawatt	=	1,000 kW
1 kWh	=	1 Kilowatt-hour	=	1,000 WH
1 GWh	=	1 Giga-Watt-hour	=	1,000 MWh
1 TOE	=	Tonne of oil equivalent	=	1,000 KgOE
1 KTOE	=	Kilo TOE	=	1,000 TOE
1 MT	=	1 Metric Tonne		

### LIST OF ABBREVIATIONS

- ABERME = Agence Béninoise d'Electrification Rurale et de Maîtrise de l'Energie (Benin Rural Electrification and Energy Management Company)
- ADB = African Development Bank
- ADF = African Development Fund
- AFD = French Development Agency
- BD = Bidding Documents
- CEB = Communauté Electrique du Bénin (Benin Electric Power Company)
- CEET = Compagnie d'Energie Electrique du Togo (Togo Electric Power Company)
- CERD = Decentralized Rural Electrification Unit
- CFAF = CFA Franc
- CIDA = Canadian International Development Agency
- CIE = Compagnie Ivoirienne d'Electricité (Ivorian Electricity Company)
- DANIDA = Danish Cooperation Agency
- DP = Detailed Draft
- FNER = Fonds National d'Electrification Rurale (National Rural Electrification Fund)
- GDP = Gross Domestic Product
- GPA = Government Programme of Action
- GT = Gas Turbine
- HV = High Voltage

•	IACM	=	Manual Switch (Interrupteur à Commande Manuelle)
•	IACT	=	Low Voltage Switch (Interrupteur à coupure au Creux du de tension)
•	ICB	=	International Competitive Bidding
•	IDA	=	International Development Agency
•	IERR	=	Internal Economic Rate of Return
•	IFRR	=	Internal Financial Rate of Return
•	IMF	=	International Monetary Fund
•	IRR	=	Internal Rate of Return
•	LV	=	Low Voltage
•	MMEH	=	Ministry of Mines, Power and Water Resources
•	MV	=	Medium Voltage
•	NC	=	National Competitive Bidding
•	OBMINES	=	Office béninois des mines (Benin Mining Authority)
•	PIP	=	Public Investment Programme
•	PNDC	=	National Community Development Programme
•	RE	=	Rural Electrification
•	SBEE	=	Société Béninoise d'Énergie Électrique (Benin Electric Power Utility)
•	SME	=	Small- and Medium-Sized Enterprises
•	SONACOP	=	Société Nationale de Commercialisation des Produits Pétroliers (National Oil Products Marketing Company)
•	SYSCOA	=	West African Accounting System
•	TOE	=	Tonne of Oil Equivalent (Power unit of measurement)
•	UA	=	Unit of Account
•	UNDP	=	United Nations Development Programme
•	VRA	=	Volta River Authority
•	WAEMU	=	West African Economic and Monetary Union
•	WB	=	World Bank

## **FISCAL YEAR**

**1 January-31 December**

## PROJECT BASELINE DATA

### A. Preliminary Data

Country : Benin  
 Project : Electrification of 17 Rural Centres  
 Loan Number : 2100150000098  
 Borrower : Republic of Benin  
 Guarantor :  
 Beneficiary : Société Béninoise d'Énergie Électrique (SBEE)  
 Executing Agency : Société Béninoise d'Énergie Électrique (SBEE)

### B. Loan Data

Estimates	Actual	
Loan Amount (UA million) :	UA 4.8 million	UA 4.8 million
Service Charge	0.75%	0.75%
Commitment Charge	0.5%	0.5%
Repayment Period	40 years	40 years
Grace Period	10 years	10 years
Loan Approval Date :	20 June 2000	28 June 2000
Loan Signature Date :	July 2000	26 July 2000
Effectiveness Date :	December 2000	14 August 2001

### C. Project Data

#### Project Financing by Component

No.		Cost at Appraisal (in UA million)				Cost at Completion (in UA million)				Gap	
		ADF	Govt	SBEE	Total	ADF	Govt	SBEE	Total	Gap	%
A.	Extension of MV network and mixed lines	2.37	0.06	0.80	<b>3.23</b>	2.78		1.04	<b>3.82</b>	0.59	18.27%
B.	Transformer station	0.07	0.00	0.02	<b>0.09</b>	0.08		0.03	<b>0.12</b>	0.03	33.33%
C.	Extension of LV network and distribution	0.42	0.01	0.14	<b>0.57</b>	0.50		0.19	<b>0.69</b>	0.12	21.05%
D.	LV connections	0.70	0.01	0.23	<b>0.94</b>	0.84	0.21	0.32	<b>1.36</b>	0.42	44.68%
E.	Operating and customer management equipment	0.67	0.01	0.23	<b>0.91</b>	0.39		0.63	<b>1.02</b>	0.11	12.09%
F.	Design, works supervision and monitoring	0.51	0.01	0.17	<b>0.69</b>	0.18		0.08	<b>0.26</b>	-0.43	-62.32%
G.	External Audit	0.06	0.00	0.00	<b>0.06</b>	0.03			<b>0.03</b>	-0.03	-50.00%
<b>Total Project Cost</b>		<b>4.80</b>	<b>0.10</b>	<b>1.59</b>	<b>6.49</b>	<b>4.80</b>	<b>0.21</b>	<b>2.29</b>	<b>7.30</b>	0.81	12.48%

(UA 1 = CFAF 788.808, exchange rate as at November 2005)

**Financing Plan (Equivalents in UA million)**

Sources	Estimate at Appraisal (in UA million)				Actual Cost (in UA million)			
	Foreign Exchange	Local Currency	Total	%	Foreign Exchange	Local Currency	Total	%
<b>ADF</b>	3.18	1.62	4.80	73.96	3.82	0.98	4.80	65.75
<b>SBEE</b>	1.05	0.54	1.59	24.5	1.36	0.93	2.29	31.37
<b>Govt/Subscribers</b>	0.07	0.03	0.10	1.54	-	0.21	0.21	2.88
<b>Total</b>	4.30	2.19	6.49	100	5.18	2.12	7.30	100

EstimateActual

First disbursement date	January 2001	9 October 2002
Last disbursement date	31 December 2004	31 March 2006

**D. Implementation Performance Indicators**

Total Project Cost Overrun	:	+12.5%
Slippage on schedule	:	24 months
Slippage on entry into force	:	13 months
Slippage on last disbursement	:	15 months
Slippage on completion date	:	24 months
Number of extensions of the last disbursement date	:	2
Project implementation status	:	Completed

**Return**

Appraisal	Completion	Evaluation
Economic Rate of Return	10.14%	19%      13.6% and 25.9%
Financial Rate of Return	2.1%   12%	Negative ( <i>after factoring actual costs</i> )

**E. Missions**

Missions	Dates	No. of Persons	Composition	S/Days
Identification	-	-	-	-
Preparation	March – April 1998	2	Electro-Mechanical Engineer Financial Analyst	30
Appraisal	August – September 1998	2	Electro-Mechanical Engineer Financial Analyst	30
	12 – 19 March 2000	2	Electro-Mechanical Engineer Financial Analyst	14
Launching	December 2000	1	Electro-Mechanical Engineer	6
Supervisions	16-23 June 2001	1	Electro-Mechanical Engineer	7
	18-30 March 2002	1	Electro-Mechanical Engineer	12
	18 May – 1 June 2003	2	Electro-Mechanical Engineer Procurement Officer	18
	05 -20 March 2004	2	Electro-Mechanical Engineer IT Expert	30
	03 – 16 September 2004	1	Electro-Mechanical Engineer	14
	02 – 10 March 2005	1	Electro-Mechanical Engineer	8
Completion report	23 November – 09 December 2005	2	Electro-Mechanical Engineer Financial Analyst	30
Total number of missions		17		199
Number of supervision missions 2000-2005		6		
<b>Average supervision rate in 5 years</b>		<b>1.2</b>		

## F. Other Projects Financed by the Bank Group in the Sector

No.	Project	Approval Date	Amount Approved (UA 1000)	Net Amount (UA 1000)	Disbursement Rate (15 March 2010)	Status
1	Electricity (Initial Loan)	1974	1,600,000	1,600,000	100%	Completed
2	Electricity (Supplementary Loan)	1976	1,900,000	1,900,000	100%	Completed
3	Electrification Cement works	1978	5,000,000	4,999,999	100%	Completed
4	Water Supply and Electrification in Nine Districts	1982	8,289,468	8,289,468	100%	Completed
5	Study on Rural Electrification Programme	1997	700.000	700.000	100%	Completed
6	Electrification of 17 Rural Areas	2000	4.800.000	4.800.000	100%	Completed
7	Second Rural Electrification Project	2003	12.320.000	12.320.000	83.68%	Underway
	<b>TOTAL</b>	-	<b>34,609,468</b>	<b>34,609,467</b>	<b>94.19%</b>	-

## SCORE SUMMARY

No.	Appraisal Criteria	PCR	PPER	Remarks
1	Relevance and Quality at Entry	4	3	The project is relevant because it ties with the country's socio-economic development policy, which fosters the opening up of rural areas, particularly by supplying electric power to, and improving the living conditions of, the population. Furthermore, it complies with the Bank's strategy for Benin, which aims at reducing rural poverty and consolidating sustainable development. It meets the real needs of most rural dwellers who have no access to electricity. However, due to some technical choices made with respect to the 20 KV voltage grid instead of the 30-35 KV voltage grid which is more appropriate for rural areas, failure to take account of single-phase power supply for small localities, and in the absence of attendant measures to maximize the indirect impact of electrification, the project has appropriately met the expectations of the rural population, albeit partly. This reduced quality at entry. In all, project relevance and quality at entry are deemed satisfactory.
2	Effectiveness	4	3	Despite delays ensuing essentially from excessive red tape in fulfilling the conditions precedent to effectiveness of the loan agreement and in the procurement process, as well as delays by SBEE to effect electricity connection, the project achieved its objectives in terms of the number of subscribers. Furthermore, the project's impact on development of economic activities and improvement of living conditions is noticeable and acknowledged by the beneficiaries. However, such impact could be heightened by stepping up the rate of connection and use of electricity in electrified rural centres. With regard to service quality, beneficiaries, like many other users, are complaining of excessive power outages and inefficient collection services. Overall, project effectiveness is deemed satisfactory.
3	Efficiency	3	2	As with most rural electrification projects that require arrangements involving increased public funding, the project's financial return is low, with an attendant negative internal financial return ensuing from the fact that at appraisal, the kWh price at which SBEE sold to its customers was lower than the cost price. The project's economic return is deemed satisfactory. However, the supply of electricity to more households is likely to further consolidate financial and economic returns. During implementation, the project was less efficient in time management. Total project cost increased by 12% following the electrification of 11 additional rural centres. The project was implemented 24 months behind schedule. Overall, project efficiency is deemed unsatisfactory.
4	Institutional Impact	3	3	By incorporating the establishment of a National Rural Electrification Fund (FNER) aimed at fostering the development of rural electrification, the project will help to put in place far-reaching institutional reforms, even though this contribution might fall short of boosting extensive rural electrification. At the time of project completion, the FNER was still not operational. The project had a positive impact on works supervision, control and oversight by SBEE, but not on its customer management system or sector planning capacity. The institutional framework of the energy sector was funded by a World Bank project, which improved the institutional mechanism by attaching the Implementation Unit to the General Directorate of SBEE for greater efficiency. This mechanism is particularly beneficial to the Bank's subsequent project. The project's impact on institutional development is satisfactory.
5	Sustainability	3	2	The quality of technical infrastructure is satisfactory. The infrastructure integrated seamlessly into the existing network. However, SBEE's precarious financial situation, its lack of logistic resources and

				difficulties that low-income communities face in maintaining street lights undermine the sustainability of outcomes. The noteworthy involvement and support of local authorities and elected officials have not translated into appropriate instruments and resources. Street lighting, which is considered the electricity of the poorest, is deteriorating by the day in some localities. Consequently, sustainability is deemed unsatisfactory.
6	Overall Performance	3.03	3	The implementation of the network component of the project, although belated, is satisfactory. The development outcomes in terms of access or the improvement of the living conditions of the population are satisfactory, even though they could have been further sustained. However, sustainability is affected by maintenance problems arising from SBEE's financial difficulties and those of city councils and districts. While it is true that the development potential offered by the project has not been fully harnessed, it is worth mentioning also that overall project performance is deemed satisfactory.
7	Borrower Performance	3.2	2	The project was properly prepared. The lack of a master plan encompassing a clear vision for the rural electrification policy and the lack of willingness by SBEE to execute connection works have delayed the attainment of outcomes. The Borrower was contented with the network component and failed to foster the implementation of attendant measures that would help to maximize the indirect impact of the project and guarantee the sustainability of outcomes. Project implementation by the Borrower was marked by excessive red tape in fulfilling the conditions precedent to effectiveness of the loan agreement and in the public procurement process. The State has embarked on reforms of the electric power system that is conducive to the development of the sector, even though their practical implementation remains problematic. In all, Borrower performance is deemed unsatisfactory.
8	Bank Performance	3.5	3	At the identification stage, the Bank, upon receiving the financing request, asked that the feasibility study conducted by the Government be supplemented by a study aimed at quantifying the project's social and economic benefits. The preparation phase revealed that the project met a real need of the rural population, with appropriate support from the Bank. The project's network-related components were properly appraised, while operational and financial supervision missions contributed to identifying implementation weaknesses and ways to mitigate the adverse impact, even though the missions could not avert delays in project implementation. Overall, Bank performance is deemed satisfactory.

## EVALUATION SUMMARY

### 1. The Project

1.1. The Project Performance Evaluation Report (PPER) under consideration concerns the Project for the Electrification of Seventeen (17) Rural Centres. It ties with the implementation of the Rural Electrification Programme contained in various development plans formulated by the Beninese Government for several decades. The set objectives are as follows: electrification of all district headquarters (sub-prefectures) and increase in the country's electrification rate, with a view to reducing poverty and fostering growth. The localities concerned initially covered five (5) provinces (now 7 provinces following the recent administrative review). Prior to its approval, the project underwent several appraisal missions which concluded that although it was economically cost-effective, its financial return remained low.

1.2. The project consisted in the construction of a distribution network comprising MV (20kV) lines, MV/LV transformer sub-stations, LV networks, street lighting networks and customer supply connections. Furthermore, it comprised the procurement of operating and customer management equipment, and the services of an engineering consultant and an audit firm.

### 2. Evaluation Methodology

2.1. The evaluation was conducted in three phases: (i) information gathering at the Bank's headquarters; (ii) mission fielded in Benin for data collection, exchanges and discussions with local electricity sub-sector officials, and particularly those of SBEE, and field trips to some electrified centres; and (iii) data analysis that led to the preparation of the final report.

2.2. In the absence of rigorous impact assessment, the appraisal of the project's impact on beneficiaries was based essentially on the outcomes of: (i) meetings and exchanges with administrative authorities and local elected officials; and (ii) group discussions, bringing together beneficiary and non-beneficiary segments of the population. Hence, eight group discussions were organized separately with: housewives, family heads, local elected officials, public servants (education, health, agriculture and administration), craftsmen and tertiary sector customers, and lastly citizens residing in the non-electrified section of a partially electrified locality. The information gathered was supplemented by the outcomes of proceedings conducted by other rural electrification stakeholders in Benin and elsewhere such as GTZ, World Bank and AFD.

### 3. Implementation Performance

Project implementation was marked by financial management that fell short of the requirements in force. The audit report reveals that the absence of an administrative, financial and accounting procedures manual within the PIU did not encourage sound and efficient management of project activities. Appropriate changes were made to the project, notwithstanding the persistent bottlenecks at all levels of the public procurement process, a difficult institutional framework saddled with red tape and a management wherein most duties were entrusted to the Project Coordinator. SBEE did not grant the Project

Implementation Unit the needed autonomy to operate and manage the project. Project implementation performance is deemed unsatisfactory.

#### **4. Performance Score and Appraisal**

4.1. Relevance and Quality at Entry: Rural electrification, as a means of curbing poverty and as a vector of economic growth, has been part of the priorities of successive Governments of Benin. The Bank considers that the building of electricity infrastructure is central to fostering strong, sustainable and equitable growth, and providing quality basic social services. Network electrification has a development potential that makes it a choice instrument for speeding up the socio-economic development of a country or region. In spite of its relevance, project quality at entry is deemed unsatisfactory. Due to certain technical choices, especially the voltage level, which were not necessarily the most appropriate, the project part - but suitably met - the needs of the low-income local population. While it is true that the project did not incorporate the need for attendant measures that could help to maximize the indirect impact of rural electrification, the project's relevance is deemed satisfactory.

4.2. Effectiveness: Physical output estimates were exceeded following the electrification of additional localities that were not scheduled, but whose technical quality generally complied with the relevant industry standards. However, delays were registered in connecting beneficiaries to the network due to problems besetting SBEE, whose network connection cost is deemed prohibitive. The project had no impact on the quality of SBEE's commercial department. The appropriate equipment provided for by the project was procured; however, the IT applications, which are not part of the project, have not yet been deployed.

4.3. Specific objectives to improve access to electricity were achieved with some delay. The number of domestic subscribers expected in 2005 could only be attained in 2009, i.e. a 4-year delay (including the 24-month delay registered as a result of red tape). The presence of tertiary sector customers demonstrates the project's incentive effect on the development of economic activities. The magnitude of such effect varies by locality. Overall, there has been no significant increase in the number of both domestic and tertiary customers, in the absence of attendant measures (such as the development of financial services, vocational training courses, sensitization campaigns on the advantages of electrical appliances, token subscription fees for primary and secondary schools, etc.) aimed at promoting access to electricity and fostering the development of economic activities.

4.4. Although not easily quantifiable, the objectives to improve the living conditions of the population in the project areas have been achieved somewhat, according to beneficiaries met during group discussions. For them, the project's impact on education, health care access, women's empowerment and environmental protection is obvious. They could have been the more so if, among other things, rural electrification had been attended by an information campaign on the benefits of household electrical appliances and the appropriate use of electricity by families.

4.5. The low level of connection and use of electricity reveals the under-utilization of the development potential provided by the project. The project adopted a passive attitude by assuming that it would spontaneously generate a positive impact on the rural environment. With respect to service quality, users are reporting excessive power outages and inefficient collection services. Project effectiveness is deemed satisfactory in the short and medium term, but much less so in the long term. The project's impact on the living conditions of the

population, albeit obvious, still falls short of playing a catalytic role in the development of the localities concerned and contributing significantly to reducing poverty in such areas. In fact, project effectiveness is satisfactory on the whole, but could be further sustained by improving electricity connections and use in the electrified areas, and by adopting attendant measures aimed at speeding up the use of electric power.

4.6. Efficiency: The project's financial return is low, with an attendant negative internal financial return ensuing from the fact that at appraisal, the kWh price at which SBEE sold to its customers was lower than the cost price. Such low financial return is characteristic of rural electrification projects that require financial arrangements involving increased public funding. The project's economic rate of return was estimated at 10.14% at appraisal and 19% at completion. Given the consumption pattern observed in some of the electrified localities and the outcome of the sensitivity analysis, these rates, when recalculated, stand at between 8% and 14% if only factor cost savings are considered, and at 18% and 26% should economic surpluses generated by project-induced economic activities be taken into account. The domestic connection cost, which is not affordable to the target rural population, has led to clandestine connections to the network and low collection rates of outstanding electricity bills, thereby adversely affecting project efficiency. The final project cost increased by 12.17% following the electrification of 11 additional localities as a result of economies of scale. Hence, the number of electrified localities increased from 17 to 28, with its attendant additional delays. Project implementation experienced a 24-month delay on the whole, with respect to estimates. Overall, project efficiency is deemed unsatisfactory.

4.7. Impact on institutional development: The institutional framework of the energy sector was funded by a World Bank project. Even though it was not part of the project outcomes, the executing agency (at the time responsible for electricity and water distribution), was split into two distinct entities during project implementation, with one responsible for water and the other for electricity. Furthermore, the establishment of *Agence Béninoise de d'Electrification Rurale et de Maitrise d'Energie* (Benin Rural Electrification and Energy Management Agency) (ABERME) is effective, whereas the privatization of the "electricity" operator is still on-going. However, by tying the first disbursement to a Beninese Government commitment to establish the National Rural Electrification Fund (FNER) aimed at fostering the development of rural electrification, the project will help to put in place far-reaching institutional reforms, even though this contribution might fall short of boosting extensive rural electrification. At the time of project completion, the FNER was still not operational. The project had a positive impact on works supervision, control and oversight by SBEE, but not on its sector planning capacity. This undermined the optimal selection of localities to be electrified and the appropriate technical and technological options. The project did not have an impact on SBEE's customer management system. The project improved the institutional mechanism by attaching the Implementation Unit to the General Directorate of SBEE for greater efficiency. In addition, it helped to improve SBEE's works supervision, control and oversight capacity. The project contributed to improving the institutional mechanism by attaching the Implementation Unit to the General Directorate of SBEE for enhanced effectiveness. This mechanism is particularly beneficial to the on-going Second Rural Electrification Project financed by the Bank in Benin.

4.8. Sustainability: The implementation of the MV lines, LV lines and MV/LV substation components of the project have become part of SBEE assets (SBEE is the operator responsible for operating this type of network). SBEE's financial situation and its maintenance problems adversely affect the sustainability of project outcomes. For instance, the shortage of connection equipment to replace the one procured under the project is the

cause of implementation delays reported in the areas visited. Stock shortages are not limited to connection equipment, but also concern a large number of distribution equipment.

4.9 SBEE is responsible for street lighting. This provision prohibits the local authorities from intervening directly on lamps and obliges them to have maintenance and repair works executed by SBEE. The preservation and operating maintenance of these public lighting networks depend on the resources of local authorities, which vary from one locality to another. For low-resource local district authorities, the risk of losing lamps for want of maintenance and/or default in the payment of electricity bills is perceptible. In spite of the willingness of the authorities and local elected officials to support the project, it has not been translated into effective support and appropriate resources. In all, the sustainability of project outcomes is problematic and hence unsatisfactory.

## **5. Conclusions and Appraisal Scores**

5.1 The project ties with Benin's socio-economic development policy, which promotes the opening up of rural areas, particularly by supplying electric power to, and improving the living conditions of, the population. It meets the real needs of most rural dwellers who have no access to modern sources of power such as electricity. Given the available development potential, the project constitutes a choice instrument for the Bank and the country for curbing poverty and providing impetus to the socio-economic development of the localities and surrounding areas concerned.

5.2 Due to certain technical choices that are not necessarily the most appropriate, the project partly - but suitably - met the needs of the low-income rural population. In fact, the choice of the 30-35 kV voltage grid which is more appropriate for rural areas, instead of the 20 kV voltage grid widely used by the project, would have been better. In addition, the project did not envisage the supply of single-phase MV power lines for small areas with predictably low economic development. This would have lowered the investment cost per domestic customer and speeded up their electrification.

5.3 While it is true that project outputs and their quality are deemed satisfactory, it should also be underscored that improved access to electricity for the population of electrified rural centres, albeit satisfactory, could be further sustained. This relative under-utilization of the development potential provided by the project is due essentially to: (i) the late start of connection works executed under public contracts by SBEE; (ii) SBEE's difficulties in coping with subscription applications, such that several applicant customers who had paid for new connections, wait for their metres for several months; (iii) connection costs not affordable to the rural population; and (iv) billing procedures.

5.4 Group discussions with key beneficiaries have revealed that electrification has had a positive impact on all areas of rural life and has contributed to improving the living conditions of the population of electrified rural centres. Such impact may be further sustained by increasing the rate of connection to the electricity network, both for domestic and tertiary sector customers, as well as enhancing the utilization of electricity for productive activities. The project's impact on the living conditions of the population still falls short of playing a catalytic role in developing the localities concerned and contributing significantly to reducing poverty in such areas.

5.5 Hence, evaluation confirms the need to plan rural electrification simultaneously with attendant measures, thereby maximizing its indirect impact. The sustainability of project

outcomes is unsatisfactory due to difficulties facing SBEE and low-income communes with respect to street lighting. In light of all appraisal criteria, overall project performance is deemed satisfactory.

## **6. Key Lessons and Recommendations**

### **6.1. Key Lessons.**

6.1.1. Real political willingness translated by the funding of rural electrification underlies the successful implementation of this type of project, which helps to meet the need for maintaining socio-political equilibria and ensuring balanced development nationwide.

6.1.2. Rural electrification can only be effective when attended by measures that help to improve access to, and use of electricity, with a view to boosting local social and economic development.

6.1.3. The productive utilization of electricity that helps to maximize its impact, requires actions that will likely improve the utilization and knowledge of the benefits of electrical appliances, and provide small businesses with the financial resources to procure electrical tools.

6.1.4. The choice of a 30-35 kV voltage grid and single-phase MV power lines for small areas with predictably low economic development is more conducive to reducing the investment cost per domestic customer and speeding up their electrification.

6.1.5. The control of clandestine electrical connections can be achieved through collective electricity metres and pre-paid meters, and especially through the extension of networks to enable a greater number of households to have access to electricity.

6.1.6. Rural electrification through the network or a small power station is considerably more advantageous than other alternative solutions, particularly standalone systems such as photovoltaic systems, and helps to increase the development impact associated with this type of project.

### **6.2. Key Recommendations**

#### **For the Government:**

- a. *Formulation of a Rural Electrification Master Plan:* The Government should formulate an Electrification Master Plan for the country, which is indispensable in establishing criteria for selecting localities, prioritizing and programming rural electrification projects.
- b. *Impact Maximization:* The Government should maximize the indirect impact of electrification by improving its utilization, quantitative and qualitative accessibility, with a view to boosting all economic and social development sectors and human activities geared towards improving the living conditions of the rural population. ABERME could ensure impact maximization by adopting the following attendant measures:

- c. *Financing of Investment Costs by the State:* The Government should defray investment costs related to the development of rural electrification under FNER or as part of other capital investment grants to SBEE.
- d. *Financing of Recurrent Electrification Costs:* The Government should envisage appropriate recurrent cost-sharing between the various partners (national authorities and public operators) under rural electrification projects. To that end, the Government should conduct a study to identify the method of financing recurrent electrification costs in low-income local district authorities.
- e. *Attendant Measures:* The impetus to create economic activities in some localities may be further sustained by adopting attendant measures that will help to make the best of the potential offered by the project, for instance the development of micro-finance services to enable small businesses to procure electrical machines and tools, vocational training services, sensitization campaigns focused on the benefits of electrical appliances with a view to increasing knowledge on the use of electrical machines, making subscription fees affordable to users, etc. These approaches should undergo prior small-scale testing.
- f. *Containing the Development of Clandestine Networks (cobwebs).* There are several possible solutions such as the one allowing families in the short term to get organized to manage a collective meter, or to use the meter belonging to one of the families to have access to the network without extra cost. In this case, SBEE may, in areas serviced by an MV network, delegate the installation and/or management of mini-electricity distribution systems to either private-owned companies or groups of users, without running any financial or technical risk. Other more effective actions involve: (i) initiating network extension projects with a view to enabling a greater number of households to have access to electricity and thereafter prohibiting the establishment of “cobwebs”; and (ii) proposing solutions anchored on the use of pre-paid meters. This cobweb phenomenon is naturally doomed to vanish in the medium term.

#### **For SBEE**

- a. *Securing a Return on Investments:* SBEE should at all cost secure a return on the investments made, by: (i) connecting as many subscribers as possible to the existing networks; (ii) improving the quality of electricity provided; (iii) adapting the tariff structure; and (iv) improving maintenance and collection services.
- b. *Making Appropriate Technical Choices:* SBEE should adopt the 30-35 kV voltage grid which is more suitable for rural areas than the 20 kV voltage grid, and provide for single-phase MV power lines for small localities with predictably low economic development, in a bid to lower the investment cost per domestic customer and speed up their electrification.

**For the Bank**

- i. *Improving Output Quality:* The Bank should not encourage the execution of connection works on force account by the national electricity distribution company, in view of works execution timeframes and the cost implications. An alternative would be to encourage outsourcing and development of sub-contracting SMEs.
- ii. *Impact Assessment:* The Bank should lay more emphasis on the monitoring/evaluation of the most significant outcomes and impact of rural electrification and improvement of the living conditions of the populations, by combining participatory evaluation methods with socio-economic impact surveys. Such monitoring/evaluation should be conducted during the entire project cycle and beyond.
- iii. *Attendant Measures:* The Bank should include support for the implementation of attendant measures in its rural electrification projects, with a view to maximizing the development outcomes of rural electrification projects (sensitization, education, vocational training and establishment of microcredit).
- iv. *Equality among Components:* Equal attention should be paid to different project components at appraisal and implementation. The data processing component envisaged to strengthen SBEE's customer management system was not properly assessed and implemented. The Bank should ensure that the composition of the appraisal team matches the project profile.

## I. THE PROJECT

### 1.1 National Economic and Sector Context

1.1.1 In the late 70s and early 80s, the economy of Benin was marked by State control of the key sectors. This policy led to a serious imbalance in State accounts. The ensuing financial crisis quickly paralysed the entire banking system. In the face of mounting social upheavals, a major policy shift was engineered to usher in economic liberalization to the country.

1.1.2 Starting in the 70s, the Beninese Government listed the electrification of the country's 77 localities (Sub-prefectures) among the priority actions in various social development plans. From 1989, several Structural Adjustment Programmes (SAPs) were implemented. The initial programmes focused essentially on the stabilization and streamlining of the economy. The social dimension was incorporated a few years later. In 1996, Benin adopted the Population Policy Declaration (DEPOLIPO) for 15 years, which incorporated the social dimensions of development. Similarly, studies on long-term development prospects led to the formulation of Benin's National Strategic Vision 2020. The Declaration and Vision serve as baseline for formulating various development plans and strategies. These development guidelines were buttressed by the country's democratic achievements. Since 1990, Benin embarked on a particularly stable democratization process with the organization of presidential, legislative and municipal elections.

1.1.3 As with most African countries, Benin embarked on the formulation and implementation of programmes compliant with the Millennium Development Goals. To achieve these goals, the country acknowledged the need to improve its energy services. In Benin, three public stakeholders operate in the electricity sub-sector (production and distribution), namely: *Communauté Electrique du Bénin* (CEB), *Société Béninoise d'Énergie Electrique* (SBEE) and *Agence Béninoise d'Électrification Rurale et de Maîtrise d'Énergie* (ABERME).

1.1.4 *Communauté Electrique du Bénin* (CEB), a multinational public corporation, is governed by the Benin-Togo Electricity Code born of the bilateral agreement between Togo and Benin to create a common interest community between both States in the area of electric energy. CEB had monopoly over the development, implementation and operation of electric power production and distribution installations in both countries. The revision of the Benin-Togo Electricity Code in August 2006 ended the CEB monopoly over electricity production, thereby opening the electricity production and distribution segments to private operators. However, with respect to commercial electric power, CEB remains the sole buyer of production (except in regions not serviced by CEB, where SBEE plays such a role). CEB can no longer meet current electricity needs, due essentially to poor hydraulicity in the Akossombo and Nangbeto dams, and delays in the construction of interconnections.

1.1.5 At appraisal, SBEE was designated as the project executing agency. A public industrial and commercial entity established in 1973, SBEE's objective was to import, produce, transport and distribute electric power in Benin, harness, purify and distribute drinking water, as well as oversee the drainage of waste water. SBEE is placed under the supervisory authority of the Ministry of Energy and enjoys management autonomy. However, key issues such as the setting of prices and significant investments fall within government's jurisdiction and are decided by the Council of Ministers.

1.1.6 In January 2004, the institutional reform of the energy sector led to the separation of water supply management from electricity supply activities, thereby entailing the establishment of *Société Béninoise d'Énergie Électrique* (SBEE) and *Société Nationale des Eaux du Bénin* (SONEB). Furthermore, the concession for SBEE did not materialize.

1.1.7 The *Agence Béninoise d'Électrification Rurale et de Maîtrise d'Énergie* (ABERME) was established in 2004 by Decree No. 2004-151 of 29 March 2004 with mission to implement State policy as regards rural electrification and energy management. It took into account the achievements of the former Pre-electrification and Solar Programme Coordination Unit (CCPS) which, established in 1995, helped to electrify about 10 localities using the solar system and electricity generators.

1.1.8 In Benin, similar to most poor countries, biomass energy (fuel wood and charcoal) is the dominant energy consumption option, followed by oil products and, to a lesser extent, electricity. The final energy consumption pattern in households in 2004 (1.37 million TOE) revealed the relative significance of biomass energy in domestic energy consumption, with biomass energy accounting for 78.91%; oil for 18.99%; electricity for 1.41% and butane gas for 0.69%. The household sector is the largest energy consumer in Benin (63% of total energy consumption in 2004, against 23% for the transport sector, 11% for the services sector and 3% for industry)<sup>1</sup>.

1.1.9 The Bank Group has been in Benin since 1972. As at end 2007, the number of operations in Benin totalled 79, 53 of which have been completed. The total amount of net commitments for approved projects amounted to UA 506.7 million. In the energy sector, the Bank's involvement dates back to 1974. Taking the Cement Works Electrification Project (October 1978) into account, its commitment in the sector exceeds UA 34 million for seven operations. The Project for the Electrification of 17 Rural Centres is the sixth to be approved in the sector (in chronological order). The seventh project (Electrification of 57 Localities) is underway. This testifies to the continuity of Bank action.

## 1.2 Project Formulation

1.2.1 The Project for the Electrification of 17 Rural Centres was initiated in 1995, with the implementation of a feasibility study financed by the Canadian International Development Agency (CIDA). At the Bank's request, this study was updated end-1997 with SBEE's own funds. Consideration of the request for financing presented by the Beninese Government began in 1998 and culminated in the signing of a loan agreement of UA 4.8 million in July 2000 between the African Development Fund and the Republic of Benin.

1.2.2 The 1996 feasibility study was carried out simultaneously with another study ("Electric Energy Production, Transport and Distribution Master Plan – Objective 2012"). Both independent studies were conducted by two Canadian firms: Berocan International for the Study for the 17 centres, and SNC-LAVALIN for the Master Plan. The former received CIDA funding whereas the latter was financed by IDA.

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<sup>1</sup> "Energy Trend Chart in Benin 2004", Final Report, Ministry of Mines, Energy and Hydraulic Resources, General Directorate of Energy, Cotonou, October 2005.

1.2.3 The study on the 17 centres dwells particularly on the technical and economic comparison of two means of electricity supply to the centres: diesel thermal plants and interconnection to the grid. The 17 localities concerned were on an initial list whose content changed throughout the project implementation cycle.

1.2.4 With respect to distribution, the Master Plan set out to present the technical and economic criteria for grid planning. It contained two key recommendations: (i) the rationale for considering a voltage above 20 kV for rural networks (30 kV is mentioned); and (ii) the rationale for considering the introduction of single-phase medium voltage distribution (North American type).

1.2.5 Project content has undergone several changes. Throughout the project's life cycle, some localities were added to the project while others were withdrawn, depending on changes in socio-economic requirements. In 2000, the final list was adopted, comprising 10 centres which had been part of the initial feasibility study financed by CIDA, and 7 new centres. The project concerned the electrification of 17 localities distributed in five provinces of the country. With the recent administrative review, these localities will now be distributed among seven provinces (see Annex 12).

1.2.6 The project took advantage of the tradition of consultation, instituted in the country since the advent of democratization. This "participatory approach", enabled the Bank and SBEE to be abreast of the implementation conditions of previous projects and the experience of other donors. All organs concerned by the project (administrative authorities, beneficiaries, donors, etc.) were consulted. This approach accounts for the massive adherence of the population concerned. They were encouraged by SBEE's decision to reduce the rural individual connection cost during project start-up. Hence, in several localities, several customers spontaneously paid up connection fees several months prior to grid construction.

### **1.3 Objectives and Scope at Appraisal**

1.3.1 The specific project objectives were to: (i) improve access to electricity for the population of the 17 rural centres; and (ii) improve SBEE's operating and customer management system. In terms of outcomes, improvements were expected at the level of: (i) access to electricity; (ii) domestic use, collective use (schools, dispensaries or street lighting) and productive use; and (iii) living conditions of the beneficiary population (see the Logical Intervention Format in Annex 8).

1.3.2 The project comprises the following components: (i) extension of the 20 kV medium voltage (MV) grid; (ii) equipping the MV/LV transformer sub-station; (iii) extension of the LV distribution grid; (iv) street lamp connection and installation; (v) procurement of customer operating and management equipment<sup>2</sup>; (vi) works studies, control and supervision; and (vii) external audit.

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<sup>2</sup> This component comprises technical equipment for operating the network and computer hardware. The computer hardware is part of a wider IT project comprising two batches: (i) a "hardware and software" batch, including an "integrated management" function and a "customer management" function; (ii) and a cabling and interconnection batch for some regional sites. The Bank loan only covers the "hardware" portion of the first batch.

## 1.4 Financial Arrangements

At appraisal, project cost estimate exclusive of taxes stood at UA 6.49 million. It was expected that the ADF would fund the project to the tune of UA 4.8 million (73.96%), SBEE for UA 1.59 million (24.5%) and the Government and customers for UA 0.10 million (1.54%). At project completion, the final cost stood at UA 7.3 million. The ADF loan amount remained unchanged and was completely used.

## II. EVALUATION

### 2.1 Evaluation Methodology and Approach

2.1.1 The adopted methodology essentially comprises the following: (i) collection and analysis of documents available at the Bank and with various sector operators met during the field mission; (ii) discussions with Bank experts who managed the project with local sub-sector officials, particularly those of the Project Monitoring Unit of the executing agency; (iii) exchanges with key project beneficiaries to assess the project's impact on the living conditions of the population and economic activity; (iv) trip to some of the installations built in different areas of the country; and (v) operation and restoration of customer management files provided by SBEE in some project areas.

2.1.2 Site visits<sup>3</sup> enabled: (i) awareness of project specificities from the technical standpoint and the quality of built installations; and (ii) the organization of exchange sessions with project beneficiaries in the localities visited. The information obtained during these sessions helped to assess the impact of electrification on the population concerned, while gathering opinion on the project since its inception. The information was supplemented by the outcome of rural electrification works executed by other stakeholders in Benin and elsewhere such as GTZ, World Bank and AFD. The Evaluation Matrix is presented in Annex 13.

### 2.2 Availability and Use of Baseline Data and Key Outcome Indicators

2.2.1 Indicators adopted during appraisal are as follows: (i) number of localities to be electrified; (ii) number of households and street lights connected by 2005; and (iii) the country's rural electrification rate in 2006, which stood at 51%.

2.2.2 These indicators only deal with improving access to electricity which is the key output of an electrification project. From the standpoint of physical achievements, the project did define indicators in terms of quantities of various types of infrastructure to be built, i.e. the lengths of MV, LV and mixed voltage networks, the number of street lights and the number of connections. The "customer operating and management equipment" component, which accounts for 14% of the project cost, was not entirely specified in the appraisal report.

2.2.3 The review of objectives and identification of expected outcomes raised challenges regarding the measurement of intermediate and long-term impact. The weakness of the monitoring/evaluation system considerably affects the use of baseline data and key outcome

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<sup>3</sup> The following localities were visited: Don-Tan, Banté, Agoua, Séhoué, Sékou, Aguégué, and Bonou. The choice of these localities was made in agreement with SBEE, using the following criteria (size of the locality, main activity, remoteness, etc.). Some specific areas such as flood-prone areas were taken into account. In addition, a non-electrified locality, very close to another electrified locality, was also selected.

indicators. The appraisal team gathered data on the numbers and characteristics of various categories of applicant customers, and used qualitative methods to assess the impact of electrification in various aspects of rural life.

2.2.4 In the absence of a monitoring/evaluation system, the needs of and possible impact on the end beneficiaries were not analysed during appraisal or in the course of project implementation. A socio-economic impact survey was not possible at appraisal. The customer management system which should have been operational at project closure could have been useful for a thorough appraisal.

2.2.5 The Logical Framework Matrix at appraisal (presented in Annex 9), is based on the logical framework of the completion report. It was filled in in light of prioritization of objectives and specification of expected outcomes.

### **III. IMPLEMENTATION PERFORMANCE**

#### **3.1 Compliance with Implementation Schedule and Costs**

3.1.1 The loan entered into force on 1 September 2001, i.e. 13 months after the signing of the loan agreement and 7 months after the maximum timeframe stipulated by Bank rules. The overall implementation timeframe starting from the signing of the loan agreement increased from 36 to 60 months, i.e. a 24-month gap. This lateness is due essentially to: (i) excessive delay in ratification of the loan agreement by the National Assembly; (ii) procurement delays due to inadequate compliance with relevant Bank rules and procedures; and (iii) the Bank's tardiness in notifying its decisions on submitted dossiers, particularly following its relocation to Tunis.

3.1.2 During implementation, some additional works that were not included in the initial contract were deemed necessary. These works were the subject of two amendments to the main contract and were approved by the Bank. The ensuing additional amount stands at 18.27% of the main contract amount. The first contract amendment is related to the change of the section of the Parakou-N'Dali line from a 75.5 mm<sup>2</sup> cable to a 148.1 mm<sup>2</sup> cable. CEB plans to use this line as a main line for major power transit from its HV grid that will facilitate the North Benin/North Togo interconnection. The second amendment defrays costs corresponding to the following additional services: (i) digging of special foundations needed for lines crossing certain areas prone to flooding; (ii) redesign of (poles and conductive) lines situated in the Aguégues lakeside area; and (iii) installation of additional poles to phase out "long distance" lines. The total project cost increased by 12% on completion.

#### **3.2 Project Management, Transmission of Reports, Monitoring/Evaluation**

3.2.1 Members of the Project Implementation Unit set up a few months after the signing of the loan agreement did not all quit the positions they held prior to their secondment, and thus did not devote themselves fully to the project. Successive supervision missions and reminders helped to significantly improve the situation with respect to the availability and quality of Unit members.

3.2.2 The transmission of quarterly progress reports to the Bank began only during the second half of the implementation period. Furthermore, the Project Management Unit did not keep an account exclusive to the project. The accounting entries of operations relating to

project activities were recorded under “loans” in SBEE’s financial statements. The Project Implementation Unit was plagued by chronic lack of logistic resources, particularly for transportation. Hence, the control of grid construction works by SBEE<sup>4</sup> could not keep pace with the execution of works, in spite of the procurement of two vehicles for the project under the electrification study. Connection delays had an adverse impact on the achievement of specific objectives at project closure.

### **3.3 Overall Implementation Performance**

3.3.1 Project implementation was marked by financial management not compliant with the requirements in force. Project audit for the period 01/01/2002 to 31/12/2004 revealed that the absence of an administrative, financial and accounting procedures manual in the PIU did not allow for efficient management of project activities, although this does not call into question the legality and sincerity of the operations of the period audited or the project’s financial situation and assets at the end of the fiscal year<sup>5</sup>.

3.3.2 Amendments made during project implementation were appropriate, given the inclusion of new localities, especially certain flood-prone areas and lakeside villages such as Aguégué, notwithstanding the ensuing delays registered in the execution of works. Generally, the entire public procurement process recorded delays, in a difficult institutional context characterized by red tape and a management system wherein most duties were performed by the Project Coordinator (albeit assisted by the engineering consultant). SBEE did not grant the Project Implementation Unit the autonomy needed to run and manage the project<sup>6</sup>. Overall, project implementation performance is deemed unsatisfactory.

## **IV. KEY EVALUATION FINDINGS AND PERFORMANCE SCORES**

### **4.1 Key Findings**

#### **a.) Relevance and Quality at Entry**

4.1.1 The project ties with the socio-economic development policy of the country, which promotes the opening-up of rural areas, particularly through electricity supply and improvement of the living conditions of the population. This policy is translated by the Rural Electrification Programme embarked on since the 1970s, i.e. prior to the economic liberalization. The Beninese Government’s set objective is to supply electricity to all district (“*commune*”) headquarters. The political changes experienced in Benin have not thwarted the country’s electrification effort. In the late 1980s, the initial three-year assistance programmes and strategies were based on economic stabilization and streamlining. It was in 1996 that the socio-economic aspects of development started to emerge with the adoption of DEPOLIPO.

<sup>4</sup> A consultant was recruited for works control and supervision, with a limited number of missions and duration. Consequently, SBEE should have ensured steady control of works execution.

<sup>5</sup> The audit report states that: “The absence of any clearly defined administrative, financial and accounting organization at the Project Monitoring and Implementation Unit did not help to enforce compliance with the procedures in force. These shortcomings may cause problems in the implementation and management of project activities. In fact, these different situations exposed the absence of control and supervision of human, financial and material resources”. In addition, it reports violations regarding the appropriation of resources by expenditure components as provided for in the loan agreement, thereby entailing very high risks of inadequate commitment of project funds. Lastly, it reveals the absence of regular transmission of works progress reports to the Bank (Chap.2 – points 1.1, 2.3 and 2.5)

<sup>6</sup> See paragraph 4.3.1 of the Project Completion Report (PCR)

4.1.2 The project is in line with the Bank's Country Strategy for the period (CSP 1999-2001). It meets a real need for most of the rural population with no access to electricity<sup>7</sup>. On account of the available development potential, the project should be a choice instrument for curbing poverty and providing impetus to the socio-economic development of the localities concerned. Project relevance is satisfactory.

4.1.3 However, evaluation findings show that as a result of certain poor technical choices, the project could not suitably meet the expectations of low-income rural populations. The choice of the 30-35 kV voltage grid which is more appropriate for rural areas, instead of the 20Kv voltage grid widely used by the project, would have been better. The project did not provide single-phase MV power lines for small localities with predictably low economic development, even though such a move would have lowered the investment cost per domestic customer and speeded up their electrification. Furthermore, the project did not include attendant measures that could allow for the rational utilization of the available development potential. This has had an adverse impact on the project's quality at entry. Overall, relevance and quality at entry are deemed satisfactory.

b.) Achievement of Objectives and Outcomes (Effectiveness)

4.1.4 **Attainment of Outputs**

- Physical Outputs and Quality

4.1.5 As concerns MV and LV lines, MV/LV transformer sub-stations and street lighting, all projected facilities were completely built and other additional facilities, procured to cope with unforeseen contingencies, were installed by SBEE teams to supply electricity to other localities. Hence, the project allowed for the electrification of several localities situated near the layout of the new grid, thereby increasing their number from 17 to 28 localities<sup>8</sup>. This unexpected increase in the number of localities shows the need to draw an inventory and map the localities to be electrified, with a view to achieving the goal of a national average electrification rate of about 60% in 2015, as set out in the programme of action for the electrification of rural localities adopted by the Government in March 2006. The need to set priorities suggests that rural electrification programmes should be implemented first and foremost in economically dynamic areas<sup>9</sup>. The implementation of these physical outputs may be considered satisfactory. The quality of facilities built under the main contract by the contractor is better in terms of finishing than the additional ones built by SBEE teams on force account<sup>10</sup>.

4.1.6 The customer management system was studied, appraised and financed by SBEE with own funds. However, the project provided support in procuring equipment amounting to CFAF 733 million, representing 14% of project cost, with a view to improving the system. With respect to its functionality, the outcomes obtained fell short of expectations. Project performance in terms of improving SBEE's customer management system is unsatisfactory.

<sup>7</sup> In Benin, the urban electrification rate in 2007 stood at 52.35% against 1.89% for the rural area. The rural electrification rate has not changed between 2005 and 2007.

<sup>8</sup> Pressure from the population who witnessed the installation of electricity in neighbouring localities obligated the Government and SBEE to making additional efforts by increasing their financial contributions, thereby enabling the electrification of additional localities with equipment procured under the project and to financing the additional works of the contractor.

<sup>9</sup> AFD, 2010, "Impact Assessment of Rural Electrification Programmes in Sub-Saharan Africa", Series: Ex Post Impact Analysis, Tanguy Bernard.

<sup>10</sup> This difference varies by locality. Hence, for instance, connections are executed with appropriate equipment by the contractor and with scrap cable mouldings for some other extensions.

4.1.7 Overall, the attainment of outputs as well as their quality is deemed satisfactory.

- Improving Access to Electricity

4.1.8 The utilization of SBEE statistics, available for 12 of the electrified localities which cover 72% of the 7000 households to be connected, helped to assess the increase over time in the number of new customers. Furthermore, the restoration of computer data covering a restricted sample of localities, provides information on the consumption trend for new customers during the early years following their connection.

4.1.9 *Supply of Domestic Customers:* The evaluation reveals that: (i) the rate of achievement of goals in terms of the number of households connected in 2005, stood at 44%; (ii) the target number of 7000 connected customers expected under the project was only reached in 2009 instead of 2005 as initially projected; and (iii) the customer increase rate, which is high during the early years following installation, decreases as time goes on due, among other things, to SBEE's difficulties in coping with demand. However, it is worth noting that these figures only concern customers supplied directly by SBEE with a conventional or prepaid meter. They do not take into account homes supplied through cobwebs<sup>11</sup>, whose development tends to be encouraged by SBEE's installation of meters in booths located a long way from the property of customers<sup>12</sup>. "Cobwebbing" is forbidden.

4.1.10 To sum up, the objective in terms of the number of domestic customers was not achieved within the expected timeframe. The project did not allow for a significant increase in access to electricity for the population of electrified rural centres. This situation is due to: (i) the belated start-up of connection works executed under public contract by SBEE; (ii) SBEE's difficulties in coping with subscription applications, such that several applicant customers who had paid for new connections, wait several months for their metres; (iii) connection costs not affordable to the rural population; and (iv) billing procedures that often lead to unintelligible bills.

4.1.11 In Benin, the cost of grid connection varies between CFAF 40 000 and CFAF 120 000, depending on the source of financing<sup>13</sup>. Under this project, SBEE reduced the individual rural connection cost over a limited period from CFAF 120 000 to CFAF 40 000. In addition, SBEE opted for an attractive tariff for the underprivileged. However, given that the average monthly income in rural areas stands at CFAF 65 000, connection costs are obviously still exorbitant for the rural population.

4.1.12 After the project became operational, a promotional tariff was instituted for the connection of customers within the project area. This operation lasted a few months. Thereafter, the common regulation was applied to all SBEE customers. Under such regulation, the customers who so requested were required to pay the connection cost combined with the total cost of facilities. Given the income level of most of the population of the localities concerned by the project, the implementation of this regulation led to unaffordable amounts. The same regulatory principle is applied whenever extensions require MV facilities. In such a case, the contributions required of customers are even higher.

<sup>11</sup> This term designates the "Low Voltage" grid built by customers on the public thoroughfare, under very poor technical conditions. The cables used are made up of small wires usually used in built-in installations. These electric wires, tied to trees or 3- to 4- metre tall poles, run across roads and private properties, and often get entangled. Most of the numerous splices on these wires are not insulated.

<sup>12</sup> SBEE's contribution to the development of cobwebs stems from the fact that some customers, located outside the low voltage area, were entitled to a meter installed in a booth built on the border of this area and pulled isolated cables to their homes, in violation of technical standards and specifications.

<sup>13</sup> Donors or "political projects" sponsor the regions to be electrified.

4.1.13 Although illegal, the commonplace practice of “cobweb” shows the population’s obvious need for access to electricity. This practice is developed in electrified localities to the detriment of both SBEE and the households involved, given the often exorbitant costs of such fraudulent connections and their attendant risks. With respect to quality, users deplore excessive power outages, routine load-shedding operations in Benin and inefficient collection services.

4.1.14 *Supply of Tertiary Sector Customers:* In the absence of available data on all localities electrified under the project, appraisal was based the analysis of the following two tables: Table 1 shows the trend in the number of LV tertiary sector customers in three localities of Atlantique Department. Table 2 refers to the Trend in the Number of Three-Phase Power Subscribers (4 cables) in 9 localities. These are made up essentially of economically productive customers.

**Table 1:** Trend in the Number of Tertiary Customers (Tariff BT2)

Locality	Year					Total	
	2004	2005	2006	2007	2008		2009
Zé	2	14	6	7	9	6	44
Sékou	4	20	4	6	3	3	40
Toffo	14	6	4	11	6	9	50
<b>Total</b>	<b>20</b>	<b>40</b>	<b>14</b>	<b>24</b>	<b>18</b>	<b>18</b>	<b>134</b>

**Source:** Files prepared by the Data Processing Directorate, SBEE

4.1.15 Both tables reveal that in several localities, there is a new set of dynamics, however limited, associated with the advent of new tertiary sector customers. Given that the project has no set objective in terms of tertiary sector customers, it is not possible to pass value judgement on performance relating to changes in the connection pattern of these customers. There are differences between the localities.

4.1.16 The change is clearer in large localities compared to small ones. In both cases, the level of connection is relatively low. The development of economic activities is also undermined by difficulties faced by beneficiaries in having access to 10A meters. Most customers have 5A meters that cannot operate certain machines such as saw mills and power-driven pumps. Users assert that they face administrative bottlenecks in trying to increase amperage.

4.1.17 The socio-economic impact assessment conducted from November 2006 to February 2007<sup>14</sup> during the preparation of a rural electrification project in Benin by GTZ, through a survey involving a sample of about 500 families, social institutions, craftsmen and businesses in 12 electrified and non-electrified localities, also revealed that the connection of commercial users in Benin is not systematic. Most of these businesses use electricity for lighting, thereby enabling them to work for longer hours. Only a few businesses capable of using

**Table 2:** Trend in the Number of Three-phase (4 cables)

Localities	Year					Total
	2004	2005	2006	2007	2008	
Sakété	5	3	8	3		19
Aguégoué			0			0
Bonou		1	1	5	6	13
Djidja		9	1	3	5	18
Banté		3	3	8	5	19
N’dali		9	7	5	3	24
Copargo	0	1	1	0	2	4
Zazpota	3	3	0	7	6	19
Ouinhi				4	1	5
<b>Total</b>	<b>8</b>	<b>29</b>	<b>21</b>	<b>35</b>	<b>28</b>	<b>121</b>

**Source:** Annual Report 2008 SBEE

<sup>14</sup> “Free services should attend rural electrification”, Article by Jörg Peters, Marek Harsdorff and Florian Zizgle, published in the review “Applied Technology”, Volume 34 No.3 of September 2007.

electricity to operate power tools (joinery, flour-mill, welding, etc.) have decided to connect to the grid. Bars and small-size restaurants are those that mostly use electricity for music and refrigeration of drinks. Reasons for low investment in electrical appliances include: (i) lack of financial resources; (ii) limited access to loans; and (iii) poor knowledge in the use of electrical machines. These reasons underlie the idea of attending rural electrification with incentive measures such as access to microfinance, vocational training and sensitization campaigns on the benefits of using electrical appliances.

4.1.18 *Supply of Public Service*: Like businesses, social institutions such as schools and health centres are not necessarily ready to pay connection costs, even though it sounds economically reasonable. According to beneficiaries, the benefits of using electricity in schools and health centres are obvious. However, sensitization campaigns are necessary for a convincing and intelligible explanation of the advantages of low operating costs.

4.1.19 *Street Lighting*: The goal of installing street lighting networks has been significantly exceeded in terms of the number of street lamps installed and the number of villages lit. However, the appraisal mission has taken cognizance of difficulties regarding financial resources necessary for consumption and network maintenance. The localities are deeply concerned about decentralization not attended by fiscal transfers, since this undermines their intervention capacity with respect to street lighting, which becomes defective over time. Furthermore, the technical solution proposed for street lighting in rural centres is not the most appropriate. Hence, a single faulty street lamp requires about CFAF 500 000 to be replaced, whereas street light maintenance is the responsibility of local government authorities<sup>15</sup>.

#### 4.1.20 **Attainment of Immediate and Intermediate Impacts**

- Domestic Use of Energy

4.1.21 Group discussions revealed a few improvements in the domestic use of energy in households electrified by the project, particularly with respect to lighting and communication tools (radio, television and mobile telephone) and, in some cases, power-driven pumps to access drinking water. However, the use of paraffin oil lamps seems to be deeply engrained in the people's habits, even in electrified households. Hence, for various reasons, some individuals continue to use candles and paraffin oil lamps which are expensive, dim and produce toxic smoke. Similarly, some families continue to use batteries for their torch lamps and radio sets. This reflects the fact that households, especially those with a low level of education, are probably unaware of the economic potential of electricity and its many advantages (see Table 3).

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<sup>15</sup> In a locality visited, 6 street lamps had been degraded in one year, i.e. a need of CFAF 3 million. The "commune" can hardly defray such expenses, given its small budget.

**Table 3**  
**Cost Comparison With and Without Electricity**

	Villages Without Electricity	Electrified Villages
Cost of using the radio	CFAF 4.9 per hour	CFAF 3.1 per hour
Cost of energy in the village	CFAF 7,500 per month	CFAF 2,500 per month
Energy cost of one refrigerator	CFAF 14,000 per month	CFAF 2,000 per month
Average cost of fuel needed for five lamps	CFAF 10,000 (paraffin oil lamps)	CFAF 7,000 per month (fluorescent tubes)

Source: GTZ, Benin survey based on a sample of 500 families, social institutions, craftsmen and businesses. (Applied Technology, Volume 34, No. 3 – September 2007)

4.1.22 The project's impact on the domestic environment of households in beneficiary areas is still marginal due to the low network connection rate and changes in household habits. Currently, electricity has not replaced fuelwood and charcoal for cooking. Indeed, in these regions, the key method of lighting homes is paraffin oil (84%), followed by electricity (15%); the most widely used cooking method is wood (84%) and charcoal (11%)<sup>16</sup>. Hence, the use of electricity for domestic activities in electrified rural centres is still limited, in the absence of effort by SBEE to sensitize rural dwellers, particularly the poor whose capacity to pay for services and defray costs is low.

- Collective Utilization and Improvement of Services

4.1.23 *Improving the Quality of Education:* The outcomes of group discussions show that the project had a separate impact on several factors that have helped to improve the performance of the educational system in electrified areas: (i) pupils with electricity at home no longer hurry to take advantage of daylight. They can afford a little break after classes before they start doing their homework. Hence, they are more receptive; (ii) pupils without electricity at home use street light to prepare their lessons; (iii) whenever nearby localities are electrified, it has been observed that in the evenings, pupils travel to study under electricity lamps (an example is Bebé which, although not electrified, is not far away from Ahozin which is electrified); (iv) teachers have the possibility to improve the quality of their teaching by preparing lessons more thoroughly, using audio-visual resources and the Internet, illustrating their lessons with classroom demonstrations, etc.

4.1.24 For two consecutive years (2008 and 2009) the Séhoué locality ranked first in terms of success among general secondary schools (CEG) in the District (“*Département*”). Local officials assert that electrification has contributed significantly to achieving this result.

4.1.25 Citizens living in the non-electrified part of the Aguégoués villages have complained that the success rate of their children was definitely lower than that of children living in the electrified section. In this connection, the benefits mentioned during group discussions, although somewhat exaggerated<sup>17</sup> given the backdrop of protest (demand for electrification), reflect beneficiary perception of the impact of electrification on pupils' success rate.

4.1.26 Quantitatively, the phenomenon of improving social conditions has not necessarily translated into explicit outcomes. Several factors tend to render some of the impact less

<sup>16</sup> Data from the National Institute of Statistics and Economic Analysis of Benin - INSAE, Indicators on Household Living Conditions (<http://www.insae-bj.org/doc/indicateurs.pdf>)

<sup>17</sup> At Don Tan, participants present in group discussion stated that the success rate of their primary school increased from 75 to 100%, thanks to electrification.

noticeable: (i) paucity of the current statistics system; (ii) low electricity network connection rate; and (iii) significance of other more discriminating phenomena regarding school results. Annex 11 further explains the school success ratio in a few electrified localities and their environment.

4.1.27 *Improving Health Services:* With the advent of electricity in localities, the beneficiaries contacted assert that the quality of care given by health units has improved. At the quantitative level, the impact of electrification is more visible for health services than for education. This stems from the fact that improvements in health are attributable to the equipment of health units that have become more operational with electrification (preservation of certain medications, sterilization, analyses, lighting, etc.). Hence, the figures gathered from a few villages (see Annex 10) confirm such progress. Indeed, there is a significant increase in the number attending health centres (annual rise in consultations above 10%). This reflects improved patient care in the locality and neighbouring areas.

4.1.28 In addition, there is a ripple effect on private investment in some cases such as in Séhouè, where three additional units (including a medical laboratory and an echography unit) were set up since 2006. A similar thing has happened in the Bonou locality with the establishment of a medical laboratory, thus sparing the citizens the trouble of traveling for more than 70 km.

**Box 1: Impacts of electricity on Health Services**

Electric light has made night shift activities easier for health personnel and spared patients kerosene shortages and the unavailability of lamps. The use of electricity-powered refrigerators has allowed for on-site storage of medication and vaccines which previously had to be sought from other distant electrified villages. Some health centres have begun procuring medical laboratory and research equipment for which electricity is indispensable. One psychological impact reported by several groups relates to the sense of safety felt by patients and essentially women during delivery. One of the various cases cited during surveys is that of electrification at Don Tan, which increased the number of births attended by health personnel. Women are no longer sent to the distant village of Cove. All these factors contribute to improving access to and quality of care given to the population of electrified and neighbouring localities.

**Source:** Outcomes of group discussions with beneficiaries

4.1.29 *Improving Safety:* According to beneficiaries, street lighting has significantly curbed insecurity and nocturnal delinquency. Thanks to this, night time economic activities have received a boost. Such improvement is contingent on maintaining street lighting installations in an operational state. With time, street lamps have become increasingly scarce in localities that lack the resources for replacing the bulbs. Hence, the feeling of safety induced by the project has dissipated over time, making the situation harder to bear than before.

- Development of Economic Activities

4.1.30 There are widespread dynamics for the development of both daytime and night-time wealth-creation activities. Barely perceptible in small localities, these dynamics are relatively significant in big localities and those that enjoyed embryonic economic activities prior to electrification. Field visits have shown that electrification has boosted the development of handicraft production, particularly in Banté, where welders, tailors, hair dressers, sawyers and turners have settled on the heels of electrification. New appliances such as electric dryers for hair dressers, embroidery and edging machines for fashion designers, laboratory equipment, power-driven pumps for pumping water in houses and water towers, and electric mills owe their existence to electricity. Hence, all components of economic activity were affected: trade, arts and crafts, small workshops, agricultural produce

processing, tertiary services, etc. This situation projects an increase in inter-sector impact induced by economic activities.

4.1.31 One of the advantages of using electricity mentioned by participants in various group discussions is improvement in the quality of goods and services. For example, the use of electric dryers by hair dressers saves time, compared to the previous system. Similarly, laboratory equipment allow for basic analyses formerly conducted elsewhere. In addition, electricity has helped to increase the quality of care given, especially at night during delivery, and enabled improved availability of vaccines and the introduction of new health services for which citizens hitherto were obliged to travel. This has helped to increase the rate of attendance of health centres. Lastly, by extending working hours and improving the working environment, electricity has improved the quality of services.

4.1.32 However, it appears the electrification project does not spontaneously engender a positive impact in rural localities and that the often approximate knowledge of the use of electric appliances undermines the economic impact potential of electrification. The project's impact on the development of economic activities, deemed satisfactory, could be further consolidated.

#### 4.1.33 **Project's Contribution to Improving the Living Conditions of the Population**

4.1.34 The improvement of the living conditions of the population of electrified rural centres, which is difficult to quantify in the absence of tested methods, was approached through group discussions organized in various localities electrified under the project.

4.1.35 The project revealed its socio-economic impact potential by incorporating the possible impact on health, education, women's empowerment, security and the development of income-generating activities. In electrified localities as well as neighbouring non-electrified localities, the population has benefitted directly or indirectly from the project.

4.1.36 However, at the level of the local economy, this impact is less obvious, the more so as under the current situation, that economy is still too weak to invest in tools and equipment that would help to increase agricultural and non-agricultural productivity, and develop local small industry. Furthermore, it has not engendered significant changes in the structure of rural household expenditure, in which the share of food consumption remains huge (46.3%). The share of items that boost the use of electricity is still small. In fact, at national level, domestic appliances, rental fees (including energy and telecommunications) absorbed 0.6%, 4.5% and 4.8% in 2008, respectively<sup>18</sup>.

4.1.37 In all, the project has not improved possibilities for choice and action by the rural population concerned, particularly in a context where electricity per capita consumption in Benin dropped from 75kWh in 2005 to 72 kWh in 2007. As reported in several surveys on rural electrification<sup>19</sup>, the low network connection rate in electrified rural centres, for both domestic and tertiary sector customers, has been compounded by the low degree of utilization

<sup>18</sup> Data on households from: "General Analysis of Vulnerability, Food Security and Nutrition (AGVSAN)", November and December 2008.

<sup>19</sup> "Impact Analysis of Rural Electrification Projects in Sub-Saharan African", Tanguy Bernard, the World Bank Research Observer Advance Access published September 1, 2010 and; "Maximisation des retombées de l'électricité en Zones rurales, Application au Cas du Sénégal", ESMAP Technical PAPER 109/07 FR, May 2007.

"Asian Development Bank's Assistance for Rural Electrification in Bhutan: – Does Electrification Improve the Quality of Rural Life?" Impact Evaluation Study, August 2010.

of techniques and tools requiring electricity, even when power is accessible. Although the project has had an obvious impact on the living conditions of the population, it still falls short of playing a catalytic role in the development of the localities concerned and contributing significantly to reducing poverty in these areas.

c.) Efficiency

4.1.38 *Financial Return*: Given the technical and technological option retained, the level of cost engendered and the current billing, it is difficult to obtain enough return on this rural electrification project. The IFRR determined at appraisal and completion stands at 2.1% and 12%, respectively. According to the completion report, the gap is due mostly to the increase in SBEE prices and estimates made on the number of customers which, starting 2007, was expected to exceed the number projected at appraisal, i.e. 7,000. The appraisal produced a negative IFRR (Annex 10). Such negative score for this criterion would be due more to the fact that the costs of real factors were taken into consideration (the selling price per kWh by SBEE to its customers was lower than the kWh cost). In fact, changes in the cost of fuel used in thermal plants as well as other factors no longer enable SBEE to balance its accounts, thereby preventing it from financing investments necessary for extending access to electricity<sup>20</sup>. Furthermore, the domestic connection cost, which is not affordable to the target rural population, has led to clandestine connections and low collection rates of outstanding electricity bills. This has had an adverse effect on project efficiency. End 2002, the amount of SBEE's total commercial loans stood at CFAF 32.04 billion, i.e. 67.1% of turnover. Close to 70% of its arrears stem from electricity sector customers.

4.1.39 Consequently, unless attendant measures are adopted, SBEE (responsible for electrification development and management) stands the risk of not being able to obtain the resources necessary for its financial survival. SBEE has made some price changes, with a current average electricity selling price of CFAF 86.5 per kWh, to help cover all its operating costs, finance its extension and improve maintenance on the existing grid.

4.1.40 *Economic Return*: The economic return and sensitivity analysis shows that the Economic Rate of Return calculated based on capital gains stands at between 7.9% and 13.6%. However, factoring in the economic spin-offs of project-induced activities gives a high IERR estimated at between 17.8% and 25.9%, which exceeds projected estimates, and a positive Net Present Value (NPV) of 10% when cash flows are discounted. This underscores the importance of maximizing the project impact by stimulating economic activities with accompanying measures (see Annex 10). Economic return is considered satisfactory.

4.1.41 *Time and Resource Utilization*: Project implementation recorded an overall 24-month delay with respect to estimates and a 12% increase in total project cost due to additional resources appropriated by Government as its counterpart contribution to enable the electrification of 11 additional localities. Furthermore, the customer connection timeframe was long.

4.1.42 Efficiency is deemed satisfactory overall.

d.) Impact on Institutional Development

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<sup>20</sup> Aide mémoire of the joint mission of technical and financial partners of Benin, 22 September 2008 to 1 October 2008.

4.1.43 During the project implementation period, an institutional reform of the sector was underway. The reform focused mainly on the: (i) separation of electricity and water activities. SBEE is still responsible for electricity, whereas a new structure, SONEB, is in charge of water; (ii) quest for a strategic partner to privatize SBEE; and (iii) establishment of ABERME (*Agence Béninoise de l'Électrification Rurale et de la Maîtrise de l'Énergie*) with a view to granting a concession for the development and management of rural electrification. The territory was divided into fifteen concession areas. Bid invitations will be announced for the selection of concessionaires. This reform has no direct bearing on the project.

4.1.44 The institutional framework of the energy sector was funded by a World Bank project. During the project implementation period, an institutional reform of the sector was underway. The reform focused mainly on the: (i) separation of electricity and water activities. SBEE is still responsible for electricity, whereas a new structure, SONEB, is in charge of water; (ii) quest for a strategic partner to privatize SBEE; and (iii) establishment of ABERME (*Agence Béninoise de l'Électrification Rurale et de la Maîtrise de l'Énergie*) with a view to granting a concession for the development and management of rural electrification. The territory was divided into fifteen concession areas. Bid invitations will be announced for the selection of concessionaires. This reform has no direct bearing on the project. The privatisation process for the “electricity” operator has not been concluded.

4.1.45 However, by making the first disbursement contingent on a Beninese Government undertaking to establish the National Rural Electrification Fund (FNER) aimed at promoting the development of rural electrification, the project will help to put in place far-reaching institutional reforms, even though this contribution might fall short of boosting extensive rural electrification. At the time of project completion, the FNER was still not operational<sup>21</sup>. The project had a positive impact on works supervision, control and oversight by SBEE, but not on its customer management system or sector planning capacity. This limited the optimization of localities to electrify and the suitable technical and technological options. Although the project had no impact on the SBEE customer management system, it improved the institutional mechanism by attaching the Implementation Unit to the General Directorate of SBEE for greater efficiency. This mechanism is particularly beneficial to the Bank's ongoing second rural electrification project in Benin. The project's impact on institutional development is satisfactory.

4.1.46 Consequently, impact on institutional development is deemed satisfactory.

e.) Other Impact

4.1.47 *Impact on the Environment:* The project is classified under Environmental Category 2. To that end, it is considered as having limited adverse impact that could be reduced through the implementation of mitigative measures and adequate monitoring.

4.1.48 During implementation, the adverse impact resulted essentially from damage caused when accessing sites for implantation of MV/LV poles and sub-stations, and reduced-surface areas hosting such facilities. MV electric lines are located within the right-of-way of roads. Beneficiaries have not complained of any inconvenience during implementation.

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<sup>21</sup> One of the components of the Project to Develop Improved Access to Modern Energy –DAEM- (June 2009) supported by an IDA loan of USD 70 million, (about CFAF 35 billion) and a Global Environment Facility (GEF) grant, is aimed at rendering FNER operational.

4.1.49 For lines in operation, there is need to periodically prune surrounding trees to prevent branches from touching the lines. The mechanical weeding around poles is justified by the risk of bush fires to which the lines are exposed. In addition to mechanical weeding, citizens should be sensitized on the adverse consequences of bush burning and similar practices. Legal means of dissuasion could also be sought.

4.1.50 In conclusion, the project's negative impact on the environment seems to have been contained at relatively low levels.

4.1.51 *Impact on Gender:* The project seems to have had a positive impact on both male and female citizens in a number of ways. Men enjoyed better comfort at home, thanks to television and other possibilities offered by satellite channels. Women freed themselves of some chores to devote themselves more to their families, organize or develop an economic activity. The project gave women new opportunities to sell new products such as ice cream, lollipop, fruit juice, etc. In some localities (e.g. Sehoué), group discussions revealed that the development of certain activities enriched some women to the point of them becoming wholesale traders. Small-scale commercial activities enabled the poorest to buy and resell products with profit margins. The use of refrigerators also enabled female traders of fresh fish and frozen products to gain time and be safe in the evening.

f. Sustainability

4.1.52 *Technical Viability:* Networks under the project are generally well built. The quality of facilities built under the main contract by the contractor is better in terms of finishing than the additional ones built by SBEE teams.

4.1.53 SBEE has its own "Technical Standards for Distribution Installations" drawn up in 1999. These standards are shared with the *Compagnie d'Énergie Electrique du Togo* (CEET). The standards were generally (but not thoroughly) monitored during project implementation. These standards are not currently monitored and updated by a structure clearly identified by SBEE. A standardization unit is being set up at the Studies and Planning Directorate.

4.1.54 During site visits, the existence of several insulators broken by thrown stones was recorded. Officials of the SBEE district concerned indicated that network rehabilitation works had been scheduled under a network preventive maintenance programme. Besides the insulators broken by stone throwers, bush fires are sometimes lit in the vicinity of the network. This causes damage especially to the wooden electric poles. No case of electrocution was reported in the localities visited.

4.1.55 Monitoring of repair works is left to the initiative of the officer responsible for repair teams in the region, who is normally informed of all violations of standard implementation rules. Technical faults appear not to be systematically reviewed. The shortage of connection materials is the root cause of implementation delays reported in the localities visited. Stock shortages are not limited to connection equipment, but also concern a large number of distribution equipment. Technical and non-technical losses incurred by SBEE stood at an average of 14%. The technical losses are also attributable to poor programming of spare part and tool supplies, which affects network maintenance planning. Lack of transport resources was mentioned by several interlocutors. Some customers stated during group discussions that they had to provide transportation to SBEE workers for repair services. Councils with inadequate financial resources find it difficult to repair street lamps (electricity of the poorest).

4.1.56 Clandestine networks made up of “cobwebs” are a danger to the population, given the high risk of third party electrocution. The service provided to connected households is of poor quality, marked by significant drops in voltage. This undermines the efficiency and shortens the lifespan of most electrical appliances.

4.1.57 Overall, technical viability is deemed unsatisfactory.

4.1.58 *Socio-political Support:* From the studies phase, the project drew enthusiasm and received support from the population who mobilized to promote the operation and collected contributions from customers towards connection fees. The absence of an appropriate mechanism to finance at least part of the “social” connection costs affects the appraisal of political support, which is nevertheless considered satisfactory.

4.1.59 *Socio-economic Viability:* Economic spin-offs vary from one locality to another. They are greater and more perceptible in big localities or in those that had embryonic economic activities prior to the project. The sustainability of economic spin-offs seems assured, thanks to their multiplier effect. For small localities, the reaction will be slower. The setting-up of regional or local development programmes, taking advantage of the availability of electricity, is likely to leverage the economic impact of the project. Economic viability is deemed satisfactory.

4.1.60 *Financial Viability:* The facilities built to supply electricity to customers are incorporated into SBEE’s distribution network, becoming an integral part of the grid. In the long run, good or poor performance ensuing specifically from the project will no longer be identifiable. The project’s financial viability is integrated into SBEE’s financial situation and becomes dependent on the company’s financial viability.

4.1.61 As long as the selling price per kWh was higher (with a profit margin for the operator) than the cost price per kWh produced and distributed by SBEE, the project generated cash-flow for SBEE. Since CEB can no longer meet Benin’s entire interconnection network needs, the share and unit cost of electricity self-produced by SBEE have increased, prompting the average cost per kWh (CFAF 98.9) to rise above the average selling price (CFAF 86.5). The issue at stake is not the project’s financial viability as such, but that of funding the financial cost of rural electrification development investments for SBEE’s very survival.

4.1.62 As Concerns street lighting installations, their situation is peculiar. Lamps belonging to the local district authorities (“communes”) are installed on LV poles. Consumption and maintenance cost of these lamps fall under the jurisdiction of the communes, whereas SBEE is responsible for interventions on installations. For communes with adequate financial resources, the situation is normal. Orders are placed with SBEE, which executes the maintenance or repair works and bills the relevant commune for services provided. For low-income communes (which seem to be numerous given the nascent decentralization), the situation is different. There is little or no maintenance of street lights, which risks jeopardizing their longevity, without forgetting the burden of bills to be paid. In these localities, the inhabitants who participated in group discussions underscored the impact of street lighting and the return of delinquency when the lights are put out. Given that street lighting is particularly beneficial to the poorest in the localities, there is need to find a solution to this issue which threatens the sustainability of project impact.

4.1.63 SBEE is in a very uncomfortable situation. As public operator, SBEE is required to implement Government policy; as a business, it is also required to generate, through its activity, enough cash-flow and profit to ensure its sustainability. The lack of resources (that the State must mobilize to defray the financial cost of its political decisions) affects SBEE's sustainability and viability. Overall, the weaknesses observed render financial viability unsatisfactory.

4.1.64 *Effectiveness of Institutions, Organisation and Management:* The outcome of electrification projects is the extension of lines and an increase in the number of maintenance and repair equipment. Maintaining the same quality of service to customers before and after the project requires putting in place new technical arrangements and/or increasing the human and logistic resources of the operator. Since the project did not introduce new technology, the demand for the services of technical teams is bound to increase. If no action is taken, SBEE, plagued by inadequate means of transport and spare parts, risks seeing the situation exacerbate. In spite of huge investments on the computerization of customer management, the quality and regularity of services provided by SBEE are in no way guaranteed. Efforts should be made to increase the quality and reliability of data in the billing, collection and encashment chain, as well as information sharing within the company.

4.1.65 *Resistance to External Factors:* Upon project completion, the facilities are integrated into SBEE's estate and are subject to the rules applicable to all other SBEE installations. Consequently, the project, taken individually, does not run any external risk other than that to which the country's entire electricity network is subjected. However, it should be underscored that the population serviced by the project is on average more sensitive than the rest to external factors, particularly the increase in the prices of oil products, which exacts a heavy toll on the cost of electricity.

4.1.66 Variations in the prices of raw materials, particularly oil, and the CFAF exchange rate fluctuation negatively impact project outcomes. The project is affected by the cost price of electricity and the price of equipment needed for maintenance and small-scale extension works, most of which are imported.

4.1.67 Overall, the sustainability of project impact is deemed unsatisfactory.

## **4.2 Performance Scores**

### a.) Overall Project Performance

4.2.1 Overall project performance is deemed satisfactory, thanks to the smooth implementation of the network component (physical outputs). Positive outcomes have been recorded in the development of income-generating economic activities, improvement in household living conditions and well-being, and enhancement in the level of social services. This impact may be further sustained by improving the electricity network connection rate for both domestic and tertiary sector customers, and by increasing electricity use for productive activities, underpinned by appropriate attendant measures. However, sustainability is affected by maintenance problems due to financial difficulties facing SBEE and the local district authorities (communes). For instance, street lighting, which is the electricity of the poor, is deteriorating by the day in low-resource rural districts.

b.) Borrower's Performance

4.2.2 Project appraisal was conducted over several years. Its geographic area changed several times. Various consultants who worked on the project made significant contributions. The Borrower's performance at appraisal is satisfactory. During implementation, the establishment and slow start-up of the Project Management Unit had an impact on that performance. Changes made to the project and the complexity of the public procurement process in Benin led to delays in works execution. From the operational point of view, connections coming in the wake of network installation experienced some delays. Similarly, problems related to new customer connections still persist, due essentially to difficulties facing SBEE. Some MV lines servicing electrified localities are too long. This will likely reduce the voltage quality for customers at the tail end of the line. Compliance with contractual obligations was only partial. Works control teams were not given the necessary logistics to perform their tasks optimally. In conclusion, the Borrower's performance is deemed satisfactory overall.

c.) Bank Group's Performance

4.2.3 Project identification originated from the Borrower, which had conducted a feasibility study prior to seeking the Bank's intervention. At the Bank's request, the study was updated to include quantification of the project's socio-economic benefits. At preparation, the project met the real needs of the population of rural centres and the Bank provided timely support. Network-related project components were properly appraised. However, the schedule did not take into account the country's specificities regarding time management and compliance with deadlines. Project start-up and supervision received the requisite attention and allowed for significant decisions to be taken, although this did not necessarily improve implementation performance. Overall, the Bank's performance is deemed satisfactory.

### **4.3 Key Factors Affecting Project Performance and Outcomes**

a.) Factors beyond the Control of the Authorities.

4.3.1 Natural events have influenced the project in various ways and in varying degrees. Drought had a negative impact on CEB's hydro-electric power production, thereby undermining its capacity to meet demand. Hence, it had to resort to load-shedding and production from diesel generators that led to excessive costs. Furthermore, given that project facilities are spread over a wide area, sensitivity to extreme weather phenomena (floods, storms, hurricanes, etc.) may be very high at the local level.

b.) Factors falling under the Jurisdiction of the State

4.3.2 The political commitment of the State is a crucial factor for project implementation. Such commitment was attended to by mobilizing financial resources and funding additional costs borne by the Executing Agency. However, the street lighting component risks disappearing if nothing is done to help poor local district authorities financially.

c.) Factors falling under the Jurisdiction of the Executing Agency

4.3.3 The Executing Agency, which provides a public service, should be involved in the quest for and adoption of appropriate local technology to improve electricity use in homes and petty trades. Such has not been the case under this project - a negative tinge to its performance.

c.) Factors affecting Implementation

4.3.4 The revision of the list of beneficiary localities after conducting feasibility studies and project appraisal had an impact on implementation performance. Such changes and additions during the implementation phase become expensive and do not always produce the expected results.

## V. CONCLUSIONS, LESSONS AND RECOMMENDATIONS

### 5.1 **Conclusion**

5.1.1 The project ties with Benin's socio-economic development policy, which promotes the opening up of rural areas, particularly by supplying electric power to, and improving the living conditions of, the population. It meets the real needs of most rural dwellers who have no access to modern sources of power such as electricity. Given the available development potential, the project constitutes a choice instrument for the Bank and the country for curbing poverty and providing impetus to the socio-economic development of the localities and surrounding areas concerned.

5.1.2 Due to certain technical choices that are not necessarily the most appropriate, the project partly - but suitably - met the needs of the low-income rural population. In fact, the choice of the 30-35 kV voltage grid which is more appropriate for rural areas, instead of the 20 kV voltage grid widely used by the project, would have been better. In addition, the project did not envisage the supply of single-phase MV power lines for small areas with predictably low economic development. This would have lowered the investment cost per domestic customer and speeded up their electrification.

5.1.3 While it is true that project outputs and their quality are deemed satisfactory, it should also be underscored that improved access to electricity for the population of electrified rural centres, albeit satisfactory, could be further sustained. This relative under-utilization of the development potential provided by the project is due essentially to: (i) the late start of connection works executed under public contracts by SBEE; (ii) SBEE's difficulties in coping with subscription applications, such that several applicant customers who had paid for new connections, wait for their metres for several months; (iii) connection costs not affordable to the rural population; and (iv) billing procedures.

5.1.4 Group discussions with key beneficiaries have revealed that electrification has had a positive impact on all areas of rural life and has contributed to improving the living conditions of the population of electrified rural centres. Such impact may be further sustained by increasing the rate of connection to the electricity network, both for domestic and tertiary sector customers, as well as enhancing the utilization of electricity for productive activities. The project's impact on the living conditions of the population still falls short of playing a catalytic role in developing the localities concerned and contributing significantly to reducing poverty in such areas.

5.1.5 Hence, evaluation confirms the need to plan rural electrification simultaneously with attendant measures, thereby maximizing its indirect impact. The sustainability of project outcomes is unsatisfactory due to difficulties facing SBEE and low-income communes with respect to street lighting. In light of all appraisal criteria, overall project performance is deemed satisfactory.

## 5.2 Key Lessons

5.2.1 Real political willingness translated by the funding of rural electrification underlies the successful implementation of this type of project, which helps to meet the need for maintaining socio-political equilibria and ensuring balanced development nationwide.

5.2.2 Rural electrification can only be effective when attended by measures that help to improve access to, and use of electricity, with a view to boosting local social and economic development.

5.2.3 The productive utilization of electricity that helps to maximize its impact, requires actions that will likely improve the utilization and knowledge of the benefits of electrical appliances, and provide small businesses with the financial resources to procure electrical tools.

5.2.4 The choice of a 30-35 kV voltage grid and single-phase MV power lines for small areas with predictably low economic development is more conducive to reducing the investment cost per domestic customer and speeding up their electrification.

5.2.5 The control of clandestine electrical connections can be achieved through collective electricity metres and pre-paid meters, and especially through the extension of networks to enable a greater number of households to have access to electricity.

5.2.6 Rural electrification through the network or a small power station is considerably more advantageous than other alternative solutions, particularly standalone systems such as photovoltaic systems, and helps to increase the development impact associated with this type of project.

## 5.3 Key Recommendations

### For the Government:

- a. *Formulation of a Rural Electrification Master Plan:* The Government should formulate an Electrification Master Plan for the country, which is indispensable in establishing criteria for selecting localities, prioritizing and programming rural electrification projects.
- b. *Impact Maximization:* The Government should maximize the indirect impact of electrification by improving its utilization, quantitative and qualitative accessibility, with a view to boosting all economic and social development sectors and human activities geared towards improving the living conditions of the rural population. ABERME could ensure impact maximization by adopting the following attendant measures:

- c. *Financing of Investment Costs by the State: The Government should defray investment costs related to the development of rural electrification under FNER or as part of other capital investment grants to SBEE.*
- d. *Financing of Recurrent Electrification Costs: The Government should envisage appropriate recurrent cost-sharing between the various partners (national authorities and public operators) under rural electrification projects. To that end, the Government should conduct a study to identify the method of financing recurrent electrification costs in low-income localities.*
- e. *Attendant Measures: The impetus to create economic activities in some localities may be further sustained by adopting attendant measures<sup>22</sup> that will help to make the best of the potential offered by the project, for instance the development of micro-finance services to enable small businesses to procure electrical machines and tools, vocational training services, sensitization campaigns focused on the benefits of electrical appliances with a view to increasing knowledge on the use of electrical machines, making subscription fees affordable to users, etc. These approaches should undergo prior small-scale testing.*
- f. *Containing the Development of Clandestine Networks (cobwebs). There are several possible solutions such as the one allowing families in the short term to get organized to manage a collective meter, or to use the meter belonging to one of the families to have access to the network without extra cost. In this case, SBEE may, in areas serviced by an MV network, delegate the installation and/or management of mini-electricity distribution systems to either private-owned companies or groups of users<sup>23</sup>, without running any financial or technical risk. Other more effective actions involve: (i) initiating network extension projects with a view to enabling a greater number of households to have access to electricity and thereafter prohibiting the establishment of "cobwebs"; and (ii) proposing solutions anchored on the use of pre-paid meters. This cobweb phenomenon is naturally doomed to vanish in the medium term.*

#### **For SBEE**

- a. *Securing a Return on Investments: SBEE should at all cost secure a return on the investments made, by: (i) connecting as many subscribers as possible to the existing networks; (ii) improving the quality of electricity provided; (iii) adapting the tariff structure; and (iv) improving maintenance and collection services.*
- b. *Making Appropriate Technical Choices: SBEE should adopt the 30-35 kV voltage grid which is more suitable for rural areas than the 20 kV voltage grid, and provide for single-phase MV power lines for small localities with predictably low economic development, in a bid to lower the investment cost per domestic customer and speed up their electrification.*

<sup>22</sup> The attendant measures mentioned in the report are adapted from "On-Grid Rural Electrification in Benin – A Socio-economic Baseline Study on GTZ Project", 2010

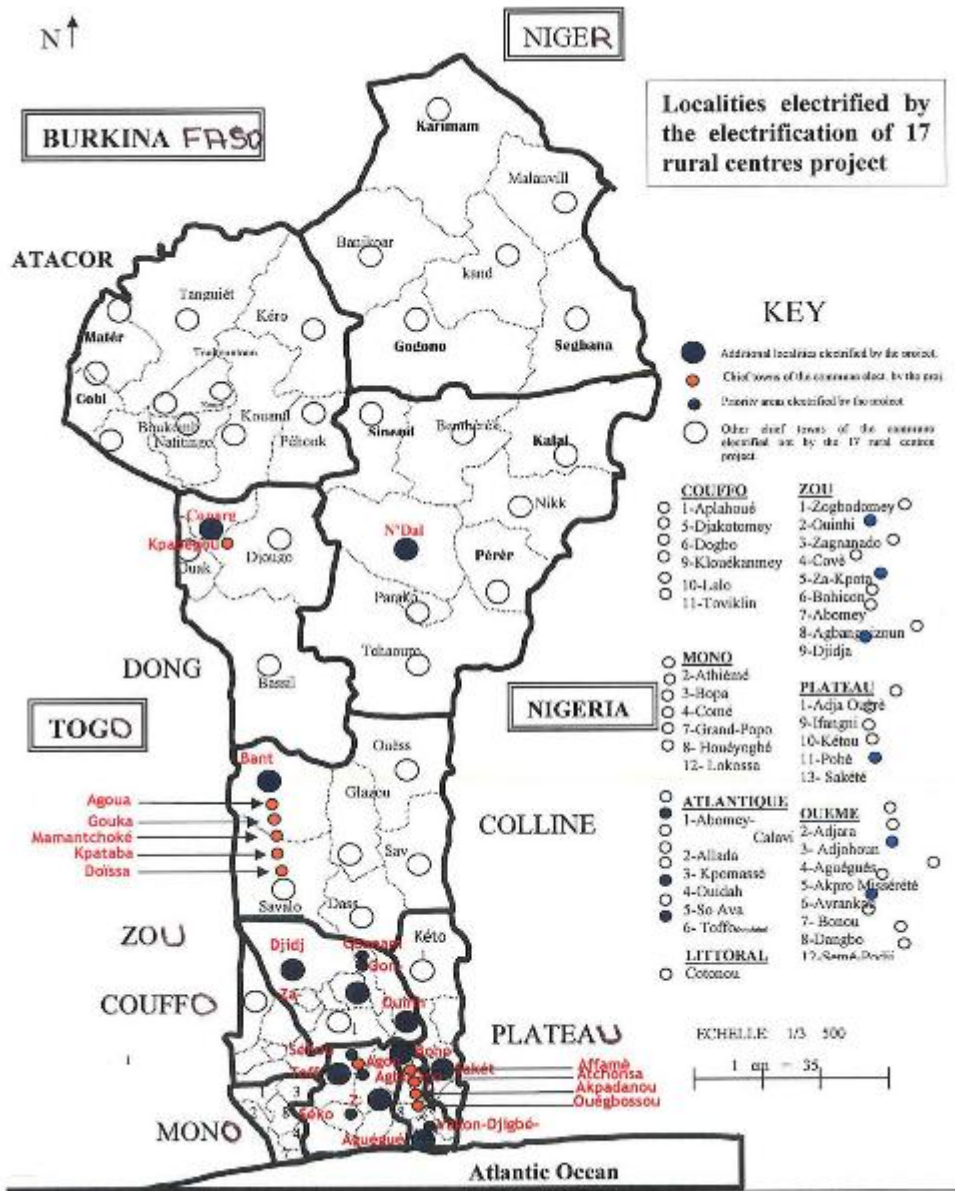
<sup>23</sup> This approach was developed in "Financing the development of rural electrification" – Technological Research and Exchange Group (GRET) – Collection Etudes et travaux – Online Series No. 2, 2005

**For the Bank**

- a. *Improving Output Quality: The Bank should not encourage the execution of connection works on force account by the national electricity distribution company, in view of works execution timeframes and the cost implications. An alternative would be to encourage outsourcing and development of sub-contracting SMEs.*
- b. *Impact Assessment: The Bank should lay more emphasis on the monitoring/evaluation of the most significant outcomes and impact of rural electrification and improvement of the living conditions of the populations, by combining participatory evaluation methods with socio-economic impact surveys. Such monitoring/evaluation should be conducted during the entire project cycle and beyond.*
- c. *Attendant Measures: The Bank should include support for the implementation of attendant measures in its rural electrification projects, with a view to maximizing the development outcomes of rural electrification projects (sensitization, education, vocational training and establishment of microcredit).*
- d. *Equality among Components: Equal attention should be paid to different project components at appraisal and implementation. The data processing component envisaged to strengthen SBEE's customer management system was not properly assessed and implemented. The Bank should ensure that the composition of the appraisal team matches the project profile.*

## **ANNEXES**

**ELECTRICITY MAP OF BENIN**



This map was provided by the African Development Bank Group exclusively for the use of the readers of the report to which it is attached. The names used and borders shown do not imply on the part of the Bank and its members any judgment concerning the legal status of a territory nor any approval or acceptance of these borders.

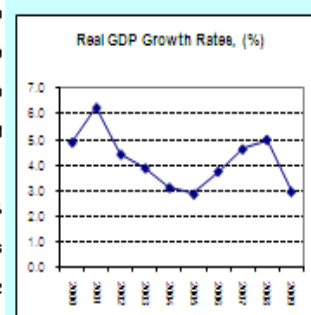
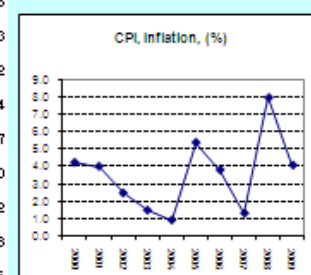
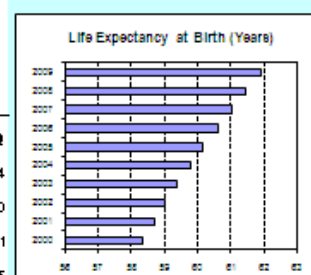
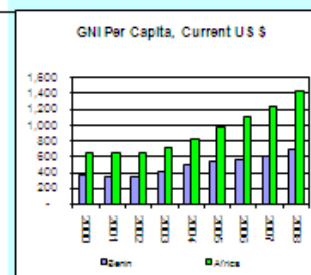
Extract from Project Completion Report (ADF/BD/IF/2006/201)



## Benin - Country Profile



	Benin		Africa Developing countries		
	Year	Value	Most Recent Year		
<b>Social</b>					
Population, mid-year (millions)	2009	8.9	1008	5629	
Population growth (annual) (%)	2009	3.1	2.3	1.3	
GNI per capita (Atlas method, US\$)	2008	690	1,428	2,780	
Urban population (% of total population)	2009	41.6	39.6	44.8	
Life expectancy at birth (years)	2009	61.9	55.7	66.9	
Infant mortality (per 1,000 live births)	2009	82.4	80.0	49.9	
Child malnutrition (% of children under 5)	2006	22.6	130.2	80.8	
Access to an improved water source (% of population)	2006	65.0	64.0	84.0	
Illiteracy (% of population age 15+)	2007	40.5	59.4	19.0	
Gross primary enrollment (% of school-age population)					
Male	2008	124.8	101.6	108.9	
Female	2008	108.1	91.7	104.6	
Human Development Index	2007	0.492	0.514	0.679	
<b>Macroeconomic indicators</b>					
	<b>1990</b>	<b>2000</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>
GDP (US\$ billions)	2.0	2.4	5.5	6.6	6.4
Real GDP Growth Rate (%)	3.2	4.9	4.6	5.0	3.0
Real Per Capita GDP Growth Rate (%)	-0.1	1.7	1.4	1.8	-0.1
Gross capital formation (% of GDP)	14.1	18.7	20.7	20.5	20.5
Gross national savings (% of GDP)	12.0	12.2	11.5	12.4	14.9
Inflation (%)	-1.5	4.2	1.3	7.9	4.1
Growth of Money Supply, M2 (%)	28.6	26.0	19.6	26.6	7.6
Export Growth of Goods, volume (%)	3.1	30.7	90.3	-11.5	-3.3
Import Growth of Goods, volume (%)	46.0	1.2	12.8	5.1	4.2
Terms of Trade (%)	35.1	25.2	-32.0	11.7	-8.4
Debt Service (% of Exports of G&S)	...	16.1	1.2	2.9	3.7
Current Account (% of GDP)	-2.2	-2.1	-10.0	-8.3	-10.0
Total external debt (% of GDP)	47.5	24.4	12.4	12.2	15.2
Average exchange rate (National Currency Per US \$)	272.265	711.976	479.267	447.805	489.148
Reserves including gold (US\$ millions)	69.1	351.6	765.2	820.2	826.6
Reserves (months of imports of goods & services)	1.9	6.6	5.2	5.1	5.6
<b>STRUCTURE of the ECONOMY</b>					
<b>By sector (% of GDP)</b>					
Agriculture	36.1	34.9	36.0	34.9	36.0
Industry	13.0	12.9	14.4	14.4	13.3
Manufacturing	7.7	6.2	8.4	8.4	8.0
Services	51.0	52.1	49.5	50.6	50.1
<b>By sector (Annual growth rate)</b>					
Agriculture	2.5	4.6	5.5	4.2	3.6
Industry	7.4	8.5	0.0	3.9	4.8
Manufacturing	8.8	8.8	-3.6	2.7	3.2
Services	0.7	3.7	3.6	5.1	6.2

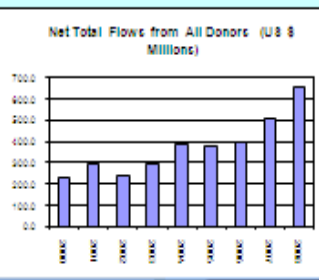
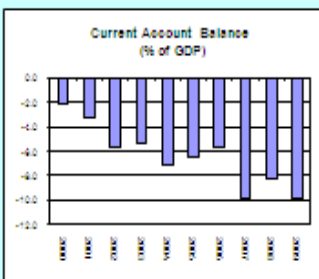
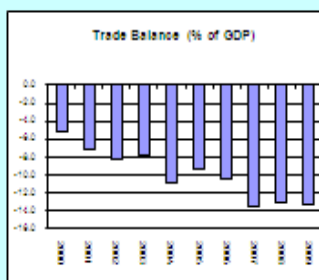
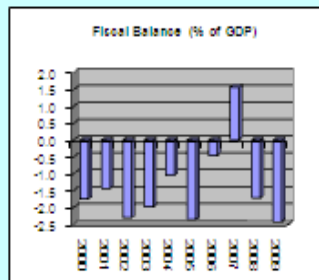




## Benin - Country Profile



<b>Private sector development</b>	<b>1990</b>	<b>2000</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>
Time to start a Business (days)	...	...	31	31	31
Registering Property (days)	...	...	120	120	120
Paying Taxes - Payments (number)	...	...	55	55	55
Enforcing Contracts - Time (days)	...	...	625	625	625
Protecting Investors - Investor Protection Index (0-10)	...	...	3.3	3.3	3.3
<b>Government finance (% GDP)</b>					
Total revenue and grants	15.8	17.5	23.7	21.3	21.2
Total expenditure and net lending	19.9	19.2	22.2	23.0	23.6
Overall surplus/deficit (including grants)	-3.9	-1.7	1.6	-1.7	-2.4
<b>BALANCE of PAYMENTS</b>					
(US\$ millions)					
Trade balance	-178.8	-123.6	-745.1	-866.4	-856.6
Exports of goods (fob)	117.7	332.5	504.5	530.1	408.4
Imports of goods (fob)	297.5	516.2	1,249.6	1,396.6	1,265.0
Services balance	-3.5	-36.1	-104.7	-42.9	-54.2
Net income	-38.9	-12.2	-9.0	-12.1	-22.4
Current account balance	-39.9	-48.9	-548.5	-548.9	-638.7
<b>BALANCE of PAYMENTS</b>					
(% of GDP)					
Trade balance	-9.2	-5.2	-13.5	-13.0	-13.4
Exports of goods (fob)	6.0	16.6	9.2	8.0	6.4
Imports of goods (fob)	15.2	21.9	22.7	21.0	19.7
Services balance	-0.2	-1.5	-1.9	-0.6	-0.8
Net income	-2.0	-0.5	-0.2	-0.2	-0.3
Current account balance	-2.0	-2.1	-10.0	-8.3	-10.0
<b>Financial Flows and External Debt</b>					
(US\$ millions)					
Net Total Flows from All Donors	242.1	226.5	507.8	651.8	...
Net Total ODA (Official Dev. Assistance) from All Donors	266.9	238.4	474.3	640.8	...
Foreign Direct Investment Inflows from All Donors	62.4	59.7	255.2	120.5	...
Total debt outstanding at year-end	876.0	575.3	682.8	813.2	972.1
Total debt service	...	16.1	1.2	2.9	3.7



## Evaluation Criteria

<b>PERFORMANCE EVALUATION OF THE PROJECT FOR THE ELECTRIFICATION OF 17 RURAL CENTRES IN BENIN</b>			
No.	COMPONENT INDICATORS	Score (1 to 4)	REMARKS
1	<b><u>Relevance and evaluation of quality at entry</u></b>	3	The project is part of the priorities of the Government of Benin. It ties with the GPA, enshrined in Benin's national strategy for 1997-2001 and SBEE's development plan. It meets a real need of most of the rural population who do not have access to electricity. Given the available development potential, the project constitutes a choice instrument for curbing poverty and providing impetus to the socio-economic development of the country. Furthermore, it complies with the Bank's strategy for Benin for the period under review, aimed at reducing rural poverty and consolidating sustainable development. However, due to certain technical choices made in some localities and in the absence of attendant measures geared towards maximizing the indirect impact of electrification, the project partly – albeit suitably - met the needs of the rural population. This has affected quality at entry. Overall, relevance and quality at entry are deemed satisfactory.
i)	Consistency with the country's overall development strategy	3	Electrification as a means of curbing poverty has been part of the priorities of various successive Governments of Benin, and enshrined in the various strategic papers.
ii)	Consistency with the Bank's assistance strategy	4	The project is fully consistent with the Bank's strategy. Furthermore, it complies with the Bank's strategy for Benin for the period under review, aimed at reducing rural poverty and consolidating sustainable development.
iii)	Poverty Reduction	3	Given the available development potential, the project constitutes a choice instrument for curbing poverty and providing impetus to the socio-economic development of the country.
iv)	Quality at entry	2	The project was restricted to infrastructure financing and did not include attendant measures aimed at maximizing the indirect impact of electrification. Project objectives were not properly defined. Due to certain technical choices made in some localities, the project could not meet the needs of the rural population in the most appropriate manner.

<b>PERFORMANCE EVALUATION OF THE PROJECT FOR THE ELECTRIFICATION OF 17 RURAL CENTRES IN BENIN</b>			
<b>No.</b>	<b>COMPONENT INDICATORS</b>	<b>Score (1 to 4)</b>	<b>REMARKS</b>
<b>2</b>	<b>Achievement of Objectives and Outputs (“Effectiveness”)</b>	<b>3</b>	The project’s impact on the development of economic activities and the enhancement of human potential is noticeable and acknowledged by the beneficiaries. However, it falls short of the development potential offered by the project.
i)	Physical Outputs	3	The quantities of MV and LV network facilities estimated at appraisal were exceeded, whereas connections that had to be made by SBEE teams were delayed tremendously
	-Networks	(3)	
	-Connections	(2)	
ii)	Improved access to electricity	3	Satisfactory
	-Tertiary sector customers	(3)	In several localities, there is are new dynamics associated with the advent of new tertiary sector customers, however small this number may still be.
	-Domestic customers	(3)	Even though with delay, the objectives in terms of number of domestic customers have been achieved, with an attendant problem of “cobwebs”.
	-Street lighting	(3)	The street lighting network exceeded the expected objectives. However, the operation and maintenance of street lamps is problematic in low-income localities.
iii)	Improvement of services related to the collective use of electricity	3	Satisfactory
	-Education	(2)	The impact of the electrification of households and street lighting on education is less obvious.
	-Access and care quality	(3)	Testimonies relating to the impact on health are more obvious.
	- Street lighting	(3)	According to beneficiaries, street lighting has led to public safety in electrified localities.
iv)	Improvement of the domestic environment and use of domestic energy services	2	The project’s impact on the domestic environment of households in localities electrified by the project is still marginal due to the low rate of network connections and the change in the habits of households that use paraffin oil lamps and wood fire.
v)	Development of economic activities and improvement in the quality of services	2	The advent of real impetus for the development of economic activities is affected by low rates of access and use.

<b>PERFORMANCE EVALUATION OF THE PROJECT FOR THE ELECTRIFICATION OF 17 RURAL CENTRES IN BENIN</b>			
<b>No.</b>	<b>COMPONENT INDICATORS</b>	<b>Score (1 to 4)</b>	<b>REMARKS</b>
vii)	Project's contribution to improving the living conditions of the rural population	3	The impact on improving the living conditions, although difficult to quantify, was acknowledged during group discussions with beneficiaries. They would be further sustained if more households had access to electricity.
viii)	Other impact	3	Satisfactory
	-Women's empowerment	(3)	The impact on women's empowerment especially through the improvement of domestic comfort is satisfactory. This has been ascertained through group discussions.
	-Environmental protection	(2)	Environmental protection is undermined by the use of paraffin oil lamps and candles even in electrified houses.
	<b>Efficiency</b>	<b>2</b>	Economic Rates of Return, calculated at appraisal, at completion and at evaluation, are very positive and would have been higher had more customers been connected. Low Financial Rate of Return is characteristic of rural electrification projects. The final project cost, which increased by 12%, allowed for the electrification of 11 additional localities, thereby increasing the number of electrified localities from 17 to 28 and required additional time. Project implementation recorded an overall 24-month delay with respect to estimates. Efficiency is deemed unsatisfactory.
	Economic Rate of Return Estimates at appraisal: 10 % Estimates at completion: 19 % Estimates at PPER: 13.6 and 25.9%		
	Financial Rate of Return Estimates at appraisal: 2.1 % Estimates at completion: 12 % Estimates at PPER: Negative	-	
<b>4</b>	<b>Institutional Development</b>	<b>3</b>	Satisfactory
(i)	-Sector	3	The sector's institutional framework was financed by the World Bank. The sector's planning capacity is still limited. However, by tying the first disbursement to a Beninese Government undertaking to establish the National Rural Electrification Fund (FNER) aimed at promoting the development of rural electrification, the project will contribute to initiating far-reaching institutional reform, even though it seems inadequate to boost large-scale rural electrification.
(ii)	-Executing agency	3	The project has improved SBEE's works supervision, control and monitoring capacity, thereby allowing for the attainment of physical outputs. Furthermore, the project has improved the institutional mechanism by attaching the Implementation Unit to the General Directorate of SBEE for greater efficiency. This mechanism is particularly beneficial to the on-going Second Rural Electrification Project.

<b>PERFORMANCE EVALUATION OF THE PROJECT FOR THE ELECTRIFICATION OF 17 RURAL CENTRES IN BENIN</b>			
<b>No.</b>	<b>COMPONENT INDICATORS</b>	<b>Score (1 to 4)</b>	<b>REMARKS</b>
	<b>Sustainability</b>	<b>2</b>	The sustainability of project's impact is unsatisfactory, due primarily to maintenance difficulties ensuing from SBEE's fragile financial situation and those of local government authorities.
i)	Technical viability	2	Facilities are integrated seamlessly into the existing network. The technical choices made are not the most appropriate. In rural areas with long distances between load centres, the choice of the 30kv voltage would have been the most appropriate. Similarly, the single-phase system should have been considered. There are a few problems relating to the maintenance of distribution networks due to shortage of materials and stock of equipment for the maintenance of HV lines. From 1998 to 2002, technical and non-technical losses incurred by SBEE stood at 14% on average.
ii)	Sustainable commitment of the Borrower (legal/regulatory framework included)	2	The country is embarking on structural reforms of the sector, particularly through Law No. 2006-16 of 27 March 2007 instituting the Electricity Code of Benin and establishing ABERME. Sometimes, these reforms take time to become effective and the current political commitment is not necessarily concretized by appropriate instruments and measures.
iii)	Socio-political support (including contributions by beneficiaries, protection of vulnerable groups, political stability)	3	From the studies phase, the project has won the enthusiasm and support of the population who mobilized to promote it and collected contributions from customers towards connection fees.
iv)	Economic viability	2	Economic spin-offs vary from one locality to another. They are greater and more perceptible in big localities or in those that had embryonic economic activities prior to the project. They are limited by the low rate of access and use. Social pricing adapted to users' capacity to afford energy services could further sustain such economic viability.
v)	Financial viability	2	The financial arrangement is not adapted to this type of project. Access to a greater number of users would likely sustain such financial viability. Networks built under the project are similar to SBEE's existing networks. In addition, customers who benefitted from the project are subject to the same commercial conditions as those applicable to existing customers. This is not appropriate for rural dwellers.

<b>PERFORMANCE EVALUATION OF THE PROJECT FOR THE ELECTRIFICATION OF 17 RURAL CENTRES IN BENIN</b>			
<b>No.</b>	<b>COMPONENT INDICATORS</b>	<b>Score (1 to 4)</b>	<b>REMARKS</b>
vi)	Institutional arrangements (effectiveness of institutions, organization and management)	2	The outcome of electrification projects is the extension of lines and the increase in the number of maintenance and repair equipment. Maintaining the same quality of services to customers before and after the project requires the establishment of new technical arrangements and/or the increase in the human and logistic resources of the operator. Given that the project did not introduce new technology, the demand for technical teams is bound to increase.
vii)	Environmental viability	2	The project had little impact on the environment due to persistent consumer habits, use of paraffin oil lamps and wood for cooking.
viii)	Resistance to external factors	2	The population serviced by the project is on average more sensitive than the rest of the population to exogenous factors, including the increase in oil prices which have heavy repercussions on the cost of electricity.
<b>6</b>	<b>Overall Performance Indicator</b>	<b>3</b>	Overall, the project has attained the expected short- and medium-term outcomes. The long-term outcomes are limited by low rates of access and especially commercial use. The sustainability of outcomes is still problematic. On the whole, in light of the key appraisal criteria, overall project performance is deemed satisfactory.

## Borrower's Performance

<b>PERFORMANCE EVALUATION OF THE PROJECT FOR THE ELECTRIFICATION OF 17 RURAL CENTRES IN BENIN</b>		
<b>Component Indicators</b>	<b>Score (1 to 4)</b>	<b>Remarks</b>
<b>1. <u>Preparation quality:</u></b>	<b>3</b>	Considered individually, the project was properly prepared. There is no master plan charting a clear vision for the electrification policy. The financing of counterpart contributions was taken into account. A pre-electrification campaign was conducted in some localities, with a view to familiarizing the rural population with the use of electricity. The Government is committed to improving the institutional framework of the energy sector.
- Control, participation of the beneficiaries		
- Government's commitment		
- Macroeconomic and sector policies		
- Institutional arrangements (financing of counterpart contribution)		
<b>2. <u>Implementation quality</u></b>	<b>2</b>	By and large, implementation quality is satisfactory as seen by the attainment of physical outputs
- Secondment of key staff	2	The Project Implementation Unit (PIU) did not receive adequate human resources from SBEE. In contrast, the engineering consultant was fully involved in project implementation. Members of the Unit were often overwhelmed by numerous external demands, resulting in lack of thorough action.
- Management performance of the Executing Agency	2	The Executing Agency did not have the autonomy necessary to run and manage the project. The PIU did not keep any account exclusive to the project, had no logistic resources for project supervision or any administrative, financial and accounting procedures manual.
- Mid-term adjustments	3	To cope with the needs of the populations of localities crossed by the project but not taken into account, the Borrower responded satisfactorily by providing additional funds needed to increase the number of localities to be electrified.
- Schedule and cost compliance	2	Changes made to the project and the complexity of the public procurement process in Benin has led to delays in works execution. The total project cost increased by 12% and was borne by the Government and SBEE. This allowed for the electrification of 11 additional localities.
<b>3. Fulfilment of procurement arrangement</b>	<b>2</b>	In all, procurement arrangements were complied with, notwithstanding significant delays in procurements and signing of contracts.
<b>4. Monitoring/evaluation and transmission of reports</b>	<b>2</b>	Even though they are part of the duties of the Executing Agency, quarterly progress reports started being transmitted to the Bank only during the second half of the implementation period. There was no monitoring/evaluation system for project outcomes. Regular changes in SBEE's management teams did not allow for on-going monitoring of the implementation of recommendations of Bank-fielded supervision missions.
<b>5. Satisfactory operations (where necessary)</b>	<b>2</b>	Considerable delays were reported after construction of the network. Similarly, problems relating to the connection of new customers still persist, due to difficulties facing SBEE. Some MV lines servicing the electrified localities are very long. This will likely reduce voltage quality for customers at the tail end of the line.
<b><u>Borrower's overall performance</u></b>	<b>2</b>	<b>Unsatisfactory</b>

**Bank's Performance**

<b>PERFORMANCE EVALUATION OF THE PROJECT FOR THE ELECTRIFICATION OF 17 RURAL CENTRES IN BENIN</b>		
<b>Component Indicators</b>	<b>Score (1 to 4)</b>	<b>Remarks</b>
<b>At identification</b>	<b>3</b>	Project identification began with the Government conducting a feasibility study before contacting the Bank. However, on receiving the study and the financing request, the Bank asked for a supplementary study to quantify the project's social and economic benefits.
- Project compliance with Government's development strategy	3	The project is consistent with the country's socio-economic development policy, which promotes the opening-up of rural areas, particularly by supplying electricity and improving the living conditions of the population. This policy was translated into the rural electrification programme embarked on since the 1970s and which is still topical.
- Project compliance with Bank's country strategy	3	The project ties with the Bank's strategy for the period under review in Benin, which aimed at reducing rural poverty and consolidating sustainable development.
- Government/beneficiary participation	3	Project identification began with the Government conducting a feasibility study before contacting the Bank.
- Innovative nature of the project	1	The Bank persistently believed that energy was an end in itself and failed to initiate attendant measures that would help to maximize the project's indirect impact on improvement of the living conditions of the rural population concerned.
<b>At project preparation</b>	<b>3</b>	The project met a real need of the population of rural centres. The Bank provided timely support.
- Soundness of the Bank's support	3	The project has met a real need of most rural dwellers who had no access to electricity. Given the available development potential, the project constitutes a choice instrument for curbing poverty and providing impetus to the country's socio-economic development. The Bank provided sound and timely support. It helped in preparing the operation by financing the study aimed at quantifying the project's social and economic benefits.
- Relevance of the Bank's support	3	

<b>PERFORMANCE EVALUATION OF THE PROJECT FOR THE ELECTRIFICATION OF 17 RURAL CENTRES IN BENIN</b>		
<b>Component Indicators</b>	<b>Score (1 to 4)</b>	<b>Remarks</b>
<b>At appraisal</b>	<b>3</b>	“Networks” components were properly appraised.
- Quality of the technical, economic, financial, institutional, social and environmental analyses	3	The quality of the technical, economic, financial, institutional, social and environmental analyses may be considered satisfactory, in spite of problems on the technical choices of 20Kv instead of 30-35Kv.
- Relevance of the conditions	3	The conditions precedent to first disbursement were relevant, particularly those concerning the establishment of the National Rural Electrification Fund whose resources should be channelled towards the development of rural electrification.
- Appropriateness of the lending instrument	3	The loan for this type of infrastructure projects was the most appropriate lending instrument, even though it was up to the Government to pay the political price of rural electrification – which is not financially cost-ineffective.
- Appropriateness of the financial arrangements	2	The State has not marshalled enough resources to fund the cost of its political decisions.
- Quality of co-ordination with other donors/partners	3	The project took account of the fact that the World Bank had to finance the institutional framework of the energy sector.
- Implementation and supervision plan (including performance indicators, appraisal criteria)	2	Given that the setting of objectives in the form of actions did not allow for clear delineation of the expected development outcomes, this limited the choice of performance indicators.
- Monitoring/Evaluation	1	The Monitoring/Evaluation system was not put in place.
<b>At supervision</b>	<b>3</b>	Operational and financial supervision missions have helped to identify implementation weaknesses and mitigate their adverse impact, even though the missions could not avoid project implementation delays.
- Suitability of Bank staff (skills, time and continuity)	2	Supervision mission teams did not include socio-economists who would have ensured that conditions geared towards improving the living conditions of the population concerned were fulfilled.

<b>PERFO</b>		
<b>PERFORMANCE EVALUATION OF THE PROJECT FOR THE ELECTRIFICATION OF 17 RURAL CENTRES IN BENIN</b>		
<b>Component Indicators</b>	<b>Score (1 to 4)</b>	<b>Remarks</b>
- Solution to problems	3	Bank interventions were central to consideration of the loan agreement for ratification by the National Assembly in extraordinary session. Despite the Bank's routine supervision missions, the project's financial management remained non-compliant with procedures in force.
- Sensitivity to situational changes	2	The project is sensitive to situational changes, particularly variations in commodity prices, especially oil.
- Appropriate monitoring of recommendations/decisions	2	The Bank was not thorough in monitoring recommendations and decisions owing to the fact that the problems and difficulties facing the PIU had been long overdue without being resolved.
- Realistic scores at CPPR/APPR	3	The portfolio review report considered operational performance satisfactory. End-of-project connection of users shows that this score was realistic.
- Attention to likely impact on social development	2	The attention paid to the project's impact on social development was not enough. The impact was supposedly obvious.
- Attention to sustainability issues	2	The good quality of physical outputs and the quest for political support were effective, but the conditions for sustaining the outcomes were not adequately considered at appraisal and supervision.
<b><u>Overall Bank Performance</u></b>	<b>3</b>	<b>Satisfactory</b>

## Performance Evaluation of the Project for the Electrification of 17 Rural Centres in Benin

### Factors Affecting Implementation Performance and Outcomes

Factors	Substan- -tial	Partial	Negli- -gible	N.A.	Remarks
<b>1. Not subject to Government control</b>					
1.1 World market price	-				
1.2 Natural events	-				
1.3 Bank's performance		+			
1.4 Performance of contractors/consultants	+				Improve the sustainability of installations and expertise of the executing agency
1.5 Civil war	-				
<b>1.6 Others (to be specified)</b>					
<b>2. Subject to Government control</b>					
2.1 Macro-economic policies	+				Political commitment with resource mobilization is crucial.
2.2 Sector policies	+				
2.3 Government's commitment	+				
2.4 Appointment of key staff	+				
2.5 Counterpart funds	+				
2.6 Administrative capacity	+				
2.7 Others (to be specified)					
<b>3. Subject to the control of the executing agency</b>					
3.1 Choice of techniques and technologies	-				
3.2 Staffing		-			
3.3 Monitoring and evaluation		-			
3.4 Participation of the beneficiaries		+			
<b>4- Factors affecting implementation</b>					
4.1 Over-estimation/under-estimation of material inputs, base unit costs		-			It is preferable to envisage all cases during the study and not at implementation
4.3 Quality of studies, appraisal and implementation	-				Modification of project scope/scale/design
4.5 Unrealistic implementation schedule		-			Demobilizing effect on the executing agency
4.6 Quality of management, including financial management		+			Non-compliant

Factors positively (+) or negatively (-) affecting the implementation and achievement of key objectives.

**MATRIX OF RECOMMENDATIONS AND FOLLOW-UP ACTIONS**

<b>BENIN – PROJECT FOR THE ELECTRIFICATION OF 17 RURAL CENTRES</b>			
<b>OBSERVATIONS/LESSONS</b>	<b>RECOMMENDATIONS</b>	<b>ACTIONS</b>	<b>RESPONSIBILITY</b>
<p>The project content underwent several changes. Throughout the project’s life cycle, localities were added to the project and others withdrawn depending, on changes in socio-economic requirements. In 2000, the final list was adopted and comprised 10 centres which formed part of the initial feasibility study financed by CIDA and 7 new centres. (1.2.5)</p>	<p>The Government should formulate an Electrification Master Plan for the country. This instrument is indispensable in establishing criteria for selecting localities, prioritizing and programming rural electrification projects.</p>	<p>Formulate a Rural Electrification Master Plan</p>	<p>GOVERNMENT</p>
<p>The electrification of several localities situated near the layout of the new network was financed by the project, thereby increasing their number from 17 to 28 localities. This unexpected increase in the number of localities shows the need to draw up an inventory and map the localities to be electrified, with a view to achieving the goal of a national average electrification rate of about 60% in 2015, as set forth in the programme of actions for the electrification of rural localities, adopted by the Government in March 2006 (4.1.5).</p>			
<p>Real political willingness, translated by the funding of rural electrification, underlies the successful implementation of this type of project which helps to meet the need for maintaining socio-political equilibria and ensuring nation-wide</p>	<p>The Government should finance rural electrification development investments under FNER or other capital subventions to be granted to SBEE.</p>	<p>Finance investments for rural electrification by the State.</p>	<p>GOVERNMENT</p>

**BENIN – PROJECT FOR THE ELECTRIFICATION OF 17 RURAL CENTRES**

<b>OBSERVATIONS/LESSONS</b>	<b>RECOMMENDATIONS</b>	<b>ACTIONS</b>	<b>RESPONSIBILITY</b>
balanced development. (5.2.1)	The Government should envisage appropriate recurrent cost-sharing between the various partners (national authorities and public operators) under rural electrification projects.	Conduct a study to identify the method of financing recurrent costs of electrification in low-income communes.	GOVERNMENT
Rural electrification can only be effective when attended by measures that help to improve access to and use of electricity, with a view to boosting local social and economic development (5.2.2)	The Government should maximize the indirect impact of electrification by improving its utilization as well as quantitative and qualitative accessibility, with a view to boosting all economic and social development sectors as well as human activities geared towards improving the living conditions of the rural population.	In rural electrification projects, choose the 30-35kV voltage grid and single-phase lines for small localities with predictably low economic development.	GOVERNMENT
It appears that the electrification project does not spontaneously engender a positive impact in rural localities and that the often approximate knowledge of the use of electric appliances limits the economic impact potential of electrification (4.1.32)		Organize briefing and sensitization sessions for beneficiaries on the benefits and economic potential of electricity.	GOVERNMENT
		Consider the possibility of entrusting the funding of rural electrification impact maximization to ABERME.	GOVERNMENT
The productive use of electricity, which helps to maximize its impact, requires actions that will likely improve the utilization and knowledge of the advantages of electrical appliances, and provide small-sized businesses with the financial resources to procure electrical equipment (5.2.3)	Accompany rural electrification projects with attendant measures, tested on a small scale, that help to benefit the most from the development potential offered by the project.	Develop micro finance services to enable small-sized businesses to procure electrical appliances and tools	GOVERNMENT
		Develop vocational training services and awareness campaigns focused on electrical equipment, with a view to improving knowledge on the use of electrical appliances.	GOVERNMENT
		Propose affordable connection fees	GOVERNMENT

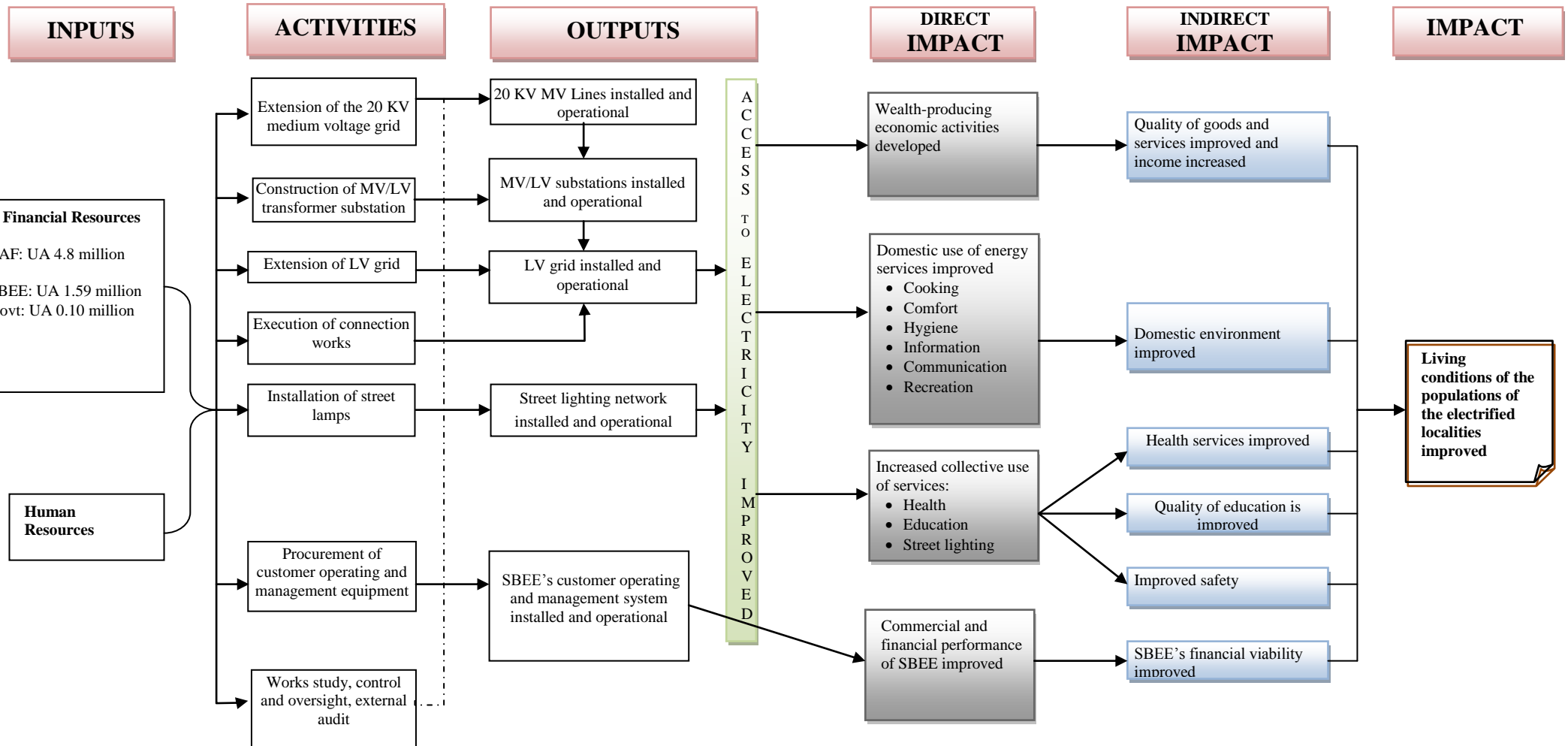
**BENIN – PROJECT FOR THE ELECTRIFICATION OF 17 RURAL CENTRES**

OBSERVATIONS/LESSONS	RECOMMENDATIONS	ACTIONS	RESPONSIBILITY
	The Bank should encourage and help countries to institute attendant measures with a view to maximizing the development outcomes of rural electrification projects.	For any rural electrification project, take account of attendant measures that should be financed by one of the stakeholders.	BANK
The control of clandestine electrical connections can be achieved through collective electricity metres and pre-paid meters, and especially through the extension of networks with a view to enabling more households to have access to electricity. (5.2.5)	Control the development of clandestine networks (cobwebs).	In areas crossed by a Medium Voltage (MV) network, delegate the installation and/or management of mini-electricity distribution systems to either a private-owned company or groups of users.	SBEE
		Initiate network extension projects.	<ul style="list-style-type: none"> <li>•GOVERNMENT</li> <li>•SBEE</li> </ul>
		Propose solutions anchored in the use of pre-paid meters.	SBEE
Rural electrification by network or small power station is considerably more advantageous than other alternative solutions (particularly standalone systems such as photovoltaic systems), and helps to increase the development impact associated with this type of project. (5.2.6)	Promote electrification through the extension of electricity interconnection networks and the use of hydro-electric power. This enables the greatest number of rural dwellers to have access to electricity at least cost.	Give priority to rural electrification through networks or small power stations.	<ul style="list-style-type: none"> <li>•GOVERNMENT</li> <li>•BANK</li> </ul>
The IFRR determined at appraisal and completion respectively stands at 2.1% and 12%. According to the completion report, the gap is due mostly to the increase in SBEE prices and estimates made on the number of customers which, starting 2007, should exceed the number projected at appraisal, i.e. 7,000 (4.1.38)	SBEE should do its utmost to secure a return on the investments made.	Connect the greatest number of customers to existing networks.	SBEE
		Improve the quality of electricity supplied.	
		Improve maintenance and collection services.	
		Adapt the price structure.	

**BENIN – PROJECT FOR THE ELECTRIFICATION OF 17 RURAL CENTRES**

<b>OBSERVATIONS/LESSONS</b>	<b>RECOMMENDATIONS</b>	<b>ACTIONS</b>	<b>RESPONSIBILITY</b>
<p>The quality of facilities built under the main contract by the contractor is better in terms of finishing than the additional ones built by SBEE teams on force account. (4.1.5)</p>	<p>The Bank should not encourage the execution of connection works on force account by the National Electricity Distribution Company.</p>	<p>Ensure that connection works are carried out by a specialized structure</p>	<p>BANK</p>
<p>The improvement of the living conditions of the population of electrified rural centres, which is difficult to quantify in the absence of tested methods, was approached through group discussions organized in various localities electrified under the project. (4.1.34)</p>	<p>The Bank should lay more emphasis on the monitoring/evaluation of the most significant outcomes of rural electrification and improvement of the living conditions of the populations, by combining participatory appraisal methods with socio-economic impact assessments. Such monitoring/evaluation should be conducted during the entire project cycle and beyond.</p>	<p>Conduct impact assessments</p>	<ul style="list-style-type: none"> <li>• BANK</li> <li>• GOVERNMENT</li> </ul>

**PPER BENIN PROJECT FOR THE ELECTRIFICATION OF 17 RURAL CENTRES  
LOGICAL FORMAT OF INTERVENTION**



**Performance Evaluation of the Project for the Electrification of 17 Rural Centres in Benin  
Retrospective Logical Framework Matrix**

HIERARCHY OF OBJECTIVES (HO)	EXPECTED OUTCOMES	OBJECTIVELY VERIFIABLES INDICATORS (OVI)				MEANS OF VERIFICATION (MOV)	MAJOR ASSUMPTIONS/ RISKS
		Indicator	Targets	At Completion	At Evaluation		
<b>Sector Objective</b>	<b>Long-Term Outcome</b>						
Improve rural population's access to electricity.	Improved living conditions of the population of electrified localities	Beneficiaries' assessment of living conditions in the localities	No target	Not appraised	Satisfactory	Discussions and Focus Group	
	<b>Intermediate Outcomes</b>						
	Improved quality of goods and services provided by economic activities	Beneficiaries' assessment of the quality of products and services provided	No target	Not appraised		Discussions and Focus Group	Producers of goods and services have the capacity to efficiently use electrical machines
	Increased job creation in the localities concerned	Beneficiaries' assessment of job creation	No target	Not appraised		Discussions and Focus Group	Attendant measures exist to financially and technically support initiatives geared towards the creation and improvement of electricity demand-enhancing activities
Improved domestic	Beneficiaries' assessment of the domestic environment	No target	Not appraised	The improvements were unanimously reported at Focus Group meetings to	Discussions and Focus Group	Awareness campaigns to	

HIERARCHY OF OBJECTIVES (HO)	EXPECTED OUTCOMES	OBJECTIVELY VERIFIABLES INDICATORS (OVI)				MEANS OF VERIFICATION (MOV)	MAJOR ASSUMPTIONS/ RISKS
		Indicator	Targets	At Completion	At Evaluation		
	environment				the population of the electrified localities. Quantification is rendered difficult by the status of local statistics.		sensitize households to the advantages of electricity
	Improved health services	Beneficiaries' assessment of health quality	No target	Not appraised		Discussions and Focus Group	Lump sums have been proposed to ease access to electricity and sensitization on the proper use of electricity
	Improved quality of education	Beneficiaries' assessment of the quality of education	No target	Not appraised			Discussions and Focus Group
	Increased safety in electrified rural centres	State of safety and external comfort in the localities	No target	Not appraised	Public safety improved as street lamps became operational. However, where defective lamps are not changed, safety quickly transitions to insecurity as soon as darkness sets in	Discussions and Focus Group	Resources are available for street lamp maintenance
	Improved SBEE financial viability	SBEE's financial viability	No target	Not appraised	Unsatisfactory	SBEE report	Rural-appropriate services are used to improve collection
<b>Specific Objectives</b>	<b>Immediate Outcomes</b>						
Improve the access of the population of the 17 rural centres to electricity	Wealth-producing economic activities developed	Assessment of electricity-induced improvements on the development of economic activities <ul style="list-style-type: none"> <li>Arts and crafts (types of machine and utilisation)</li> <li>Conservation of products for petty trade</li> <li>Refrigeration and freezing of beverages</li> </ul>	No target	Not appraised	The improvements were unanimously reported at Focus Group meetings to the population of the electrified localities. Quantification is rendered difficult by the status of local statistics.	Discussions and Focus Group  Discussions and Focus Group	Attendant measures exist to financially and technically support initiatives geared towards the creation and improvement of electricity demand-enhancing activities
	Improved domestic use of energy services	Assessment of electricity-induced improvements in households on: <ul style="list-style-type: none"> <li>Cooking method</li> <li>Refrigeration</li> <li>Use of Video, TV and small household appliances</li> </ul>	No target	Not appraised	The improvements were unanimously reported at Focus Group meetings to the population of the electrified localities. Quantification is rendered difficult by the status of local statistics.	Discussions and Focus Group  INS survey	Lump sums proposed to ease access to electricity and sensitization on the proper use of electricity

HIERARCHY OF OBJECTIVES (HO)	EXPECTED OUTCOMES	OBJECTIVELY VERIFIABLES INDICATORS (OVI)				MEANS OF VERIFICATION (MOV)	MAJOR ASSUMPTIONS/ RISKS
		Indicator	Targets	At Completion	At Evaluation		
		<ul style="list-style-type: none"> <li>Water pumping</li> <li>Communication (GSM)</li> </ul>					
	Increased collective use of energy services	<b>Education</b> <ul style="list-style-type: none"> <li>Education statistics</li> <li>Assessment of improvements brought about by electricity in the area of education</li> </ul>	No target	Not appraised	Average connection rates, which are still low, diminish the impact of electrification on education. For want of in-depth surveys and owing to the fact that pupils in electrified schools may come from electrified homes or not and other considerations, a quantitative approach to the impact of electricity on education is complex	Discussions and Focus Group  INS survey	Lump sums proposed to ease access to electricity and sensitization on the proper use of electricity
		<b>Health</b> <ul style="list-style-type: none"> <li>Health statistics</li> <li>Assessment of improvements brought about by electricity in the area of health</li> </ul>	No target	Not appraised	<ul style="list-style-type: none"> <li>The rate of attendance at health centres in some electrified localities (Segou and Séhoué) increased by 10%.</li> <li>The rate of attendance at the Aguégué maternity (lagoon village) increased from 73% in 2003 to 85% in 2007</li> <li>Three new private health units (including two specialized units) were established in Séhoué since 2007 and have contributed to meeting 45% of the demand</li> </ul>	Discussions and Focus Group INS survey	Lump sums proposed to ease access to electricity and sensitization on the proper use of electricity
		<b>Street Lighting</b> <ul style="list-style-type: none"> <li>Status of street lamps</li> </ul>	No target	Not appraised	<ul style="list-style-type: none"> <li>Several of them are not operational in small communes, for lack of resources to replace the lamps</li> </ul>	Discussions and Focus Group  Local district statistics	Resources are available for street lamp maintenance
	Improved SBEE commercial and financial performance	Timeframe for processing bills	No target	Not appraised	Data not available at SBEE	SBEE Reports	Rural-appropriate services are used to improve collection
		Timeframe for processing claims	No target	Not appraised	Data not available at SBEE	SBEE Reports	
		Credit coverage ratio	92% (reference, 2000)	Not appraised	Data not available at SBEE	SBEE Reports	

HIERARCHY OF OBJECTIVES (HO)	EXPECTED OUTCOMES	OBJECTIVELY VERIFIABLES INDICATORS (OVI)				MEANS OF VERIFICATION (MOV)	MAJOR ASSUMPTIONS/ RISKS
		Indicator	Targets	At Completion	At Evaluation		
<b>Inputs and Activities</b>	<b>Outputs</b>						
Connection of users	Electrification of localities	Number of electrified rural centres	17 by 2005	28 in 2005 (i.e. a 65% increase)	28 localities in 2009	Project documents	Measures taken to increase the connection rate
		Country's electrification rate	51 % in 2006 (against 10% in 1993)	51% in 2005	+0.7% in 2007 (Urban 52.35 % against 1.89% for rural)	Project documents SBEE Reports	
	Increased access of tertiary customers in the localities concerned	Number of connections (households)	7000 by 2005	3900 in 2005 (44%)	6440 in 2008 (92%). It is likely that the number of 7000 connected customers was only attained in 2009	Project documents SBEE Report	
		Volume of sales				Project documents SBEE Report	
	Increased access of domestic customers in the localities concerned	Number of tertiary sector customers connected	No target	Not appraised	<ul style="list-style-type: none"> <li>• 121 three-phased customers (4 cables)</li> <li>• 134 tertiary sector customers in three localities (Zé, Sékou and Toffo)</li> </ul>	Project documents SBEE Report	
		Volume of sales				Project documents SBEE Report and statistics	
Extension of 20 KV medium voltage grid	20 kV lines operational	Length of 20 kV MV lines installed	204.4 km of new three-phased lines	252.63 km in 2005	252.63 km in 2009	Project documents SBEE Reports	
		Length of mixed lines installed	25.3 km	49 km in 2005	49 km in 2009	Project documents SBEE Reports	
Construction of MV/LV transformer substations	MV/LV transformer substations operational	Number of operational MV/LV transformer substations	No target	Not appraised	Not appraised	Project documents SBEE Reports	
Extension of LV and distribution network	LV grid operational	Length of LV lines installed	52.5 km	90 km in 2005	90 km in 2009	Project documents SBEE Reports	
Installation of street lamps	Street lamps installed	Number of street lamps installed	400 by 2005	823 in 2005	823 in 2009	Project documents	

HIERARCHY OF OBJECTIVES (HO)	EXPECTED OUTCOMES	OBJECTIVELY VERIFIABLES INDICATORS (OVI)				MEANS OF VERIFICATION (MOV)	MAJOR ASSUMPTIONS/ RISKS
		Indicator	Targets	At Completion	At Evaluation		
Procurement of customer operating and management equipment	SBEE's customer operating and management system is operational	Status of procurement of customer operating and management equipment	Operating and management equipment procured	Operating and management equipment procured (operational?)	Operating and management equipment procured (operational?)	Rapports SBEE Project documents SBEE Reports	

## Performance Evaluation of the Project for the Electrification of 17 Rural Centres in Benin

### Calculation of Economic and Financial Return

#### ECONOMIC RETURN

##### 1. Methodology

It is established that the economic benefits ensuing from an electrification project are of various types: (i) there are benefits resulting from the substitution of factors; indeed, in the pre-project era and for various purposes (domestic including lighting, activities), a primary source of energy (paraffin oil) was used, whereas during the project, electricity is used and there is a possibility of determining its economic cost; the difference of economic costs of factors between both situations will give the project's economic benefits; (ii) there are also economic benefits stemming from the increase in (production) activity engendered by the availability of electricity. It is observed that with the advent of electricity, there is generally a development of economic activities (development of existing economic activities, creation of new project-induced activities).

##### 2. Assumptions

**Increase in the number of customers:** The analysis of restituted data relating to the increase in the number of customers in some localities and the extrapolation of outcomes from all the localities shows that the objective of connecting 7000 customers was achieved only towards 2009. The rate of increase in the number of customers, which is high during the early years following entry into service, diminishes over time.

**Financing investments:** It is assumed that no additional investments will be financed by SBEE (and hence local government authority) for the connection of new customers, given that the initial investment has enough potential for such connections.

**Increase in electricity consumption per customer:** The same restituted data shows that average consumption per customer (for all types of use) stands at about 600 kWh. This value will increase with time, the more so during the early years.

**Breakdown of electricity consumption by use:** The consideration of the electricity consumption tariff structure for 2008 in Benin shows that overall consumption by tertiary customers and small-scale industry (tariff BT2) accounts for 31% of overall low voltage consumption. For the purpose of calculating the economic return, it is assumed that during the early years of electrification, this percentage will be low (given that the impact on activities will increase with time) and will get closer to the national average towards year twenty.

### Before the Project

- Tertiary customers and petty trades could obtain electricity by producing it themselves through small power generators. In order to factor in the operating cost and maintenance fees, it is estimated that the cost price per kWh produced will stand at about 150% of the cost of fuel. For a specific consumption of 400 grams of GO per kWh and the price of USD 800 per tonne of GO, the price of fuel would be CFAF 140 and the cost price per kWh produced would be CFAF 210. This figure seems to be more plausible in the sense that the cost price of energy self-generated by SBEE in 2008 stands at CFAF 165.5, including CFAF 114 for fuel.
- Domestic customers use paraffin oil for lighting. Based on information gathered during group discussions, it is estimated that each household consumes ten litres of paraffin oil per month exclusively for lighting.

### After Project Implementation

- Tertiary sector customers and petty trades will generate savings on production factors resulting from the difference between the pre-project cost price and the SBEE (economic) cost price.
- With respect to lighting, domestic customers may generate savings amounting to:  $ppo \times month \times cpo - (lamp \times day \times hours \times Cpr \times month)/1000 = 33\,360$  rounded up to CFAF 35 000/year and per customer.

*With the following ratings:*

Variable	Value	Definition
ppo	350	Price (Exclusive of Taxes) of paraffin oil (CFA/l)
month	12	Nb of months per year
cpo	10	Monthly consumption of paraffin oil (l/month)
lamp	40	Wattage of a lamp (W)
day	30	Nb of days per month
hours	6	Average Nb of lighting hours per day
Cpr	100	Cost price (Exclusive of Taxes) per kWh SBEE (CFA F/kWh)

### Results:

Two return assessments will be conducted:

#### **Consideration of Sole Gains from Factor Cost Savings**

A first assessment – by default - where only benefits from economic gains are obtained from factor costs (between both situations – reference/project). This estimate is obviously done by default, given that it discards the economic benefits of the economic surplus generated by economic activities induced by the electrification project. The Economic Rate of Return calculated taking into account only capital gains savings as specified above, is estimated at between **7.9%** and **13.6%**.

### Consideration of Economic Surplus Generated by Project-induced Economic Activities

A second assessment was conducted while taking into account the benefits over factor costs and economic surplus generated by project-induced economic activities. The first evaluation implicitly presupposes that economic activity is the same before and after the project, i.e. the presence of electricity did not engender any induced activities which would not have existed without electrification.

It is difficult to conduct a direct estimate of this economic surplus, given that such direct assessment presupposes the existence of resources: identification of these new activities (and old ones that have been developed, thanks to the project), productions and supplementary value added. This would have required in-depth surveys.

Hence, an indirect estimate has been conducted in accordance with the following procedure:

- Starting from the real field observation (particularly in group discussions) which is the stimulation of economic activity in a number of electrified centres;
- The establishment of a time-path of production activities (tertiary and small-scale industrial activities) in terms of electricity consumption. Indeed, in Benin, electricity consumption for economic purposes slightly exceeds 30% on average. Based on the dynamics observed in the development and creation of economic activities, the share of electricity consumption for tertiary purposes (i.e. destined for economic activities) will increase to reach the national average i.e. 30% in the long run (in 15-20 years);
- The establishment of a link between energy consumption (electricity in this case) and the creation of value added. To that end, energy intensity is an average ratio expressing, at country level, the value of GDP with respect to total consumption of primary energy. In the case of Benin, this intensity is high; in 2007, it was estimated at USD 4/kg of oil equivalent<sup>24</sup>. In other words, the calculation gives an economic surplus ratio (increase in value added) of USD 1.6/kWh (of tertiary consumption), i.e. CFAF 788/kWh consumed, as at 2007. The latter figure is bound to increase in future as the energy intensity ratio improves. On a conservative basis, the ratio of CFAF 788 /kWh of energy consumed by the tertiary sector will be adopted throughout the project's life cycle. Of course, this ratio is applicable only to activities induced by the project (and not already existing ones).

This approach generates a very comfortable IERR, estimated at **17.78%** to **25.9%**. This figure, which is beneficial to the project, translates the intense economic impact of induced activities, which is the core economic advantage. This underscores the importance of recommendations on impact maximization by stimulating economic activities through appropriate attendant measures.

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<sup>24</sup> IBRD: Country Assistance Strategy, Benin 2009-2012- page 77

Table 1: Schedule of (economic)Costs and Benefits-

Sole Consideration of Factor Cost Gains

Year	Customers	kWh/Customer	kWh total (KWh)	productive Kwh (KWh)	Factor Cost Gains (in CFA F million)		Investment (In CFA F million)	Advantages (in CFA F million)
					Tertiary Economy	Domestic Customers		
2002							27.923	- 27.923
2003							1,559.551	- 1,559.551
2004							1,932.160	- 1,932.160
2005	3,000	600	1,800,000	90,000	9.900	99.750	1,589.587	- 1,479.937
2006	3,750	690	2,587,500	129,375	14.231	124.688		138.919
2007	4,688	794	3,719,531	185,977	20.457	155.859		176.317
2008	5,859	913	5,346,826	534,683	58.815	184.570		243.385
2009	7,324	1,049	7,686,063	768,606	84.547	230.713		315.260
2010	8,789	1,154	10,145,603	1,014,560	111.602	276.855		388.457
2011	10,547	1,270	13,392,196	2,008,829	220.971	313.770		534.741
2012	12,656	1,397	17,677,698	2,651,655	291.682	376.523		668.205
2013	14,555	1,536	22,362,288	3,354,343	368.978	433.002		801.980
2014	16,738	1,690	28,288,294	4,243,244	466.757	497.952		964.709
2015	19,249	1,775	34,158,115	6,831,623	751.479	538.960		1,290.439
2016	21,173	1,863	39,452,623	7,890,525	867.958	592.856		1,460.814
2017	23,291	1,956	45,567,780	9,113,556	1,002.491	652.142		1,654.633
2018	25,620	2,054	52,630,786	10,526,157	1,157.877	717.356		1,875.233
2019	28,182	2,157	60,788,558	15,197,139	1,671.685	739.773		2,411.459
2020	31,000	2,265	70,210,784	17,552,696	1,930.797	813.751		2,744.547
2021	32,550	2,378	77,407,390	19,351,847	2,128.703	854.438		2,983.141
2022	34,178	2,497	85,341,647	21,335,412	2,346.895	897.160		3,244.055
2023	35,886	2,622	94,089,166	28,226,750	3,104.942	879.217		3,984.159
2024	37,681	2,753	103,733,305	31,119,992	3,423.199	923.178		4,346.377

IERR 13.6%  
NPV(12%) 719 CFA F Million

Assumption 1					
	2009-2012	2013-2015	2016-2020	2021-2024	
- Rate of increase in the number of customers (/year)	20%	15%	10%	5%	
	2009-2012	2010-2014	2015-2024		
- Rate of increase in average consumption /customer (/year)	15%	10%	5%		
- Ratio of domestic customers/total customers	2009-2010	2011-2014	2015-2018	2019-2022	2022-2024
	90%	85%	80%	75%	70%
- Difference in (economic) cost per KWh individual generator- KWh SBEE- (in CFA F/KWh)	110				

With inadequate information on the number of years which is yet crucial for the outcomes, a consideration of the following most conservative assumptions will give:

IERR 7.9%  
NPV (12%) CFAF 1,325 Million

Assumption 2					
	2009-2012	2013-2015	2016-2020	2021-2024	
- Rate of increase in the number customers (/year)	5%	10%	10%	5%	
	2009-2012	2010-2014	2015-2024		
- Rate of increase in average consumption /customer (/year)	5%	10%	5%		
- Ratio of domestic customers/total customers	2009-2010	2011-2014	2015-2018	2019-2022	2022-2024
	90%	80%	85%	80%	70%
- Difference in (economic) cost per KWh standalone generator- KWh SBEE- (in CFAF/KWh)	110				

**Table 2: Schedule of (economic)Costs and Benefits-**

**Consideration of Economic Surplus Generated by Project-induced Economic Activities**

Year	Customers	kWh/customer	kWh total (KWh)	Kwh productive (KWh)	Advantages		Investment (In CFA F million)
					Factor Cost Gains (in FCFA F million)	Economic Surplus (induced economic activities )*	
2002							27.923
2003							1,559.551
2004							1,932.160
2005	3,000	600	1,800,000	90,000	109.650	0	1,589.587
2006	3,750	690	2,587,500	129,375	138.919	0	
2007	4,688	794	3,719,531	185,977	176.317	0	
2008	5,859	913	5,346,826	534,683	243.385	199	
2009	7,324	1,049	7,686,063	768,606	315.260	285	
2010	8,789	1,154	10,145,603	1,014,560	388.457	377	
2011	10,547	1,270	13,392,196	2,008,829	534.741	995	
2012	12,656	1,397	17,677,698	2,651,655	668.205	1,313	
2013	14,555	1,536	22,362,288	3,354,343	801.980	1,661	
2014	16,738	1,690	28,288,294	4,243,244	964.709	2,101	
2015	19,249	1,775	34,158,115	6,831,623	1,290.439	3,806	
2016	21,173	1,863	39,452,623	7,890,525	1,460.814	4,396	
2017	23,291	1,956	45,567,780	9,113,556	1,654.633	5,078	
2018	25,620	2,054	52,630,786	10,526,157	1,875.233	5,865	
2019	28,182	2,157	60,788,558	15,197,139	2,411.459	9,031	
2020	31,000	2,265	70,210,784	17,552,696	2,744.547	10,431	
2021	32,550	2,378	77,407,390	19,351,847	2,983.141	11,501	
2022	34,178	2,497	85,341,647	21,335,412	3,244.055	12,679	
2023	35,886	2,622	94,089,166	28,226,750	3,984.159	17,474	
2024	37,681	2,753	103,733,305	31,119,992	4,346.377	19,265	

\* GDP Surplus (CFA F/KWh) 742.9

**IERR 25.92%**  
**NPV (12%) 13,547 CFA F Million**

<b>Assumption 1</b>	2009-2012	2013-2015	2016-2020	2021-2024
- Rate of increase in the number customers (/year)	20%	15%	10%	5%
	2009-2012	2010-2014	2015-2024	
- Rate of increase in average consumption /customer (/year)	15%	10%	5%	
- Ratio of domestic customers/total customers	2009-2010	2011-2014	2015-2018	2019-2022
	90%	85%	80%	75%
- Difference in (economic) cost per KWh individual generator-KWh SBEE- (in CFA F/KWh)	110			

Conservative assumptions give:

**IERR 17.78%**  
**NPV (12%) CFAF 3,321 Million**

## FINANCIAL RETURN

### Introduction, Basic Considerations

The financial return of this project expresses the project operator's point of view. Under the current project arrangements, it is difficult to generate adequate return on this Rural Electrification Project. There are several determining factors for such a return:

- First, rural electrification through the development of a conventional network, as in this case, is undermined – with respect to financial return – by the weakness of the target market regarding the requisite investment;
- A second limiting factor is the fact that the public operator (service concessionaire) has to finance almost the entire investment;
- A third crucial factor is the electricity production cost compared to its marketing price. If the gap between the average production cost and the prices (set by the government), leaves a little profit margin (or no margin, or even a negative margin) to the operator providing the service, the financial return on any network development undertaken by this operator will definitely be problematic.

It can be stated that all three undermining factors have plagued the SBEE, thereby generating extremely low Financial Rates of Return at various stages of the project. It is worth noting that: (i) demand in the localities was low not only at the beginning (objectives) but also during the early years of operation, so much so that these objectives could only be achieved with a slippage of 3 to 4 years; (ii) almost the entire project (development ) cost was funded by SBEE; furthermore, the SBEE loan conditions entail an additional cost with respect to the base cost of the ADF soft loan; (iii) the gap (or margin) between the cost price (at network entry) of electricity and the average selling price tends to narrow, and is even inverted (negative margin) as the electricity self-produced by SBEE gradually increases under less advantageous conditions than those of CEB. While it is true that the gap adopted during the completion report (2006) stood at CFAF 29/kWh (selling price of CFAF 84/kWh against CEB/SBEE average cost price of CFAF 55/kWh), it should be acknowledged also that it is currently inverted (CEB/SBEE average cost price stands at CFAF 115/kWh, compared to an average selling price below CFAF 100/kWh!).

### Simulations

To assess the project's financial return, various simulations were made with a view to shedding light on this issue. Several scenarios were tested:

- First, the recalculation of the return similar to that of the PCR (investments fully funded by the operator) with 3 scenarios (1, 2 and 3). For purposes of information, the scenario restates the entry and exit prices adopted during the PCR with an attendant adjustment to demand trends. With respect to the previous scenario, Scenario 2 modifies the lending conditions for the operator and is the more realistic (+3% on interest rate). Lastly, with respect to the second previous, Scenario 3 modifies the entry/exit price of electricity (average cost price/average marketing price ) to reflect the current environment;

- Thereafter, with the predictable growth in the volume of both factors (gap between entry/exit prices, funding of investment), three cases were tested (Scenarios 4.1, 4.2, 4.3) simulating different rates of investment funding and a bracket of margin on distribution.

### **Outcomes:**

The outcomes summarized in the following table show the absence of financial return on this type of project and under current conditions defined by two determining factors: (i) a distribution margin turned negative with the current cost price of electricity production (by CEB weighted billing costs and the cost price of SBEE self-production); (ii) total funding of investments by SBEE and –in addition- lending costs higher than the ADF loan.

An analysis of the conditions for the restoration of the operator's financial return reveals:

- The need to reflect on distribution solely for this type of project, in which case, the margin on distribution needs to be considered. That means production-related issues and pricing policy further fall under the jurisdiction of the sector department;
- The need to review the financial arrangements of this type of project. Such a review ties with reforms undertaken with the establishment of ABERME and the Rural Electrification Fund (FER).
- In any case, it seems obvious that return on this project may only be achieved by combining both objectives mentioned: maintaining a minimal margin on distribution of CFAF 10/kWh and limiting the operator's share in investment funding to 20-25%, which generally corresponds to the LV component.

No.	Assumption Scenario	Average Selling (CFAF/KWh)	Gap at Entry (CFAF/KWh)	Outcomes		Remarks
				IFRR	NPV (12%) (in CFAF million)	
1	Assumption (entry cost/selling price) similar at PCR Financing charges defrayed without additional lending cost	84	28.6	10.5%	-614	Return slightly lower than 12% of PCR - reason: lower demand trend, financing charges defrayed - simulation for information purposes but not realistic.
2	Same as Scenario 1 – but with harsher lending conditions (+3% interest rate)	84	28.6	9.3%	-1,114	Impact of lending conditions: loss of one return point. However, scenario still not realistic with respect to entry costs
3	Financing of real average entry cost as currently is, without subsequent deterioration- Financing charges defrayed as in Scenario 1	87 (2008)	-28	Negative cash flow Series	-8,401	Deficit operation owing to a negative margin on distribution

No.	Assumption Scenario	Rate of Investment Funding by SBEE	Margin (CFAF/KWh)	IFRR	NPV (CFAF Million)	Remarks
4	Scenario test on: (i) distribution margin; (ii) investments funding by SBEE					
4.1	Total investment funding	100%	10	0.4%	-3,200.3	It may be observed that total investment funding by the operator requires a high margin on distribution, close to CFAF40/kWh to provide the operator with minimal financial return
			15	3.8%	-2,640.3	
			22.5	7.2%	-1,800.3	
			30	9.7%	-960.3	
			39	12.1%	47.7	
4.2	Investment funding to the tune of 25%	25%	10	12.3%	39.9	With the operator's contribution to investment to the tune of 25%, a limited margin on distribution of CFAF10/kWh provides the operator with minimum financial return
			15	16.3%	599.9	
			22.5	20.7%	1,440.0	
			30	24.1%	2,280.0	
			39	27.5%	3,288.0	
4.3	Investment funding to the tune of 20%	20%	10	14.5%	256.0	With a 20% contribution, a limited margin on distribution of CFAF 10/kWh provides the operator with acceptable financial return
			15	18.7%	816.0	
			22.5	23.3%	1,656.0	
			30	27.0%	2,496.0	
			39	30.6%	3,504.0	

As instances of load-shedding became increasingly frequent and unbearable, SBEE was commissioned by the Beninese Government to implement actions necessary to achieve “zero load-shedding”. This decision requires, for SBEE, the rental of electricity generators to offset CEB’s weaknesses. Energy produced by SBEE, which only accounted for 11.67% of overall needs in 2004, was estimated at close to 25% for 2007 and 2008. Self-produced quantities increased from 69.306 GWh in 2004 to 196.604 GWh in 2008. The repercussion of this situation on the cost price per kWh was instant. While the average selling price per kWh stood at CFAF 84 in 2006 and did not exceed CFAF 100 in 2009, the cost price per kWh distributed by SBEE reached CFAF 101.4 in 2006, CFAF 103.67 in 2007 and CFAF 115.07 in 2008. The cost of kWh self-produced by SBEE increased to CFAF 124.45 in 2006, CFAF 115.2 in 2007 and CFAF 165.49 in 2008.

SBEE - Cost Price of Distributed Electricity (CFAF/kWh)

Year	CEB Purchase	SBEE Production Cost		SBEE Cost Price per kWh Distributed
		Fuel Share	Total	
2004	50	57.63	77	84.09
2005	50	81.52	104.85	89.41
2006	50	94.53	124.45	101.40
2007	50	90.32	115.20	103.67
2008	50	114.32	165.49	115.07

Source: SBEE Analytical Accounting

To cope with SBEE’s financial situation which is deteriorating by the day, the Beninese Government agreed to release funds to bail out the company. However, there is persistent “misunderstanding” regarding the appropriation of these funds. SBEE considers them as a subvention representing the price of Government’s decision to achieve “zero load-shedding”, whereas the State considers them as debt.

## Performance Evaluation of the Project for the Electrification of 17 Rural Centres in Benin

### Improvement of Basic Services: Education, Health

Improvements recorded in both basic services were unanimously reported during various focus group meetings held to assess the impact on the population of the electrified localities.

#### *Education:*

At the quantitative level, established improvements are not documented in the general statistics or even at the decentralized level (councils, schools, health centres). At the central level, the statistical system is so aggregated that specific impacts (at the level of the electrified localities and even districts) are not noticeable.

Furthermore, other determining impacts have distorted the statistics: wide-ranging changes in teaching methods, fluctuation in resources appropriated to educational units, household income differential which creates gaps between pupils (or between schools depending on the pupils' place of origin) with respect to school results, etc.

While bearing in mind the real difficulties experienced in defining the quantitative impact of electrification on the educational system, it should be acknowledged that elements in some villages that had benefitted from the project reveal that given the gradual nature of electrification, average connection rates are still so low that the impact of electrification is low and slow. At the level of schools situated in electrified villages, pupils may come from electrified or non-electrified homes, as has been observed in some localities. This situation and many others reveal the complexity of a quantitative approach to the impact of electricity on education, in the absence of in-depth surveys.

To illustrate these impacts, the situation will be presented as it prevails in two localities: Aguégues and Bonou. The tables below show school results in a number of schools in both localities:

AGUEGUES								BONOU							
<b>Table 1: CEP Success Rate</b> Ouèdomè I School Electrified Locality; Electrified School								<b>Table 5: CEP Success Rate</b> Ahouanzonmè: Non-electrified Locality							
Year	2003	2004	2005	2006	2007	2008	2009		2003	2004	2005	2006	2007	2008	2009
Registered			31	31	41	28	49	Registered	62	101	106	47	56	67	71
Passed			31	31	38	24	46	Passed	12	47	27	47	34	31	34
Success Rate			100%	100%	93%	86%	94%	Success Rate	19%	47%	25%	100%	61%	46%	48%
<i>Source: Headmaster -</i>								<i>Source: Headmaster - via - Council Secretary-General</i>							

*Source: Headmaster -*

**Table 3: CEP Success Rate**

Bebè  
Non Electrified Locality

Year	2004	2005	2006	2007	2008	2009
Registered	13	12	10	21	18	28
Passed	12	12	10	17	11	23
Success Rate	92%	100%	100%	81%	61%	82%

*Source: Headmaster-*

*Not far from an electrified locality called Ahozin: every evening, children go to Ahozin to study at night.*

*Source: Headmaster-*

*via - Council Secretary-General*

**Table 4: CEP Success Rate**

Donoukpa: Locality not electrified by the project  
Received energy by solar panels degraded in 2004

	2003	2004	2005	2006	2007	2008	2009
Registered	45	52	48	62	85	85	83
Passed	33	17	2	25	27	27	6
Success Rate	73%	33%	4%	40%	32%	32%	7%

*Source: Headmaster-*

*High poverty rates: there are no resources to buy lanterns for every pupil (Statement by Headmaster).*

## Health

The impact in this case may stem from at least 2 factors: (i) a first factor pertaining to the electrification of homes, which helps to improve the quality of food preservation. However, neither the cooking habits nor the capacity to own refrigeration appliances may allow for presuming that this factor will have a positive impact on health; (ii) the second factor is merely the improvement expected of the electrification of health centres. This impact was largely emphasized by beneficiaries and local health professionals during focus group meetings.

The documentation collected in a few localities electrified by the project is shown in the table below:

Type of centre	Equipment	Year of installation	2003	2005	2009	Augmentation période (2003-2009)	Taux annuel moyen d'augmentation
Public		Prior to 2003	3,715	2,907	3,737		
Private I		Prior to 2003	800		770		
Private II		2007			1,030		
Private III	Labo	2006			785		
Private IV	Labo echography	2008			1,760		
Total			4,515		8,082	79%	10.2%

*Source: All Sèhouè Health centres*

**Performance Evaluation of the Project for the Electrification of 17 Rural Centres in Benin**

**List of Electrified Localities**

DEPARTMENT	No.	LOCALITY	SATUS	POPULATION 2002			POPULATION 2006			Ménage
				Total	Male	Female	Total	Male	Female	
DONGA	1	Copargo	Initial	19,020	9,458	9,562	21,742	10,812	10,930	
	2	Kpabegou	Supplementary							
BORGOU	3	N'dali	Supplementary	15,314	7,643	7,671	18,226	9,085	9,141	
COLLINES	4	Bantè	Initial	15,297	7,448	7,849	17,858	8,745	9,113	
	5	Doïssa	Supplementary							
	6	Kpataba	Supplementary	9,474	4,579	4,895	11,060	5,377	5,683	
	7	Mamatoké	Supplementary							
	8	Gouka	Supplementary	13,765	6,726	7,039	16,070	7,897	8,172	
	9	Agoua	Supplementary	18,226	9,085	9,141	7,326	3,547	3,779	
ZOU	10	Djidja	Initial	15,549	7,481	8,068	17,457	8,443	9,015	
	11	Ouinhi	Initial	11,552	5,711	5,841	12,972	6,445	6,526	
	12	Za-kpota	Initial	16,994	7,742	9,252	19,075	8,737	10,338	
	13	Don-Tan	Initial	4,331	2,131	2,200	4,863	2,405	2,458	
	14	Gbanamè	Initial							
ATLANTIQUE	15	Toffo	Initial	4,890	2,317	2,573	5,986	2,843	3,143	
	16	Zé	Initial	10,987	5,282	5,705	13,449	6,481	6,968	
	17	Sékou	Initial	16,124	7,678	8,446	19,737	9,421	10,316	
	18	Agbotagon-Dame	Initial							
	19	Sèhoué	Initial	12,081	5,798	6,283	14,788	7,114	7,674	
	20	Agon	Supplementary							
OUEME	21	Aguégué	Initial	26,650	13,333	13,317	30,499	15,214	15,285	
	22	Vakon-Djigbé-Hozin	Initial	20,541	9,874	10,667	23,510	11,267	12,243	
	23	Bonou	Initial	7,787	3,680	4,107	8,913	4,199	4,714	
	24	Affamé	Supplementary	7,269	3,447	3,822	8,320	3,933	4,387	
	25	Atchonsa	Supplementary	6,007	2,836	3,171	6,876	3,236	3,640	
	26	Akpadanou	Supplementary	6,158	2,903	3,255	7,049	3,313	3,736	
	27	Ouegbossou	Supplementary							
PLATEAU	28	Sakété	Initial	8,418	3,832	4,586	9,545	4,365	5,180	

**Performance Evaluation of the Project for the Electrification of 17 Rural Centres in Benin  
Evaluation Matrix**

Criteria	Question /Heading	Sub-Questions	Appraisal Criteria	Information Sought and Indicators	Sources of Information	Information Gathering Methods
<b>Relevance and Quality at Entry</b>	Was the project consistent with the country's needs and priorities?		Rural electrification was among Benin's priority projects	Indication of rural electrification as priority of the Government Programme of Action (GPA) 1997-2001	<ul style="list-style-type: none"> <li>• ADB</li> <li>• Ministry of Mines, Energy and Water Resources</li> <li>• Ministry of Forward-Planning, Development, Evaluation of Public Policies and Coordination of Government Action</li> </ul>	<ul style="list-style-type: none"> <li>• Secondary data</li> <li>• Interviews</li> </ul>
	Was the project compliant with Bank policies and strategies?	Was the project compliant with overall Bank policies and strategies?	Rural electrification or infrastructure is among the Bank's overall strategic priorities (vision)	Indication of rural electrification as a priority in the (overall and sector) Bank Group Strategy for 1999- 2001 and previous years	ADB	Secondary data
		Was the project compliant with the Bank's sector policies and strategies?	Rural electrification or infrastructure is among the Bank's sector strategic priorities.			
To what extent was quality at project entry satisfactory?	To what extent were project activities consistent with the objectives and expected outcomes?	Quality of activities with respect to objectives and expected outcomes	Project documents (preparation, appraisal, mid-term review, completion reports, etc.)	* ADB,	<ul style="list-style-type: none"> <li>• Secondary data</li> <li>• Interviews</li> </ul>	

Criteria	Question /Heading	Sub-Questions	Appraisal Criteria	Information Sought and Indicators	Sources of Information	Information Gathering Methods
		To what extent has the project incorporated baseline data and appropriate outcome indicators?	Availability and quality of baseline data	Project documents (preparation, appraisal, mid-term review, completion reports, etc.)	* ADB	<ul style="list-style-type: none"> <li>• Secondary data</li> <li>• * Interviews</li> </ul>
<b>Relevance and Quality at Entry (Cont'd)</b>	To what extent has the project enabled the supply of electric power to tertiary sector customers?	To what extent has the project enabled the supply of electric power to tertiary sector customers at project completion?	Number of tertiary sector customers at project completion	Tertiary sector consumption in the localities at project completion	SBEE statistics	<ul style="list-style-type: none"> <li>• Secondary data</li> <li>• Interviews</li> </ul>
		To what extent has the project enabled the supply of electric power to tertiary sector customers who showed up after the electrification of localities?	Current number of tertiary sector customers	Number, consumption and date of entry into service of current tertiary sector customers		
<b>Effectiveness</b>	To what extent has the project enabled the supply of electricity to domestic customers?	To what extent has the project enabled the supply of electricity to domestic customers at project completion?	Number of localities electrified at project completion	Implementation rate at appraisal	SBEE Project Implementation Unit	<ul style="list-style-type: none"> <li>• Secondary data</li> <li>• Interviews</li> </ul>
			Number of connections made at project completion	Rate of access to electricity by locality		

Criteria	Question /Heading	Sub-Questions	Appraisal Criteria	Information Sought and Indicators	Sources of Information	Information Gathering Methods
		To what extent has the project enabled the supply of electricity to domestic customers as at today?	Number of electrified localities	Increase in the number of customers at project completion	SBEE statistics	<ul style="list-style-type: none"> <li>• Secondary data</li> <li>• Interviews</li> </ul>
			Number of connections executed	Current rate of access to electricity by domestic customers by locality		
<b>Effectiveness (Cont'd)</b>	To what extent has the project contributed to street lighting in the localities concerned by the project?		Street lamps effectively operational in the various localities	<ul style="list-style-type: none"> <li>• Identification of the duties of SBEE, communes, and others in the operation and maintenance of street lighting networks</li> <li>• Availability rate</li> </ul>	<ul style="list-style-type: none"> <li>• SBEE statistics</li> <li>• Communes</li> </ul>	<ul style="list-style-type: none"> <li>• Secondary data</li> <li>• Interviews</li> </ul>
	To what extent has the project allowed for effective commercial and financial management of SBEE?	To what extent has the project instituted an effective commercial management of customers (claims, billing)?	Claims and bills processing timeframe	<ul style="list-style-type: none"> <li>• Customer management process.</li> <li>• Average time needed to follow up on a claim</li> </ul>	SBEE statistics	<ul style="list-style-type: none"> <li>• Secondary data</li> <li>• Interviews</li> </ul>
		To what extent has the project established an SBEE customer bill collection system?	Status of outstanding bills	Bills collection rate		
	To what extent has the project enabled the development of economic activities: arts and crafts, agriculture, services, etc.?	To what extent has the project enabled the development of economic activities: arts and crafts, agriculture, services, etc. at project	Electricity consumption for tertiary sector customers of the electrified localities	Tertiary sector consumption in localities electrified at project implementation	SBEE statistics	<ul style="list-style-type: none"> <li>• Secondary data</li> <li>• Interviews</li> </ul>

Criteria	Question /Heading	Sub-Questions	Appraisal Criteria	Information Sought and Indicators	Sources of Information	Information Gathering Methods
		implementation ?				
		To what extent has the project enabled the development of economic activities: arts and crafts, agriculture, services, till date?		Current tertiary sector consumption in electrified localities		
<b>Effectiveness (Cont'd)</b>	To what extent has the project enabled sustained access to basic services by the inhabitants of the electrified localities?	To what extent has the project enabled sustained access to education by the inhabitants of the electrified localities?	<ul style="list-style-type: none"> <li>• Level of enrolment prior to the project and currently</li> <li>• Level of enrolment into Primary 1 (CP 1) prior to the project and currently</li> </ul>	School statistics or findings of household surveys, particularly the enrolment rate and rate of enrolment into Primary 1 (CP 1)	<ul style="list-style-type: none"> <li>• Institute of Statistics,</li> <li>• Ministry of Education (Provincial Directorates of Education),</li> <li>• SBEE,</li> <li>• Communes</li> <li>• Focus Group</li> </ul>	<ul style="list-style-type: none"> <li>• Secondary data</li> <li>• Interviews,</li> <li>• Focus Group</li> </ul>
		To what extent has the project enabled sustained access to healthcare by the inhabitants of the electrified localities?	Health infrastructure	Statistics on household health survey (number of health units (hospitals, dispensaries, infirmaries, etc.))	<ul style="list-style-type: none"> <li>• Institute of Statistics (including the findings of household surveys),</li> <li>• Ministry of Health,</li> <li>• SBEE,</li> <li>• Local districts (communes),</li> <li>• Focus Group</li> </ul>	
	To what extent has the project	To what extent do businesses	Opinion of the inhabitants, traders	Closing hours and night-time business activity	<ul style="list-style-type: none"> <li>• Local districts</li> </ul>	<ul style="list-style-type: none"> <li>• Interviews</li> </ul>

Criteria	Question /Heading	Sub-Questions	Appraisal Criteria	Information Sought and Indicators	Sources of Information	Information Gathering Methods
	contributed to improving safety in the electrified localities?	stay open for longer periods of time?	and regional authorities		(communes), • Beneficiaries	• Focus Group
		To what extent have nocturnal activities been developed?	Nocturnal activities	Increase in the number or trend of nocturnal activities		
	To what extent has the project improved SBEE's financial viability?		Billing timeframe and quality	<ul style="list-style-type: none"> <li>• Billing timeframe and resources</li> <li>• Rate of anomalies,</li> <li>• Reminder process and its performance</li> </ul>	<ul style="list-style-type: none"> <li>• SBEE statistics</li> <li>• Beneficiaries</li> </ul>	<ul style="list-style-type: none"> <li>• Secondary data</li> <li>• Interviews</li> </ul>
	To what extent has the project helped to improve the quality of the commercial service provided to customers?		<ul style="list-style-type: none"> <li>• Level of claims</li> <li>• Processing of claims</li> </ul>	<ul style="list-style-type: none"> <li>• Frequency of claims</li> <li>• Timeframe for the processing of claims</li> <li>• Quality of reception</li> <li>• Quality of claims management process</li> </ul>		
<b>Efficiency</b>	To what extent is the project's financial return ensured?		Findings of studies	Feasibility study	<ul style="list-style-type: none"> <li>• ADB</li> <li>• SBEE</li> </ul>	<ul style="list-style-type: none"> <li>• Secondary data</li> <li>• Interviews</li> </ul>
				Revenue assumptions (quantity and tariff)		
Estimate of technical and commercial operating expenditure						
Lending (loan) conditions						
	To what extent is the project's economic return ensured?		Findings of studies	Feasibility study	<ul style="list-style-type: none"> <li>• ADB</li> <li>• SBEE</li> <li>• Institute of statistics</li> </ul>	<ul style="list-style-type: none"> <li>• Secondary data</li> <li>• Interviews</li> </ul>
				Estimate of household consumption of substitute product prior to the project		
				Assessment of the increase in the productivity of non-electrified customers		
				Assessment of savings generated by former self-producing customers		
<b>INSTITUTIONAL LEVEL</b>	To what extent has the project had an impact on national	To what extent has the project strengthened governance in	Status of follow-up on the recommendations of financial audit	Quality of follow-up on audit recommendations	Project documents, particularly supervision	<ul style="list-style-type: none"> <li>• Secondary data</li> <li>• Interviews</li> </ul>

Criteria	Question /Heading	Sub-Questions	Appraisal Criteria	Information Sought and Indicators	Sources of Information	Information Gathering Methods
	capacity?	the country?	missions Status of on-site works control Status on the equal treatment of customers Status of mobilization of communes	Quality of execution of works Quality of procedures for customer relation management Level of adherence and enthusiasm of the population	mission reports	
<b>Impact on Poverty Reduction</b>	To what extent has the project enabled poverty reduction?	To what extent has the project enabled the development of an income-generating economic activity?	Productivity of industrial customers	Increase in the productivity of industrial and tertiary customers	<ul style="list-style-type: none"> <li>Local districts (communes)</li> <li>SBEE</li> </ul>	Focus group during visits
			New customers implanted in the localities	Number of new customers implanted in the localities Home-based micro-activity		
	To what extent has the project enabled the improvement of human capital?	Offer and quality of health services provided in the project localities	<ul style="list-style-type: none"> <li>Health infrastructure</li> <li>Quality of health care provided to the population of the locality</li> </ul>	<ul style="list-style-type: none"> <li>Local districts (communes)</li> <li>Local authorities</li> </ul>		
		Offer and quality of education services provided in the project localities	<ul style="list-style-type: none"> <li>School infrastructure</li> <li>Pupil enrolment</li> <li>Success rate</li> </ul>	<ul style="list-style-type: none"> <li>Local districts (communes)</li> <li>Local authorities</li> </ul>		
<b>Impact on the development of economic activities</b>	To what extent has the project helped in fostering economic activity in the private sector: (private sector capacity)	To what extent has the project enabled the incorporation of sub-contracting businesses for extension and maintenance	Sub-contracting businesses for extension and maintenance assistance works	<ul style="list-style-type: none"> <li>Number and quality of sub-contracting businesses for extension and maintenance assistance works</li> <li>Status of teams that built the network</li> </ul>	SBEE and contractor, if possible	Interviews

Criteria	Question /Heading	Sub-Questions	Appraisal Criteria	Information Sought and Indicators	Sources of Information	Information Gathering Methods
	building)?	assistance works? To what extent has the project enabled the incorporation of local equipment repairs and manufacturing businesses?	Local equipment repairs and manufacturing businesses Programme for the outsourcing of activities that do not belong to the SBEE main trades	<ul style="list-style-type: none"> <li>Number and quality of services provided by local equipment repairs and manufacturing businesses</li> <li>What is SBEE's medium- and long-term policy?</li> <li>Programme for the outsourcing of activities that do not belong to the SBEE main trades</li> <li>What is SBEE's medium- and long-term policy?</li> </ul>		
<b>Environmental Impact</b>	To what extent has the impact of the project on the environment of the localities concerned been mitigated?	To what extent has the project taken account of the environmental component in the studies?	Consideration of the environmental component in studies	Selection of layout of lines and use of updated topographical surveys Perception of the utility/aesthetics	<ul style="list-style-type: none"> <li>SBEE</li> <li>ABE</li> <li>Local districts (communes)</li> </ul>	<ul style="list-style-type: none"> <li>Secondary data</li> <li>Interviews</li> <li>Visits</li> <li>Focus Group</li> </ul>
			Consideration of the environmental component during implementation	Damage caused to crops during works, felling of trees, demolition of homes, etc. Opening of corridors for lines		
			Consideration of the environmental component during operations	Demolition of overhanging homes		
				Incidents caused by animals (birds, reptiles and others)		
				Incidents caused by trees under or alongside the lines		
			Incidents caused by weather conditions: thunderstorm, sand, humidity, fog, salt marshes, etc.			

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