

Lighting Africa Policy Report Note—Senegal

Policy  
Report Note

Senegal

This note summarizes a report prepared by Lighting Africa to identify key policy barriers to the adoption of modern lighting products and services in Senegal, and offers recommendations for their mitigation. (Lighting Africa Policy Report: Senegal, June 2010, prepared by Marge and Econoler with subsequent updates by the Lighting Africa Team.) The report involved consultations with a range of stakeholders—across the supply chain—to obtain an independent, objective assessment of the prevailing policy environment for low cost lighting and electrification services in the country. Senegal is one of eight countries studied.

Energy Sector Overview

In Senegal, about 58 percent of the primary energy needs are met by biomass, followed by 38 percent from imported petroleum fuels, three percent from coal, and one percent from hydropower. Electricity and coal account for only seven percent and four percent, respectively. The relatively high percentage of biomass use is of particular interest since it is primarily used for cooking, mostly in rural areas. This helps to explain the high energy consumption of the household sector, which is responsible for 54 percent of total energy consumption. While high, the contribution of biomass, mainly by households, is still below the African average, which is around 60 percent. Within this sector, firewood (58 percent) and charcoal (26 percent) are by far the most important sources of energy, followed by LPG (11 percent), electricity (4 percent), and finally, lamp oil (one percent).

The share of petroleum products as a portion of total energy consumption has declined, especially kerosene consumption for domestic use. A lack of energy supply diversification in Senegal is compounded by the unavailability of efficient technologies, the low density of the distribution grid, insufficient regulatory frameworks, and weak financial structures. Senegal has to import petroleum products to meet all its essential modern energy needs, especially for electricity production (which consumes 35 percent of the national consumption of petroleum products). This heavy dependence on imports combined with high prices on petroleum products (approximately US\$1.1 billion) place Senegal among the countries where energy is most expensive, making inflation control and poverty reduction exceedingly difficult. In addition, delays in or lack of investment have weakened the sector to external shocks and increased the cost of energy supply for consumers.

Senegal at a Glance

- Population: 13 million people
- GDP Per Capita: \$1,034 National
- Electrification Rate: 54 percent
- Urban Electrification: 90 percent
- Rural Electrification: 24 percent
- GDP Growth Rate: 4 percent
- Key Sectors: Agriculture, Service Industry
- Endowed with moderate natural resources
- Member of West African Economic and Monetary Union (UEMOA)



Senegal's total installed capacity is 635 megawatts (MW). In 2008, 549 MW were generated, 512 of which were fed into to the national grid. Two MW were produced from renewable energy sources.

SENELEC owns power stations accounting for nearly 60 percent of the total production capacity while 218 MW are privately owned, including independent power producers (IPPs) such as GTI-Dakar and ESKOM-Manantali. The major

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portion is generated by diesel plants with others including gas, steam, and gas-steam power plants. As a result, the electricity price in Senegal strongly depends on the world market oil-price and the local diesel price for both the national grid and mini-grids operating in the country. Due to subsidies in the energy sector, however, the price is relatively low. A chronic shortage of financial resources has led to delays in the implementation of investment programs, resulting in a mediocre quality of service, low access rates to electricity for the rural and peri-urban populations, and highly uncompetitive electricity prices. Moreover, the lack of diversification of energy sources and predominance of petroleum products in electricity production has slowed cost reductions and absorption of exogenous prices increases. With the new policies aimed at diversifying energy sources, the government is targeting 15 percent of primary energy from renewable energy by 2025. Key government agencies active in the energy market are summarized in Table 1.

**Table 1. Key Government Agencies in Senegal's Energy Sector**

- **Ministry of Energy (MOE).** The MOE is responsible for the preparation and implementation of the sector policy defined by the Government of Senegal (GoS), the development of the national electrification plan, and standards applicable to the sector. The Ministry grants licenses and concessions upon the advice of the Commission of Energy Sector Regulation.
- **Commission of Energy Sector Regulation (CRSE).** CRSE is an independent authority responsible for regulating the production, transmission, distribution, and sales of electricity. CRSE has the following missions: (a) supervision and enforcement of license or concession contracts in order to ensure that the licensees or concessionaires respect their contractual obligations and that consumer interests are safeguarded; (b) compliance with technical standards; (c) fair competition and guarantee of conditions for financial viability in the electricity industry; (d) structure and composition of electricity tariffs applicable by the operators; and (e) advice to the MOE on all draft laws and regulations concerning the electricity sector, recommended improvements of rights and obligations of companies, and third party access to the network and business relationships between operators and customers.
- **Senegalese Agency for Rural Electrification (ASER).** ASER is a public corporation of MOE, with technical and financial autonomy. ASER is responsible for promoting and developing rural electrification nationwide, with the exception of the SENELEC concession areas. ASER has the following missions: (a) advise MOE on the design of the national rural electrification policy and its implementation; (b) inform stakeholders and the population on rural electrification progress in the country; (c) provide technical assistance to rural electrification projects; (d) provide financial support to rural electrification projects by granting subsidies from the Rural Energy Fund (REF) and/or facilitate access to bank loans via a guarantee fund; (e) implement procedures for the awarding of rural electrification licenses and concessions; (f) follow-up and monitor the development of rural electrification; and (g) promote demand side management, renewable energies, and productive and social use of electricity (e.g., education, health, livestock farming, water supply, telecommunication, and craft industries).
- **SENELEC** has a monopoly on transportation across the country, with the exception of the interconnected Manantali hydroelectric dam. SENELEC operates a number of production units (416 MW of installed capacity in 2007) and is bound by contracts to purchase electricity from independent power producers (IPPs) for a period of 15 years (GTI<sup>1</sup>, Manantali<sup>2</sup> and some Senegalese self-producing industries, totalling about 150 MW of additional installed capacity). In addition, SENELEC is under obligation to deploy renewable energy within its concession areas.
- **The Inter-ministerial Committee on Renewable Energy (Comité Interministériel sur les Energies Renouvelables, or CIER)** has been charged, among other tasks, with coordinating the policies for integration of renewable energy and the grid code. Their finalization will assure more coherence in integrating renewable energy into the interconnected grid.

<sup>1</sup> GTI-Dakar is a private independent producer which signed an exclusive contract with SENELEC in 1996 to supply electricity for 15 years. It operates a combined cycle plant with a capacity of approximately 53 MW, consisting of a gas turbine of 37 MW and a steam turbine of 16 MW.

<sup>2</sup> Eskom-Energy-Manantali (EEM), a subsidiary of Eskom South Africa, has contracted Société de Gestion de l'Energie de Manantali (SOGEM) to operate and manage the electrical infrastructures belonging to the Organisation de Mise en Valeur du Fleuve Sénégal (OMVS). These infrastructures comprise five groups of 40 MW each and a transportation network of 1,683 km. The electricity supply of the three capitals of OMVS member countries, Bamako, Dakar, and Nouakchott, started in 2002. Senegal has a quota of 33 percent of the electricity yield.



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### Lighting Africa

The Lighting Africa program in Senegal seeks to support the government in creating an enabling environment to phase out traditional lighting sources while complementing current grid extension and off-grid rural electrification efforts by supporting the introduction and growth of innovative off-grid lighting solutions. Recent advances in lighting technology, including Compact Fluorescent Lamps (CFLs) and Light Emitting Diodes (LEDs), promise clean, portable, durable, lower cost, and higher quality lighting. Lighting Africa aims to mobilize the private sector with a view to providing affordable, renewable, and clean lighting to rural, urban, and peri-urban customers without electricity access—predominantly low-income households and micro businesses.

### Lighting Options in Senegal

- **Existing solar companies.** Several local enterprises distribute a large range of better-quality lighting products based on LEDs and typically powered by solar photovoltaic (PV) panels. These include flashlights and small kits for indoor lighting, some of which offer cell phone charging. These enterprises also distribute other solar PV products such as solar home systems (SHS) of various capacities. Many of these enterprises bring decades of experience in this field.
- **Fast moving goods market.** At present, the products available on the Senegalese market are of very low quality and not reliable; many do not last more than a few weeks. The most noticeable success stories revolve around radios operating on batteries that include flashlights; almost every rural household owns at least one of these. They are distributed through shops and weekly markets at relatively low prices. As mentioned above, LED flashlights are now widely available. Solar lanterns are also available on the local market, however, their high selling prices have posed a clear barrier to dissemination.
- **Newly established companies.** Numerous LED lighting products, mostly imported from China, are distributed through the informal sector and sold by street peddlers, in small shops, or in street markets in Dakar and other cities. Costs vary depending on the model, sophistication, capacity, and size of the system. Some work with batteries, a portion of which are rechargeable. A very large proportion of urban dwellers, if not all, own these products as supplemental lighting during frequent power cuts that can sometimes last several hours.

### Where is the Off-Grid Market Going?

The 2008 Energy Sector Development Policy Letter (ESDPL) goal was to raise the national electrification rate to 75 percent by 2012, to include 50 percent in rural areas<sup>3</sup> and 95 percent in urban areas. Rural electrification has received steady financial support between 2000 and 2008: XOF 54 billion (US\$119.3 million), of which about XOF 20 billion (US\$47.3 million) is from the State Budget—approximately XOF 2 to 3 billion per year (US\$ 4.1 to 6.2 million per year). This financial effort has contributed to increasing the electrification rate from 8 percent in 2000 to 16 percent in 2006 (for a target of 15 percent by the end of 2005), and 21 percent in 2008 by connecting 147,000 new customers (averaging over 18,000 more per year at an average cost of US\$750 per new connection).

According to ASER, electrification rates should reach 42 percent by 2012, which would be a significant achievement, although below the 50 percent objective. ASER is seeking to close this gap by adding more than 100,000 new connections based on additional renewable energy projects, financing sources, and service providers.

Recognizing the importance of solar PV, in 2002 the GoS developed a master plan for rural electrification based on solar energy, with support from the Japan International Cooperation Agency (JICA). This plan is targeted to reach 59,500

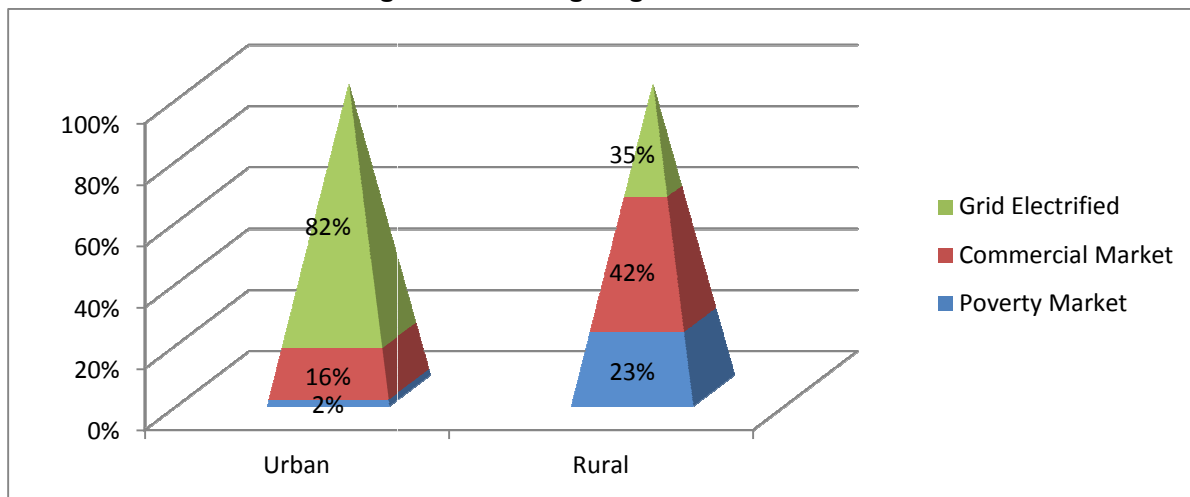
<sup>3</sup> More ambitious than the ECOWAS Decision (A/DEC.24/01/06 Decision of 12/01/2006) signed by Senegal, which set the overall goal to reach an access rate to modern energy services of at least 50 percent in rural and peri-urban areas by 2015.



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households with PV systems by 2015. According to the 2007 report of the Energy Information System (SIE), about 16,000 households were equipped with PV systems in 2006 averaging 55 Watts peak (Wp), for a total of 0.9 MWp<sup>4</sup>. To fulfill the planned objective, the remaining 43,500 households should be equipped at a rate of 4,500-5,000 per year.

Figure I. Rural Lighting Product Markets



A description of the off-grid lighting market is provided below, organized around six primary market segments.

- **Urban Grid Connected Market.** This market is a fully commercial market and interested in lighting products to serve as back-up solutions for grid failure. This market is important where grids are weak, undersized, or prone to brown-outs.
- **Rural Grid Connected Market.** This market is the same as the urban grid connected market, with the exception that rural areas tend to be located farther from commercial distribution networks and thus may have less access to modern off-grid lighting products. Furthermore, grid services are likely to be of lesser quality in this market, driving consumers to purchase modern off-grid lighting devices.
- **Urban Off-grid Commercial Market.** This is a commercial market for lighting products which has already begun to develop in towns, and will advance with or without Government interventions. The market could advance in a more rapid and sustainable manner with product quality assurance and information dissemination programs of a strategic lighting initiative, such as Lighting Africa. Note that this market would not require “solar power solutions” to charge lighting devices; grid-based charging services would be lower cost and more practical.
- **Rural Off-grid Commercial Market.** Like the above market segment, this market segment is comprised of off-grid groups which would likely be able to afford lighting products on a cash basis. The main difference is that: (i) these groups are widely distributed and harder to reach commercially than urban markets, and (ii) they would require devices charged by off-grid power sources, such as solar PV, hand cranks, and diesel-powered charging stations.

<sup>4</sup> Out of a total of 2 MW-p which includes PV systems installed in socio-community buildings, telecom station, etc.

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- **Urban Poverty Markets.** This off-grid market is constrained by income and it would be unlikely that they would be able to prioritize lighting products due to the up-front costs. This group is often unable to afford kerosene, grid electricity, or other power sources. Some type of policy and finance intervention would likely be required to facilitate access to this group.
- **Rural Poverty Markets.** This off-grid market is also constrained by income and would probably not be able to afford modern lighting products due to upfront costs. Much of this group utilizes biomass as their primary lighting source. Because of their geographic isolation and the higher prices for lighting products found in rural areas, the Rural Poverty Market segment is the hardest to reach with off-grid lighting services.

### Policy and Institutional Environment for Modern Off-Grid Lighting

#### Fiscal Measures

GoS has been strongly promoting private sector involvement for years. To that effect, the Promotion Agency for Investment and President Works (APIX<sup>5</sup>) was created in 2000, and a new Investment Act<sup>6</sup> enacted in 2004, offering significant incentives to all private enterprises. Benefits are provided to investors in terms of tax holidays and import tariff reductions. For example, according to the Investment Act and Income Tax Act, rural electrification operators are eligible for the following fiscal incentives:

- Five years exoneration of the lump sum contribution payable by employers on wages paid to Senegalese employees.
- Authorization to conclude fix-term renewable contracts for five years, for employees engaged in rural electrification projects.
- Value added tax (VAT) exoneration for customers in the “social bracket” of electricity supply.
- VAT and custom tax exoneration for the concession duration on all equipment for power production and operation.
- Exoneration of registration fees for newly established companies.
- Exoneration of business rates.

Fiscal incentives exist for private rural electrification investments reaching up to 30 percent of income tax exemption. A new act on rural electrification development is under consideration at the Parliament. Its objective is to recognize the need for a strong commitment from the State in supporting this effort. This act could lead to a full exemption for consumers. How it would be implemented and which products would be supported under the act remains to be specified through application decrees. Several stakeholders are negotiating a comprehensive list of products and components to be covered by these decrees. There is also a five-year renewable convention signed between ASER and the Ministry of Finance (MOF) that provides tax exemptions for all equipment dedicated to ASER’s rural electrification projects (including renewable energy technologies). The manufacturers and/or distributors of modern lighting products could probably benefit from similar incentives as long as they meet the required criterion, and apply for and obtain an agreement from APIX.

Nonetheless, taxes by the West African Economic and Monetary Union (UEMOA) will likely entail: (i) a common duty rate, Tarif Extérieur Commun (TEC), ranging from 5 to 20 percent according to the type of products (raw material, intermediary products and capital goods, or final consumer goods); and (ii) two small complementary taxes—a statistical fee and a community solidarity levy of one percent each. The exemption of these taxes must be negotiated with UEMOA and the Economic Community Of West African States (ECOWAS). If locally produced, a product could be

<sup>5</sup> Agence nationale chargée de la Promotion de l'Investissement et des Grands Travaux.

<sup>6</sup> “Code des investissements”, Law No 2004-06 enacted on February 6, 2004.





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fully exempted of TEC in the other UEMOA countries. A similar exemption is under consideration at the ECOWAS level.

Furthermore, there is interest in VAT harmonization at the regional level, within the range of 15 to 20 percent. If UEMOA and/or ECOWAS decide in favor of this harmonization, a member State will no longer have the latitude to decide unilaterally on VAT exemptions.

The subsidy on kerosene<sup>7</sup>, which has maintained price affordability for the poor over numerous years, has been progressively reduced. The subsidy reduction/suppression, combined with petroleum price increases, has led to soaring kerosene retail prices. For instance, the pump price in Dakar has more than doubled in April 2010 (from XOF 240 per liter in 2004 to XOF 488 per liter). This sharp increase in price weighs heavily on household expenditures, especially for the poorest. Reducing/eliminating this subsidy could be a significant incentive for households in shifting to modern lighting products.

The Rural Electrification Fund was designed to subsidize the initial investment costs of rural electrification projects. According to ASER's financing policy, renewable energy concession subsidies must be below 70 percent of three years of initial investment costs, without any ceiling set on an amount per customer. Conversely, the Locally-Initiated Rural Electrification Project (LIREP) subsidies should be limited to a ceiling of 80 percent of the initial investment, with a maximum of US\$500,000 per project. The subsidies granted or considered for renewable energy concessions are significantly lower than the set ceiling, averaging 47 percent of initial costs but ranging from 27 to 66 percent. They represent nearly US\$680 per new connected customer, varying from US\$340 to US\$1,300 for deductions from initial investment costs. This amounts to about US\$1,450 per new customer, or between US\$950 to over US\$2,000.

### **Laws Governing Private Business Development**

According to 2008 ESDPL, the contribution of renewable energy and biofuel will be brought to at least 15 percent of domestic energy consumption by 2020. A legal and regulatory framework will be established to promote renewable energy. Incentives are under study such as an obligation to purchase electricity produced from renewable energy and fixation of prices predetermined and sufficiently remunerative.

A set of measures to promote energy conservation and energy efficiency will be launched, including reduction of public expenditures on electricity and public lighting bills of communes, promotion of solar and wind, and implementation of an energy efficiency program in residential, tertiary, and industrial sectors.

Production, transportation, distribution, and sale of electricity are allowed only to natural persons and legal persons of private or public law having obtained a license (production, sale) or concession (transmission, distribution) issued by MOE. This requirement does not apply to installed capacity below 15 kVA. It is also not applicable to production, transport, and distribution of electricity by power plants and transmission networks, or distribution made by a company or a household for its own consumption, as these power plants or networks are established within private properties that do not encroach on the public domain. Production, transport, and distribution for its own consumption are subject to a prior declaration addressed to MOE, which may also authorize the sale of any excess. Licenses or concessions are granted by MOE with the prior consent of CRSE, based on the following criteria: ability of the candidate to meet all its obligations; creation of a company under Senegalese Law which will be the licensee, of which 30 percent of the capital is held by Senegalese operators; development of electricity production capacity based on energy sources complying with the sector policy in force; development of distribution capabilities corresponding to the sector policy in force; safety of electrical systems, equipment, and persons; and appropriate environmental protection and land use.

<sup>7</sup> As a basic lighting product, kerosene was classified among the necessities of life.



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### **Financing Mechanisms**

The financing of rural electrification operating and replacement costs must rely on electricity tariffs. CRSE fixes the customer tariff ceilings and bulk purchase price to SENELEC. These are applicable within each rural electrification concession area, prior to the concessionaire selection process (tariff ceilings are given in the bidding documents). The tariffs are calculated on the basis of Local Electrification Plan (PLE) results, which notably include willingness-to-pay surveys and reference costs.<sup>8</sup> The calculation aims at working out tariffs which allow: (i) incentive financial internal rate of return (about 20 percent) and payback period (less than 7 years) for the concessionaire; (ii) reasonable level of subsidy, if possible about 50 percent of initial investment; and (iii) reasonable customer tariff levels in comparison with the rates charged by SENELEC, which ideally do not exceed 20 percent for the equivalent service. The tariff structures in force generally comprise four levels: three flat social rates (very small consumers, small consumers, medium consumers) and a meter-based tariff for larger consumers.

### **Private Sector Effectiveness**

The private sector plays an active role in Senegal rural electrification. International and national utilities and/or private operators have expressed their interest in rural electrification concessions; ASER is supporting private sector involvement in rural electrification. A first measure has been taken with the obligation made to foreign concessionaires to create a company under Senegalese law with 30 percent capital share reserved for Senegalese operators/investors.

### **Organizational Support Availability**

Apart from the ASER rural electrification framework, there is no organizational support available specifically for modern lighting product development. Nevertheless, two organizations provide assistance to local and foreign entrepreneurs/investors regardless of their field of activity. These are the National Association for Subcontracting and Partnership (BNSTP) and APIX.

APIX facilitates the realization of investment projects in Senegal via multifaceted support. It is a one-stop shop that centralizes all administrative procedures for approval to the Investment Code (10 days) and export processing enterprise (21 days). The Problem Solving Department assists investors in its dealings with the administration and in the resolution of various problems, including access to land. The Investment Generation Directorate comprises heads of markets in different economic sectors which offer relevant business information and assist entrepreneurs to turn their projects into reality. The Monitoring and Documentation Centre, a source of information, also serves as "aftercare", monitoring project realization in order to accelerate implementation and facilitate development.

## **Conclusions and Recommendations**

### **Key Barriers**

- **Low Purchase Power of a Large Portion of Off-grid Lighting Users.** This is especially true in rural Senegal where households are unable to pay the initial cash cost.
- **High Costs of Market Development and Distribution Chains in Rural Senegal.** These costs have to be compared with low expected earnings for distributors due to the small size of most non-electrified villages (about 25 households).

<sup>8</sup> Uses the MATILDE computing model which was developed to simulate operator business plans.



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- **Low Quality Products in the Market.** The market is dominated by low-cost, low-quality products. There is an absence of quality standards and means to distinguish good from poor quality products. Low product quality can spoil the market.
- **Insufficient Recognition of Off-grid Lighting Products as a Complementary and Interim Option for Rural Access to Modern Energy.** Modern off-grid lighting solutions are not explicitly mentioned in the government development policy documents.
- **Environmental Risk Associated with Battery Disposal.** Large scale development of modern lighting products operating on batteries could yield negative environmental impacts if no battery recycling scheme is established. ASER is working on this but as yet none is operational in the country.

### Key Recommendations

- **Increase Political Participation.** Modern off-grid lighting devices are superior to kerosene and other traditional sources of lighting. This needs to be recognized clearly in government policy documents and integrated into country development and poverty reduction strategies as well as into rural electrification activities. Political buy-in is a prerequisite for other policy measures to urge the rapid development of the high-quality modern lighting market as this will influence policy orientation and build confidence among all players (government agencies, private sector, NGOs, donors, and consumers).
- **Enhance Awareness and Education.** Awareness raising and education of key stakeholders is fundamental as products are new in the market and the benefits have not been properly measured by most market players. Consumers need to be stimulated to purchase lighting products and businesses need to be encouraged to sell them. All levels of the political spectrum (local to national) need to be educated about the role of modern lighting solutions.
- **Address Product Quality Issues.** It is critical to promote good quality products as poor quality products can create dissatisfaction among consumers and spoil the market. Internationally accepted standards, as those developed by Lighting Africa, can create market confidence and avoid a costly development process for national standards. Moreover, a quality label/stamp would allow consumers to distinguish between good and poor quality products. Incentives should be given only to products certified under these standards and labels/quality stamps.
- **Make High Quality Products Available in the Market and Affordable to Consumers.** Two measures are to be combined. The first one consists of temporary VAT exemptions on imports of high quality modern off-grid lighting products. The objective is to encourage private players to invest in the modern lighting market by removing fiscal charges on eligible good quality products. This will make high quality modern lighting devices more affordable. It also has the advantage of developing the commercial segment of the market first, which can further lower prices for other market segments. The second measure should offer support to lighting businesses, such as a microcredit for the purchase of stock, bulk procurement facilities, guarantees for large-scale imports, and financial support for setting up rural distribution systems.
- **Subsidies for the Bottom of the Pyramid.** Subsidies for poor, rural, and peri-urban families will be required at a later stage to reach people who live below the poverty line. Subsidizing these households is also a question of social equity as rural electrification is currently highly subsidized.





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### About Lighting Africa

Lighting Africa, a joint World Bank and IFC program, seeks to accelerate the development of markets for modern off-grid lighting products in Sub-Saharan Africa where an estimated 10 to 30 percent of household incomes are spent on hazardous and low quality fuel-based lighting products. The goal is to mobilize and provide support to the private sector to supply quality, affordable, clean, and safe lighting to 2.5 million people by facilitating the sale of 500,000 off-grid lighting units by 2012 (target achieved and exceeded with 4 million people reached), while at the same time creating a sustainable commercial platform that will realize the vision of providing 250 million people with modern off-grid lighting products by 2030.

### About the Public-Private Infrastructure Advisory Facility (PPIAF)

PPIAF is a multi-donor trust fund that provides technical assistance to governments in developing countries in support of the enabling environment conducive to private investment, including the necessary policies, laws, regulations, institutions, and government capacity. It also supports governments to develop specific infrastructure projects with private sector participation. PPIAF is a major donor of the Lighting Africa program, supporting off-grid lighting policy studies and international off-grid lighting conferences.

### About the Africa Renewable Energy Access program (AFREA)

AFREA was established in 2009 to help meet energy needs and widen access to energy services in Sub-Saharan African countries in an environmentally responsible way. AFREA funds support the implementation of the World Bank's Africa Energy Unit (AFTEG) strategy and its clients, through analytical and advisory activities, while also providing recipient-executed technical assistance and investment grants that help speed up the deployment of renewable energy systems regionally. AFREA is a donor of the Lighting Africa program.

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