



# GEF-6 PROJECT IDENTIFICATION FORM (PIF)

PROJECT TYPE: Full-sized Project  
 TYPE OF TRUST FUND: GEF Trust Fund  
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For more

## PART I: PROJECT INFORMATION

Project Title:	De-risking sustainable off-grid lighting solutions in Nigeria		
Country(ies):	Nigeria	GEF Project ID: <sup>1</sup>	9743
GEF Agency(ies):	UNDP	GEF Agency Project ID:	5691
Other Executing Partner(s):	Energy Commission of Nigeria, Rural Electrification Agency, Standards Organisation of Nigeria, Federal Ministry of Environment, Ministry of Energy	Submission Date:	23 March 2017
GEF Focal Area(s):	Climate Change	Project Duration (Months)	60
Integrated Approach Pilot	IAP-Cities <input type="checkbox"/> IAP-Commodities <input type="checkbox"/> IAP-Food Security <input type="checkbox"/> Corporate Program: SGP <input type="checkbox"/>		
Name of parent program:	n/a	Agency Fee (\$)	250,774

### A. INDICATIVE FOCAL AREA STRATEGY FRAMEWORK AND OTHER PROGRAM STRATEGIES<sup>2</sup>

Objectives/Programs (Focal Areas, Integrated Approach Pilot, Corporate Programs)	Trust Fund	(in \$)	
		GEF Project Financing	Co-financing
CCM-1 Program 1 Promote timely development, demonstration and financing of low-carbon technologies and mitigation options	GEFTF	2,639,726	10,600,000
<b>Total Project Cost</b>		<b>2,639,726</b>	<b>10,600,000</b>

### B. INDICATIVE PROJECT DESCRIPTION SUMMARY

Project Objective: To promote private sector investment in sustainable off-grid lighting technologies by establishing a sound policy environment that facilitates the creation of a self-functioning and sustainable market in Nigeria						
Project Components	Financing Type <sup>3</sup>	Project Outcomes	Project Outputs	Trust Fund	(in \$)	
					GEF Project Financing	Co-financing
1. Policy de-risking of sustainable off-grid lighting solutions in Nigeria	TA	Appropriate policies, programmes and regulations are in place that address policy, awareness and financial barriers to facilitate investment in sustainable off-grid lighting solutions and corresponding business models.	1.1 Support to the Government to continue recent efforts of phasing-out kerosene subsidies  1.2 Quality standards for sustainable off-grid lighting products in place and enforced  1.3 Customs procedures and import requirements streamlined  1.4 Linkages between the telecoms and energy service sectors, policies and regulations established	GEFTF	614,025	1,695,238

<sup>1</sup> Project ID number will be assigned by GEFSEC and to be entered by Agency in subsequent document submissions.

<sup>2</sup> When completing Table A, refer to the excerpts on [GEF 6 Results Frameworks for GETF, LDCF and SCCF](#).

<sup>3</sup> Financing type can be either investment or technical assistance.

			<p>1.5 Customer awareness of sustainable off-grid lighting increased</p> <p>1.6 End-customers' ability to pay for sustainable off-grid lighting products strengthened</p> <p>1.7 Domestic financial sector's (debt/equity) experience and familiarity with financing sustainable off-grid lighting business models and products strengthened</p>			
2. Financial de-risking of sustainable off-grid lighting solutions in Nigeria	TA	Sustainable off-grid lighting (service) providers in Nigeria are operating and have access to working capital and equipment.	<p>2.1 Working Capital Finance Facility for sustainable off-grid lighting companies established and capitalised with co-financing from the Government and development partners</p> <p>2.2 Appropriate financing schemes for sustainable off-grid lighting product lending in place through the Lighting Africa initiative</p> <p>2.3 Equity support and business development provided to MSMEs, including demonstration facilities</p>	GEF TF	200,000	800,000
	Inv				1,300,000	6,000,000
3. Knowledge management and scale-up strategy	TA	Good practices, lessons learned, market assessments, demand-supply surveys, delivery models and business models are documented and scale-up guidelines are produced	<p>3.1 National kerosene lighting displacement plan developed</p> <p>3.2 Support to establishing a Lighting Transition Fund provided</p> <p>3.3 Support to a kerosene subsidy transition strategy provided</p>	GEF TF	400,000	1,600,000
Subtotal					2,514,025	10,095,238

Project Management Cost (PMC) <sup>4</sup>	GEF TF	125,701	504,762
<b>Total Project Cost</b>		2,639,726	10,600,000

For multi-trust fund projects, provide the total amount of PMC in Table B, and indicate the split of PMC among the different trust funds here: (n/a)

**C. INDICATIVE SOURCES OF CO-FINANCING FOR THE PROJECT BY NAME AND BY TYPE, IF AVAILABLE**

Sources of Co-financing	Name of Co-financier	Type of Co-financing	Amount (\$)
GEF Agencies	Climate and Clean Air Coalition (UNEP-UNDP Collaborative Initiative)	Grants	521,000
GEF Agency	World Bank and IFC Lighting Africa Initiative	Loans	6,279,000
Private Sector	Private Sector	Equity	3,000,000
GEF Agency	UNDP	Grants	300,000
Recipient Government	Energy Commission of Nigeria	In-kind	200,000
Recipient Government	Federal Ministry of Environment	In-kind	300,000
<b>Total Co-financing</b>			10,600,000

**D. INDICATIVE TRUST FUND RESOURCES REQUESTED BY AGENCY(IES), COUNTRY(IES) AND THE PROGRAMMING OF FUNDS <sup>a)</sup>**

GEF Agency	Trust Fund	Country/ Regional/ Global	Focal Area	Programming of Funds	(in \$)		
					GEF Project Financing (a)	Agency Fee (b) <sup>b)</sup>	Total (c)=a+b
UNDP	GEFTF	Nigeria	Climate Change	n/a	2,639,726	250,774	2,890,500
<b>Total GEF Resources</b>					2,639,726	250,774	2,890,500

a) Refer to the [Fee Policy for GEF Partner Agencies](#).

**E. PROJECT PREPARATION GRANT (PPG)<sup>5</sup>**

Is Project Preparation Grant requested? Yes  No  If no, skip item E.

**PPG AMOUNT REQUESTED BY AGENCY(IES), TRUST FUND, COUNTRY(IES) AND THE PROGRAMMING OF FUNDS**

Project Preparation Grant amount requested: \$100,000					PPG Agency Fee: 9,500		
GEF Agency	Trust Fund	Country/ Regional/Global	Focal Area	Programming of Funds	(in \$)		
					PPG (a)	Agency Fee <sup>6</sup> (b)	Total c = a + b
UNDP	GEFTF	Nigeria	Climate Change	n/a	100,000	9,500	109,500
<b>Total PPG Amount</b>					<b>100,000</b>	<b>9,500</b>	<b>109,500</b>

**F. PROJECT'S TARGET CONTRIBUTIONS TO GLOBAL ENVIRONMENTAL BENEFITS<sup>7</sup>**

<sup>4</sup> For GEF Project Financing up to \$2 million, PMC could be up to 10% of the subtotal; above \$2 million, PMC could be up to 5% of the subtotal. PMC should be charged proportionately to focal areas based on focal area project financing amount in Table D below.

<sup>5</sup> PPG requested amount is determined by the size of the GEF Project Financing (PF) as follows: Up to \$50k for PF up to \$2m (for MSP); up to \$100k for PF up to \$3m; \$150k for PF up to \$6m; \$200k for PF up to \$10m; and \$300k for PF above \$10m. On an exceptional basis, PPG amount may differ upon detailed discussion and justification with the GEFSEC.

<sup>6</sup> PPG fee percentage follows the percentage of the Agency fee over the GEF Project Financing amount requested.

<sup>7</sup> Provide those indicator values in this table to the extent applicable to your proposed project. Progress in programming against these targets for the projects per the *Corporate Results Framework* in the [GEF-6 Programming](#)

Provide the expected project targets as appropriate.

Corporate Results	Replenishment Targets	Project Targets
4. Support to transformational shifts towards a low-emission and resilient development path	750 million tons of CO <sub>2e</sub> mitigated (include both direct and indirect)	92,832 metric tons

## **PART II: PROJECT JUSTIFICATION**

1. *Project Description.* Briefly describe: 1) the global environmental and/or adaptation problems, root causes and barriers that need to be addressed; 2) the baseline scenario or any associated baseline projects, 3) the proposed alternative scenario, GEF focal area<sup>8</sup> strategies, with a brief description of expected outcomes and components of the project, 4) [incremental/additional cost reasoning](#) and expected contributions from the baseline, the GEFTF, LDCF, SCCF, and [co-financing](#); 5) [global environmental benefits](#) (GEFTF) and/or [adaptation benefits](#) (LDCF/SCCF); and 6) innovation, sustainability and potential for scaling up.

### *1) The global environmental and/or adaptation problems, root causes and barriers that need to be addressed*

With a population of 178.5 million, Nigeria is the most populous country in Africa and the 7<sup>th</sup> most populous country in the world. The rural population accounts for 53% of the total population<sup>9</sup>; 43% of the population is considered multi-dimensionally poor while an additional 17% are vulnerable to sliding into multi-dimensional poverty. Nigeria’s Human Development Index (HDI) value for 2015 is 0.514, which is in the ‘Low Human Development’ category and positions the country at 152 out of 187 countries and territories.<sup>10</sup>

In 2012, an estimated 93 million people did not have access to the electricity grid in Nigeria and an additional 24 million people had very unreliable and intermittent electricity access, suffering from frequent power outages that can last for several hours.<sup>11</sup> The Council for Renewable Energy of Nigeria estimates that power outages cause an annual loss to the economy of \$984 million.<sup>12</sup>

The intermittent electricity supply forces a large portion of industry, businesses and households to rely on diesel and petrol generators as a primary or back-up source of electricity. It is estimated that 2.6 GW of decentralised diesel generator capacity is currently installed in Nigeria with approximately 60 million decentralized power generators in operation. The majority of companies (85%) operate their own diesel generator.<sup>13</sup> According to the IEA, Nigeria accounts for 75% of diesel back-up power generation in Africa.<sup>14</sup> Annual fuel costs are estimated to be around \$5 billion, of which 20% are attributed to the residential sector.<sup>15</sup> Furthermore, a large part of the generated energy is wasted due to inefficient and outdated technologies. Apart from a huge income loss, the extensive use of these back-up generators has also resulted in health hazards due to the exposure to black carbon and other local pollutants, in addition to GHG emissions.

However, most of the poor in Nigeria cannot afford to buy generators and rely instead on kerosene lamps for lighting purposes. 74.5% of rural and 18.2% of urban households use kerosene for lighting.<sup>16</sup> Nigeria spends around \$1.4 billion

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*Directions.* will be aggregated and reported during mid-term and at the conclusion of the replenishment period. There is no need to complete this table for climate adaptation projects financed solely through LDCF and/or SCCF.

<sup>8</sup> For biodiversity projects, in addition to explaining the project’s consistency with the biodiversity focal area strategy, objectives and programs, please also describe which [Aichi Target\(s\)](#) the project will directly contribute to achieving.

<sup>9</sup> <http://data.worldbank.org/country/nigeria>

<sup>10</sup> [http://hdr.undp.org/sites/all/themes/hdr\\_theme/country-notes/NGA.pdf](http://hdr.undp.org/sites/all/themes/hdr_theme/country-notes/NGA.pdf)

<sup>11</sup> [https://www.iea.org/publications/freepublications/publication/WEO2014\\_AfricaEnergyOutlook.pdf](https://www.iea.org/publications/freepublications/publication/WEO2014_AfricaEnergyOutlook.pdf)

<sup>12</sup> Council for Renewable Energy, Nigeria (CREN) (2009) Nigeria Electricity Crunch. Available at [www.renewablenigeria.org](http://www.renewablenigeria.org)

<sup>13</sup> <https://www.giz.de/de/downloads/giz2014-en-nigerian-energy-sector.pdf>

<sup>14</sup> IEA, Africa Energy Outlook 2014: A Focus on Energy Prospects in Sub-Saharan Africa

<sup>15</sup> [https://www.iea.org/publications/freepublications/publication/WEO2014\\_AfricaEnergyOutlook.pdf](https://www.iea.org/publications/freepublications/publication/WEO2014_AfricaEnergyOutlook.pdf)

<sup>16</sup> <http://www.econjournals.com/index.php/ijeep/article/viewFile/708/439>

a year and consumes 17.3 million barrels of crude oil for lighting purposes.<sup>17</sup> According to the Nigerian Independent Petroleum Company, Nigerians use more than 11 million litres of kerosene daily.<sup>18</sup> According to a recent off-grid assessment by UNEP's en.lighten initiative, an estimated 39 million Nigerian households and 3.8 million businesses own a kerosene glass-covered lamp. The estimated installed stock of off-grid light sources in Nigeria consists of 40 million glass-covered kerosene lamps, 18 million simple wick kerosene lamps, 6 million torches (flashlights), and 3 million candles. Candles, batteries, gas lamps and electricity from generators are used mostly as back-up fuels.<sup>19</sup>

According to a recent UNDP assessment<sup>20</sup>, an estimated 35 million households in Nigeria likely rely on kerosene for lighting purposes. The study assessed kerosene consumption in 18 high-impact countries, with Nigeria consuming 2,471,000 tonnes of kerosene in 2013, which made up 5.2% of the global kerosene consumption (46,772 tonnes). Worldwide this is the second-highest consumption after India with 7,349,000 tonnes. With 2,470,000 tonnes in 2013, Nigerian households made up 99.9% of kerosene consumption in Nigeria (Figure 1). Globally, Nigeria accounts for 21.4% of the total household kerosene consumption, an amount exceeded only by India with 26.9%.

The use of kerosene lamps for lighting comes with far-reaching negative socio-economic and development impacts for their users. Their use creates black carbon, while meeting poor illumination and efficiency standards at high costs and safety concerns. Kerosene lamps also pose significant health impacts, due to chronic illness resulting from inhalation of fumes and risk of injury due to fire. Commonly reported health impacts include respiratory effects and pulmonary damage. In addition, insufficient illumination caused by poor lighting from kerosene burning in Nigeria has been reported to cause a reduction in visual performance, fatigue, eye strain and potential correlations with cataracts.<sup>21</sup>

Safety risks related to kerosene usage is a major concern, as in Nigeria thousands of people are maimed each year by kerosene lamp explosions and fires. Long-term studies find chronically high rates of hospital admissions due to explosions of kerosene lanterns and stoves. Several multi-year reviews at Nigerian hospitals attributed about 30% of all burn cases to kerosene fuel explosions and many people have been incapacitated, disfigured and lost their lives due to fires and explosions.<sup>22</sup>

In 2012, black carbon emissions from kerosene lamps in Nigeria were estimated at 63,400 tonnes, whereas black carbon produced by kerosene for cooking purposes amounted to 0.9 tonnes in the same year.<sup>23</sup> Various estimates have been made of the extent of financial loss to national GDP and available records show that the Government spends close to 700 million NGN per day<sup>24</sup> on subsidizing kerosene, which is globally the second-highest amount after India. Depending on the assumed reference price, UNDP estimates that kerosene subsidies in Nigeria could be even higher, at US\$ 2 billion using the Luxembourg gasoline price as a benchmark.<sup>25</sup>

A promising substitute for kerosene-based lighting products is the use of sustainable off-grid lighting solutions such as solar-powered portable lights and solar home kits as they offer a better and safer service at lower cost. A 2016 report by Bloomberg New Energy Finance and Lighting Global on the market trends of off-grid lighting estimates that the annual lighting-related expenses in a Nigerian household are, on average, about \$144 per year.<sup>26</sup> Compared with the costs of purchasing and running a simple wick kerosene lantern, the study estimates that the purchase of a \$13 solar lantern has a payback period of only 4 months. Assuming a product lifetime of 2-3 years for a typical light from a reputable manufacturer, customers can enjoy lighting at no cost for approximately 1.5 – 2.5 years before replacement. The report further states that solar is also competitive compared with candles and battery-powered torches.

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<sup>17</sup> <http://www.unep.org/Documents.Multilingual/Default.asp?DocumentID=2704&ArticleID=9407&l=en>

<sup>18</sup> <http://www.voanews.com/content/nigeria-to-switch-to-use-clean-cooking-gas/1616606.html>

<sup>19</sup> [http://unep.org/pdf/OGL\\_NGA.pdf](http://unep.org/pdf/OGL_NGA.pdf)

<sup>20</sup> UNDP, 2016: Kerosene Consumption: An Assessment of Selected High-Impact Countries

<sup>21</sup> <http://light.lbl.gov/pubs/tr/lumina-TR10-health-impacts.pdf>

<sup>22</sup> <http://light.lbl.gov/pubs/tr/lumina-TR10-health-impacts.pdf>

<sup>23</sup> UNDP, 2016: Kerosene Consumption: An Assessment of Selected High-Impact Countries

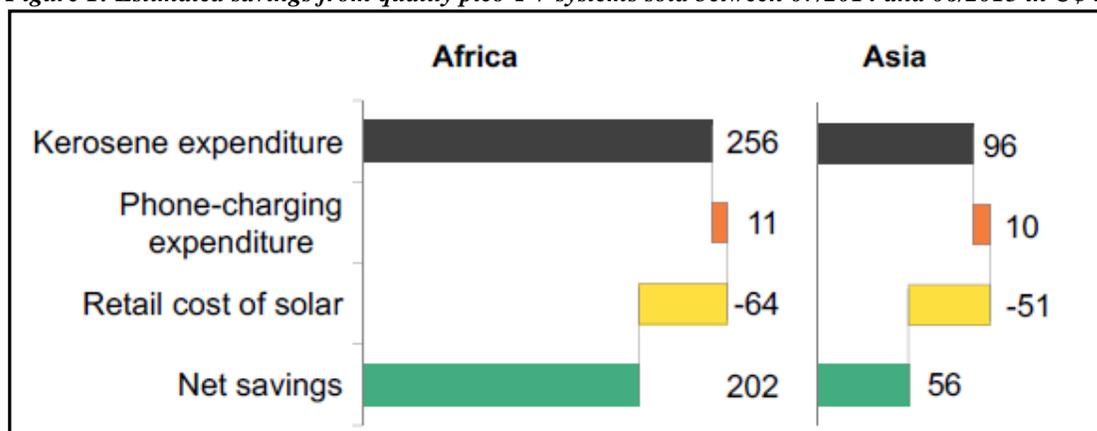
<sup>24</sup> Ca. US\$ 2.5 million as of June 2016

<sup>25</sup> UNDP, 2016: Kerosene Consumption: An Assessment of Selected High-Impact Countries

<sup>26</sup> [https://www.lightingglobal.org/wp-content/uploads/2016/03/20160301\\_OffGridSolarTrendsReport.pdf](https://www.lightingglobal.org/wp-content/uploads/2016/03/20160301_OffGridSolarTrendsReport.pdf)

The recent UNEP enlighten assessment estimates that if the current light sources in Nigeria were replaced by energy efficient off-grid lighting solutions, this would result in annual savings of \$1.4 billion. These savings would have the potential to free up much-needed disposable income, with over \$66 of savings per household per year and would result in reductions of 6.4 million tonnes of CO<sub>2</sub> emissions annually.<sup>27</sup> For example, the quality-verified pico-PV systems that were sold between July 2014 and June 2015 saved an estimated \$256 million in kerosene expenditure in Africa. Accounting for phone charging expenditure (\$11 million) and the retail costs of the solar-powered products (\$64 million), a total of \$202 million net savings were generated over the same period (see Figure 1).<sup>28</sup>

**Figure 1: Estimated savings from quality pico-PV systems sold between 07/2014 and 06/2015 in U\$ million**



Source: Bloomberg New Energy Finance and Lighting Global, 2016: Off-grid Solar Market Trends Report 2016

One of the promising business models that has shown significant growth in recent years is the Pay-As-You-Go business model (PAYG). An estimated 20 companies in the solar sector have adopted this business model, typically offering small solar home systems, including the PV panel, the battery, a control as well as small appliances such as lights and a phone charger, for an initial down payment followed by regular payments for using the systems. The daily fees for using the system are usually paid for the service and not for the consumed electricity and are typically less than the stop-gap technologies, such as the daily costs of kerosene consumption, allowing customers to save from day one of the service. The customer either owns the system after a certain number of payments are made (rent-to-own) or makes continuous payments (perpetual lease model, which is in essence a distributed utility).

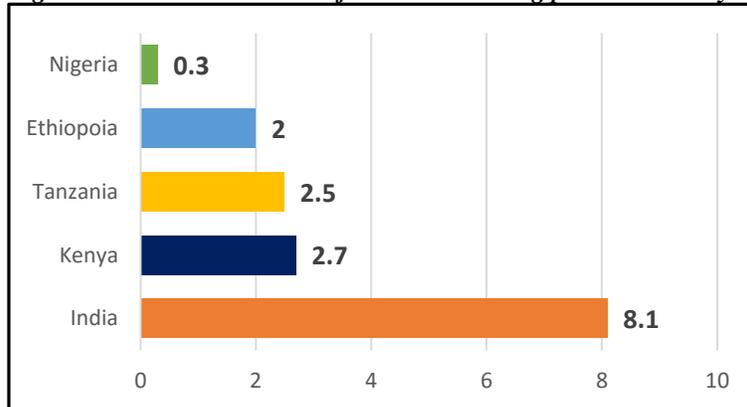
By the end of Q3 2015, 450-500,000 households were using PAYG solar systems globally, of which more than half belonged to M-KOPA in Kenya. However, despite a recent uptake in systems and introducing innovative business models, global expenditure on solar-powered lighting is still a fraction of what is spent on kerosene-based lighting. It is estimated that the global off-grid population spends over \$11.6 billion on lighting through kerosene fuel and lamps while only \$0.1 billion is spent on pico solar products. In addition, whereas other African countries have experienced a massive uptake in pico-solar products over the past years, in Nigeria, despite high solar insolation of 3.5 kWh/m<sup>2</sup>/day in the south to 7 kWh/m<sup>2</sup>/day in the north and annual average sunshine hours varying from 4 to 9 hours per day, only 300,000 households were using pico-PV products in June 2015 (Figure 2). This is very low (less than 1%) compared to the 35 million households that are estimated to rely on kerosene for lighting purposes.<sup>29</sup>

<sup>27</sup> [http://unep.org/pdf/OGL\\_NGA.pdf](http://unep.org/pdf/OGL_NGA.pdf)

<sup>28</sup> [https://www.lightingglobal.org/wp-content/uploads/2016/03/20160301\\_OffGridSolarTrendsReport.pdf](https://www.lightingglobal.org/wp-content/uploads/2016/03/20160301_OffGridSolarTrendsReport.pdf)

<sup>29</sup> [https://www.lightingglobal.org/wp-content/uploads/2016/03/20160301\\_OffGridSolarTrendsReport.pdf](https://www.lightingglobal.org/wp-content/uploads/2016/03/20160301_OffGridSolarTrendsReport.pdf)

*Figure 2: Estimated number of households using pico-solar PV systems in million as of June 2015*



Source: Bloomberg New Energy Finance and Lighting Global, 2016: Off-grid Solar Market Trends Report 2016

The PAYG market in Nigeria is still at an early stage, with only one company operating a mobile-based PAYG business model (Nova Lumos). Although other actors such as Solynta Energy, Arnergy and Green Village Electricity are currently testing or exploring similar business models, the market is at a much earlier stage compared with other African markets that have large off-grid populations such as Tanzania, Uganda and Kenya.

The principal barriers preventing development of a sustainable off-grid lighting market in Nigeria are:

- 1. Power Market:** Uncertainty regarding the credibility of electrification and renewable energy targets slows the progress of market mechanisms for efficient off-grid lighting products and systems despite offering safer, more reliable and cheaper long-term solutions.
- 2. Social Acceptance:** Among the Nigerian population, there is a low level of awareness of solar power and, where it exists, the reputation of solar technology is often low, also due to high system failure rates of ‘give-away’ programmes in the past.
- 3. Technology and Hardware:** Insufficient standard-setting has led to an uptake of low-cost generic products such as no-names, copycats or counterfeits, representing a major risk to the market as lower-quality products undermine customer satisfaction and trust. Current import clearing processes for importing sustainable off-grid lighting hardware and components lead to delays in delivery and increased costs for solar technology providers.
- 4. Digital Platform and Telecoms Sector:** Although Nigeria has a competitive mobile network operator (MNO) market, a national 2G coverage of 87.2 % and 86 million people who own a mobile phone, there are only 13 million mobile money accounts in the country. MNOs are not allowed to provide financial services and need to partner with banks, which results in under-investment in mobile money by MNOs. A high rate of financial illiteracy with respect to mobile money exacerbates this problem.
- 5. Developer and Energy Service Providers:** Due to the limited activities in the solar off-grid market in Nigeria, there is little experience with private companies’ capabilities to effectively plan, design, install, maintain, operate and monitor their sustainable off-grid lighting products and services.
- 6. Payment:** A lack of information on customer creditworthiness, such as customer credit data, makes it particularly difficult for PAYG service providers to attract longer-term consumer financing capital as lenders require historical track records which are not yet available.
- 7. Financing:** A combination of high capital costs and credit lines with tight payment terms from suppliers represents a major barrier to obtain shorter-term working capital to finance operations along the supply and distribution chains.

As a tool to assess and quantify market barriers to renewable energy investment in the developing world, UNDP has developed the Derisking Renewable Energy Investment (DREI) framework.<sup>30</sup> Qualitatively applying the structured risk and barrier assessment of the DREI framework to the sustainable off-grid lighting market in Nigeria results in the assessment presented in Annex 1.

## 2) *The baseline scenario or any associated baseline projects*

The barriers identified above will be perpetuated under the baseline scenario due to policy and regulatory gaps. While the Government has made clear its intention to expand energy access and to increase the share of renewable energy in the energy mix, there are still some important gaps. For example, apart from the general Power Sector Reform Act of 2005, no legislation has been adopted specifically in the area of rural electrification, which means that investors and private developers are exposed to uncertainties due to a lack of a clear regulatory regime. The Renewable Energy Master Plan (REMP) put forward in 2012 emphasizes the importance of solar power in Nigeria's energy mix and sets out targets to increase the share of renewable electricity from 13% in 2015 to 23% in 2025 and to 36% by 2030. However, the REMP has not yet been adopted by the Government or formulated into legislation. Formal adoption is necessary, as investors will require more certainty and clarity, including on detailed financial incentives such as tax exemptions and customs duty waivers.

As a roadmap for implementing the Renewable Electricity Policy Guideline (REPG), the Renewable Electricity Action Programme (REAP) was initiated by the Federal Ministry of Power and Steel in 2006. The main focus of the programme is on utilizing renewable energy sources for electricity generation while setting out an overview of potential gaps, technical assessments including renewable energy resource potentials, and resulting financial implications. Although the study is relevant for rural renewable energy-based electrification, there has not been much progress on this programme since the restructuring of the Ministry of Power and Steel to the Ministry of Power in 2008.

In 2014, a National Renewable Energy and Energy Efficiency Policy (NREEEP) was developed by the Federal Ministry of Power and subsequently approved by the Federal Executive Council in 2015. Lacking detail, it remains questionable whether the policy will be able to fill the gap of clear regulatory guidance relating to renewable energy and rural electrification. As a result, the Federal Government initiated the Light Up Rural Nigeria project, which focuses on the use of renewable energy in rural communities. However, according to recent studies and assessments, progress in rural electrification has been slow as the project has not shown concrete results.

The following associated baseline projects represent the most important initiatives that are currently being or have been implemented in the field for sustainable off-grid lighting and rural electrification:

- As part of the Renewable Energy Programme (REP), initiated by the Nigerian Federal Ministry of Environment and aligned with Nigeria's obligations under the UNFCCC, the Renewable Energy Access Programme deploys alternative and sustainable renewable energy technologies with the intention of creating sustainable livelihoods for the rural poor while generating positive impacts on the environment. Under this programme, the Ministry of Environment has introduced several off-grid projects including lighting components promoting energy efficient LED bulbs and stand-alone solar kits that replace incandescent bulbs, single-wick kerosene lamps, oil lamps and small diesel generators. As part of the REP, in 2013 the Ministry launched the Rural Women's Energy Security (RUWES) programme which aims to improve the value chain of the underserved rural women who are usually off-grid, energy-poor and face the highest negative health impacts caused by harmful energy consumption patterns. In addition, the programme aims to phase-out inefficient and harmful lamps in all schools in the country by providing mini-solar lamps to school children.
- The Lighting Africa programme, a joint initiative of IFC and the World Bank, is committed to increase access to affordable, clean and safer lighting to more than 30 percent of Nigeria's population who live in rural areas, have low incomes and lack access to grid electricity. Lighting Africa mobilizes the private sector to build and develop markets that enable access to clean, affordable and high-quality lighting products by fostering

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<sup>30</sup> <http://www.undp.org/drei>

partnerships among local and global manufacturers and creating new channels through local distribution companies that will help build robust supply chains for off-grid lighting products. The Lighting Africa programme in Nigeria aims to provide 5 million people who are not connected to the electricity grid with access to clean energy by 2017. This is expected to avoid 100,000 tonnes of greenhouse gas emissions, associated with current fuel-based lighting technologies.

- Lighting Africa is a key component of the Global Lighting and Energy Access Partnership (Global LEAP), an initiative of the Clean Energy Ministerial, which is a voluntary forum that brings together governments, the private sector and development partners to share knowledge and best practices and encourages self-sustaining commercial markets for energy access solutions. The main activities of Global LEAP are product quality assurance, finance across the supply chain, market intelligence, consumer education, and policy. Global LEAP also supported the development of a global standard for solar LED lanterns within the framework of the International Electrotechnical Commission (IEC).
- Between September 2016 and September 2018, UNEP and UNDP is implementing a project funded by the Climate and Clean Air Coalition (CCAC), the ‘Reducing Black Carbon Emissions by Transitioning to Clean and Sustainable Lighting’ project. The objective of the project is to overcome specific barriers to an uptake of alternative lighting technologies by providing a detailed assessment of estimated economic and environmental savings that would be generated from transitioning the off-grid lighting sector, technical assistance for policy reform and a regulatory framework on kerosene subsidies, capacity building to support the implementation of Minimum Energy Performance Standards (MEPS) for sustainable off-grid lighting solutions, an advocacy campaign to raise awareness on low-carbon energy technologies and a demonstration project in Nigeria.
- The NGO, Solar Sisters, is promoting the uptake of solar and clean cooking technologies by leveraging a women-led direct sales network to remote communities in rural Nigeria and other countries in Africa such as Uganda and Tanzania. The NGO provides women with a start-up kit containing inventory, training and marketing support. Up until now, the project has supported around 2,500 entrepreneurs, reaching a total of around 700,000 people who are now benefitting from solar lights.
- In 2006, the NGO, Community Research and Development Centre (CREDC), launched the “Promoting Renewable Energy and Energy Efficiency in Nigeria” (PREEN) project. Under the PREEN Project, CREDC worked with the international company, Schneider Electric, to distribute sustainable off-grid solar-powered LED lamps to households in different communities in southern Nigeria. Moreover, in 2012, CREDC initiated the project “Lighting Niger Delta”, which is still ongoing and aims to distribute 3 million solar home systems in off-grid communities within the nine Niger Delta States in the southern part of the country.
- UNDP is currently conducting a global study on ‘Kerosene Consumption - An Assessment of Selected High Impact Countries’. The study assesses 18 countries, including Nigeria, that are considered to have a high impact and potential for phasing-out kerosene consumption. It includes an analysis to estimate household kerosene consumption for lighting.

There are also a number of private companies that are active in Nigeria’s solar lighting market. While Nova Lumos is currently the only company that follows a mobile-enabled PAYG business model in Nigeria, a few new actors are entering the market to explore the possibilities of mobile-enabled PAYG solar, notably Arnergy and Green Village Electricity. International and national solar companies, such as d.light, Greenlight Planet, Solynta and GoSolar Africa, have been successfully distributing solar systems on the basis of a cash-sales business model over the past years and some of them are currently experimenting with expanding services to PAYG. In addition, successful PAYG solar service providers that have shown recent growth in East Africa, such as Mobisol, M-KOPA and Fenix International, are now exploring opportunities to replicate their models in West Africa.

3) *The proposed alternative scenario, GEF focal area strategies, with a brief description of expected outcomes and components of the project*

### *Overview of the Proposed Project*

The objective of the proposed project is to promote private sector investment in sustainable off-grid lighting technologies by establishing a sound policy environment that facilitates the creation of a self-functioning and sustainable market of sustainable off-grid lighting products in Nigeria while specifically leveraging and building on the recent and ongoing baseline initiatives mentioned above.

### *Use of the DREI Methodology*

The project will use UNDP's Derisking Renewable Energy Investment (DREI) methodology to quantitatively analyze the barriers and risks for sustainable off-grid solutions in Nigeria. Subsequently, it will serve as a tool to select the most cost-effective Government measures to mitigate or transfer these risks, ultimately leading to private investment in the sector and a significant uptake in sustainable off-grid lighting products. An initial DREI classification of risk categories for the small-scale renewable energy market was used to conduct a preliminary analysis for this PIF, as presented in Annex 1. A more detailed risk and barrier analysis, including the quantification of risks and the generation cost modelling, will be undertaken during the PPG development phase and applied throughout project implementation.

The DREI methodology identifies three core categories to classify public instruments. Each of the three categories of public instruments addresses the risk-return profiles of renewable energy in a different way.

- Instruments that reduce risk, by addressing the underlying barriers that create investment risk. These instruments utilize policy and programmatic interventions. An example might be the implementation of quality standards for sustainable off-grid lighting products. The DREI methodology terms these instruments “**policy derisking instruments**”.
- Instruments that transfer risk, by shifting risk from the private to the public sector. Examples might be a public loan, a loan guarantee or public insurance. The DREI methodology terms these “**financial derisking instruments**”.
- Instruments that compensate for risk, offering investors a higher financial return. Examples might be small equity grants for end-consumers or for business development. The DREI methodology calls these “**direct financial incentives**”.

By comparing the impact and cost of different combinations of public instruments on reducing renewable energy costs, the DREI methodology can assist in identifying the most cost-effective combinations of public instruments. For more information on the DREI methodology, please visit [www.undp.org/DREI](http://www.undp.org/DREI).

### *Component 1: Policy de-risking of sustainable off-grid lighting solutions in Nigeria*

GEF budget: \$614,025

Co-finance: \$1,695,238

The first component of the project will focus on supporting the creation of a favourable legal and regulatory environment to address the remaining policy-related barriers and to ultimately facilitate investment in sustainable off-grid lighting solutions and corresponding business models for basic, social and productive uses in rural areas. Activities under this component will work closely with, and build on, existing programmatic activities such as the World Bank Group's Lighting Africa or the ongoing UNEP-UNDP CCAC project on 'Reducing Black Carbon Emissions by Transitioning to Clean and Sustainable Lighting'. Donor funds for these initiatives and other potential future funding partners will be used to co-finance the GEF contribution. TA funds will be used to support the implementation of policy de-risking instruments, including institutional and capacity building activities, in the following areas:

- *Increasing confidence on market outlook:* Provide support to the Government on adopting specific necessary policies and a sound regulatory framework in the off-grid lighting space, including on actionable target-setting, such as setting rural electrification targets that lay out which areas are to be electrified through sustainable off-grid systems and thus building the private sector's confidence in rural electrification and renewable energy targets.

- *Creating a level playing field for sustainable off-grid lighting solutions:* In close collaboration with other programmes and initiatives, provide support to the Government to continue recent efforts to phase-out kerosene subsidies.
- *Increase customer awareness of sustainable off-grid lighting:* In close collaboration with the UNEP-UNDP project on ‘Reducing Black Carbon Emissions by Transitioning to Clean and Sustainable Lighting’, the GEF-financed project will conduct advocacy campaigns raising awareness of the benefits and value of sustainable off-grid lighting products for basic, social and productive uses including consumer awareness of products, quality standards, product maintenance and disposal.
- *Quality standards for sustainable off-grid lighting products:* In close collaboration with the UNEP-UNDP project and the World Bank Group’s Lighting Africa initiative, the GEF-financed project will provide support to align national quality standards with MEPS and Lighting Global’s Quality Standards, and to provide capacity support to enforce these standards.
- *Streamline customs procedures and import requirements:* Analyse current customs procedures and import requirements and provide support to harmonising import requirements for sustainable off-grid lighting products and their components, and develop detailed implementation strategies for streamlining customs processes and import requirements.
- *Capacity building and technical skills development:* Provide TA for training, apprenticeships and vocational programmes to build skills in a sustainable off-grid lighting job market, including in installation, operations and maintenance.
- *Strengthen end-customers’ ability to pay for electricity from solar-powered systems:* Provide support for the formulation and implementation of policies that facilitate the growth of the consumer credit industry including TA to assess, identify and transfer best practices from other countries such as Government-sponsored bank accounts.
- *Strengthen the domestic financial sector’s (debt/equity) experience and familiarity with financing sustainable off-grid lighting business models and products:* Provide TA to build capacity and facilitate knowledge exchange for the domestic financial industry on providing long-term, end-customer financing for businesses specialized in PAYG models in the sustainable off-grid solar power and lighting market. Provide TA for educating the banking sector about the peculiarities of sustainable off-grid lighting business models and projects, their risk-return profiles, and support the design of, and training in, specific due diligence tools.

## ***Component 2: Financial de-risking of sustainable off-grid lighting solutions in Nigeria***

GEF budget: \$1,500,000

Co-finance: \$6,800,000

The second component will focus on transferring residual risks and barriers that cannot be fully mitigated under the first component and thus involves close collaboration and coordination with existing public financial actors, financing initiatives and potential future partners including the World Bank Group’s Lighting Africa initiative. The main focus of this component is to ensure that financing for sustainable off-grid lighting (service) providers in Nigeria is catalyzed most efficiently and cost-effectively. In close partnership with the local and international “champions” that are operating in the sustainable off-grid lighting field, including PAYG businesses such as Off-grid Electric, d.light, Nova Lumas, Arnergy Solar Ltd. and Solynta Energy, and that are interested in building such business models or expanding into Nigeria, activities under this component will help to develop and provide financing for business models operating in the sustainable off-grid lighting service market. Private sector partners will be identified via an open competitive call for expressions of interest at the PPG stage. This component will incorporate, collaborate with and build upon

Government policies and existing or planned funding schemes. Specifically, TA funds will be combined with investment to provide support to financial de-risking in the following areas:

- *Establish a Working Capital Finance Facility for sustainable off-grid lighting companies:* In close collaboration with the World Bank Group's Lighting Africa initiative, which has experience in setting up similar funds in other African countries such as Ethiopia, a working capital support facility will be established targeting private sustainable off-grid lighting providers, including companies that follow a PAYG service model or a cash sales model. Whilst the facility will provide working capital loans to private sector actors, the proposed project will match these investments with TA for establishing the facility and building local capacity to manage the facility, in the process acquiring experience to demonstrate the feasibility of financing sustainable off-grid lighting investments and for supporting the facility in leveraging additional financing for the capitalization of the fund.
- *Appropriate financing schemes for sustainable off-grid lighting product lending:* In close collaboration with the domestic banking and financial sector, the GEF-financed project will facilitate and support the design of financing products for sustainable off-grid lighting and solar power use business models, ultimately promoting a mass market and a significant scale-up for these technologies, products and services. Using international best practices and project-supported examples, support will also be provided to the Government and partnering international financial institutions on the design of public loan schemes and guarantee mechanisms to complement commercial lending, ultimately assisting project developers to gain access to capital and additional funding.
- *Equity support and business development provided to MSMEs, including demonstration facilities:* In order to kick-start the market for sustainable off-grid lighting, equity support and business development/incubation services (business plan development, loan applications etc) will be provided to micro, small and medium enterprises (MSMEs) possibly through an innovation challenge approach (to be assessed during the PPG). In an early stage/pre-market, as is the case for the pico solar PV market in Nigeria, entrepreneurs and young companies require support for market entry and retail expenses. This support will address these specific needs by ensuring that high quality products are procured and by building the capacity of off-grid lighting service providers. Procuring quality products will help to develop a common expectation for quality from manufacturers in the solar lighting market. Under this output, a number of demonstration facilities will be set up in rural communities to showcase the benefits of solar PV kits compared to kerosene lamps.

### ***Component 3: Knowledge management and scale-up strategy***

GEF budget: \$400,000

Co-finance: \$1,600,000

The last component will focus on documenting good practices, lessons learned, market assessments, demand-supply surveys, delivery models and business models, and producing guidelines for scaling-up, including creating a knowledge network. In close collaboration with the outcomes and lessons learned from other relevant initiatives and projects, this component will provide TA for preparing a national scale-up programme on replacing kerosene-based lighting with sustainable off-grid lighting solutions, specifically through:

- *Support to developing a national kerosene lighting displacement plan:* In close collaboration with other initiatives focusing on phasing-out kerosene-based lighting, the project will collect and analyse international best practices and concrete results from the project to provide a National Kerosene Lighting Displacement Action Plan to the Government.
- *Support to establishing a Lighting Transition Fund:* In close collaboration with other initiatives focusing on phasing-out kerosene-based lighting, the project will collect and analyse international best practices and concrete results from the project to provide support to the Government on establishing a Lighting Transition

Fund, including TA for capacity building on how to establish and manage such a fund most efficiently and effectively.

- *Support to a kerosene subsidy transition strategy:* In close collaboration with other initiatives focusing on phasing-out kerosene-based lighting, the project will collect and analyse international best practices and concrete results from the project to provide support to the design and development of a Kerosene Subsidy Transition Strategy.

4) *Incremental/additional cost reasoning and expected contributions from the baseline, the GEFTF, LDCF, SCCF, and co-financing*

The proposed project will build upon, and closely cooperate with, the currently ongoing and planned initiatives that aim to increase the uptake of sustainable off-grid lighting solutions, provide access to clean lighting sources and/or aim to phase-out fossil fuel-based lighting. However, except for the World Bank Group’s Lighting Africa initiative, support to market creation, and in particular for innovative business models such as PAYG, is still limited. Instead of duplicating efforts and diluting resources, the proposed project will, in cooperation with Lighting Africa, scale-up private sector off-grid lighting business models in Nigeria. This will significantly contribute to creating a sustainable and self-functioning market.

In the absence of this project and under the baseline, the un-electrified population in Nigeria that is currently reliant upon kerosene for lighting purposes is not likely to change consumption patterns significantly in the short and medium term. The following table provides a detailed overview of the incremental reasoning of the proposed project.

**Table 2: Incremental reasoning and expected contributions from the baseline**

BAU Scenario and Impeding Barriers	Incremental Activities (GEF Project Components)	Incremental reasoning against baseline
<b>Component 1: Policy De-risking of sustainable off-grid lighting solutions in Nigeria</b>		
<ul style="list-style-type: none"> <li>- At present, there is uncertainty and skepticism regarding the feasibility of achieving policy targets</li> <li>- Uncertainty regarding continuation of recent subsidy removal efforts</li> <li>- There is a low level of awareness among the Nigerian public on solar power and, where it exists, the reputation of solar technology is often low</li> <li>- Competition from low-cost generic products represents a major risk as lower-quality products undermine customer satisfaction and trust significantly</li> <li>- Currently, there are hurdles to the importation of solar products into the country</li> <li>- Due to the limited experience with solar power systems in the past and low market demand, there are only a few solar technicians experienced in installing and maintaining systems</li> </ul>	<ul style="list-style-type: none"> <li>(a) Provide support for adopting necessary policies and a sound regulatory framework in the off-grid lighting space, including specific rural off-grid targets</li> <li>(b) Provide support to the Government to continue recent efforts to phase-out kerosene subsidies</li> <li>(c) Conduct advocacy campaigns to raise awareness about the benefits and value of sustainable off-grid lighting</li> <li>(d) Provide support to align national quality standards with independent product quality standards of sustainable off-grid lighting products</li> <li>(e) Provide support to harmonising import requirements for sustainable off-grid lighting products and their components</li> <li>(f) Support for training, apprenticeships and university programmes to build skills in a sustainable off-grid lighting job market including installation, operations and maintenance</li> </ul>	<p>GEF funding for activities under Component 1 will work closely with, and build upon, existing programmatic activities such as the World Bank Group’s Lighting Africa initiative or the ongoing UNEP-UNDP CCAC project on ‘Reducing Black Carbon Emissions by Transitioning to Clean and Sustainable Lighting’. These initiatives aim to address, in part, some of the barriers impeding Nigeria’s sustainable off-grid lighting market. Therefore, GEF funds will be used to complement these programmatic activities, particularly in activities (a), (b), (c), (d) and (f). In addition, GEF TA will be used to address the remaining policy-related barriers in the market and will ensure that its activities are closely aligned and incrementally build upon previous experiences of both Government- and donor-funded lighting initiatives.</p>

<p>- Capital is scarce and there is limited domestic financial sector experience in financing sustainable off-grid lighting companies and products</p>	<p>(g) Support on policies that facilitate the growth of the consumer credit industry and capacity building for the domestic financial industry</p>	
<p><b>Component 2: Financial De-risking of sustainable off-grid lighting solutions in Nigeria</b></p>		
<p>- A combination of high capital costs and credit lines with tight payment terms represents a major barrier for cash sales and specialised PAYG off-grid lighting companies to obtain short-term financing for their supply and distribution chains and working capital</p> <p>- Remaining uncertainties with business models and a lack of track record makes it difficult for sustainable off-grid lighting companies to access reasonably priced capital</p> <p>- In an early-stage market, as is the case for the pico solar PV market in Nigeria, entrepreneurs and young companies require support for market entry and retail expenses.</p>	<p>(a) Establish a Working Capital Finance Facility for sustainable off-grid lighting companies</p> <p>(b) Appropriate financing schemes for sustainable off-grid lighting product lending</p> <p>(c) Equity support and business development provided to MSMEs, including demonstration facilities</p>	<p>This component will incorporate, collaborate with and build upon Government policies and existing or planned funding schemes from international public financial actors, financing initiatives and potential future donors. GEF TA will be used to establish (a) the Working Capital Finance Facility that will be established jointly with the World Bank Group's Lighting Africa initiative and requires close collaboration with local and international "champions" that are operating in the sustainable off-grid lighting field, including PAYG businesses and that are either interested in experimenting with such business models or expanding their current activities to Nigeria. The Working Capital Finance Facility will be capitalised with co-financing from the Government and development partners. Activity (b) will collaborate closely with the domestic banking and financial sector, facilitate and support the design of financing products for sustainable off-grid lighting business models, ultimately promoting a mass market and a significant scale-up for these technologies, products and services. GEF INV will be channeled into: (c) providing equipment and services to MSMEs, which will be procured through a competitive process managed by the Energy Commission of Nigeria. Therefore, (a), (b) and (c) will incrementally build on the policy derisking Component 1 by transferring some of the remaining risks in the market to ensure that financing and equipment for sustainable off-grid lighting (service) providers in Nigeria is catalyzed most efficiently and cost-effectively.</p>
<p><b>Component 3: Knowledge Management Scale-up Strategy</b></p>		
<p>- There is a relatively low level of awareness of policy-makers, Government and community stakeholders on kerosene subsidies, sustainable off-grid lighting alternatives, and best practices and tools to achieve a transition while protecting the poor and marginalized population.</p>	<p>(a) Support to developing a national kerosene lighting displacement plan</p> <p>(b) Support to establishing a Lighting Transition Fund</p> <p>(c) Support to a kerosene subsidy transition strategy</p>	<p>This component, in close collaboration with the other initiatives and programmes from the baseline that either focus on phasing-out kerosene-based lighting and/or rolling-out sustainable off-grid lighting alternatives, will collect and analyse best practices and concrete implications from the proposed project as well as from the other initiatives, including international best practices. GEF funding for this component is crucial since, at present, there is low awareness of the best practices and lessons learned of innovative sustainable off-grid business models and schemes, including resulting implications on how to effectively and efficiently phase-out</p>

		kerosene-based lighting while protecting the poor and marginalised population.
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### 5) Global environmental benefits

The project will contribute to both direct and consequential GHG emission reductions through a significant increase in private sector investment in sustainable off-grid lighting technologies as a result of establishing a sound policy environment that facilitates the creation of a self-functioning and sustainable market for off-grid lighting products in Nigeria. Without GEF support, a significant increase in sales activities of both larger and smaller sustainable off-grid lighting solutions is not likely to take place in the short to medium term due to the impeding market barriers described earlier.

Under Output 2.3, it is estimated that approximately 10,000 solar home systems and about 17,700 solar lanterns will be sold by the small businesses that will benefit from this project's support. These solar PV kits will replace kerosene lighting, prevalent in the baseline scenario. Based on the CDM Programme of Activities "ENERCAP SunLighting Africa – Programme to replace kerosene lamps with micro PV LED systems in the sub-Sahara region," it is assumed that replacing one kerosene lamp reduces 0.08 tonnes of CO<sub>2</sub> emissions. Thus, replacing 17,700 kerosene lamps with pico solar systems will avoid 2,832 tonnes of CO<sub>2</sub> over the two-year lifetime of the solar lamps. Based on the assumption that a 100 Wp solar home system avoids around 9 tonnes of CO<sub>2</sub> over a 20 year period, the deployment of 10,000 solar home systems will result in GHG savings of 90,000 tonnes of CO<sub>2</sub>. Therefore, the project is expected to generate a total of **92,832 tonnes of CO<sub>2</sub>** in direct GHG emission reductions.

Consequential GHG emission reductions are estimated at **4,533,480 tonnes of CO<sub>2</sub>**. These estimates are based on an expected uptake in market activities similar to the Kenyan solar market growth between 2010 and 2014, applying a GEF causality factor of 60% (please see table below).

<b>Nigeria Projected development of pico solar systems 5 Watts</b>					
Year	2018	2019	2020	2021	2022
Projected number of pico solar system sales in thousands	195	485	1,430	2,200	3,400
Annual CO <sub>2</sub> emission reductions (tCO <sub>2</sub> )	15,600	38,800	114,400	176,000	272,000
Subtotal CO <sub>2</sub> emission reductions (tCO <sub>2</sub> )	616,800				
GEF Causality Factor	60%				
<b>Subtotal Consequential CO<sub>2</sub> emission reductions (tCO<sub>2</sub>)</b>	<b>370,080</b>				
<b>Nigeria Projected development of SHS average 100 Watts</b>					
Year	2018	2019	2020	2021	2022
Projected number of SHS sales in thousands	19.5	48.5	143	220	340
Annual CO <sub>2</sub> emission reductions (tCO <sub>2</sub> )	175,500	436,500	1,287,000	1,980,000	3,060,000
Subtotal CO <sub>2</sub> emission reductions (tCO <sub>2</sub> )	6,939,000				
GEF Causality Factor	60%				
<b>Subtotal Consequential CO<sub>2</sub> emission reductions (tCO<sub>2</sub>)</b>	<b>4,163,400</b>				
<b>Total Consequential CO<sub>2</sub> emission reductions (tCO<sub>2</sub>)</b>	<b>4,533,480</b>				

In addition, the project will lead to additional GHG emission reductions indirectly by accelerating the adoption of renewable energy and electrification policies and transition. Estimates made by UNEP's en.lighten initiative indicate that a full transition to efficient off-grid lighting in Nigeria would result in a total abatement of 6.4 million tCO<sub>2</sub> annually.

Annual benefits of the transition to efficient lighting				
Financial savings (million USD/year)	Kerosene saved (million litres/year)	Barrels of crude oil energy equivalent (millions)	CO <sub>2</sub> emissions reduction (thousand tonnes / year)	Households with better quality light (thousands)
1,400	2,300	17.3	6,400	19,100

Source : UNEP-GEF en.lighten Country Off-grid lighting assessment, Nigeria (2010)

Furthermore, the activities under this project will lead to black carbon emission reductions as well as avoided environmental and health impacts. Since black carbon consists of major air pollutants, the proposed project will improve the ambient air quality and health benefits, as well as reducing fire hazards associated with flammable fuels and candles.

A full calculation of the project's GHG benefits, using transparent and conservative assumptions, will be undertaken during project preparation.

#### 6. Innovation, sustainability and potential for scaling-up.

*Innovation:* This project will apply an innovative methodology, De-risking Renewable Energy Investment (DREI), analyzing and identifying barriers and risks related to off-grid lighting companies in a tailored and standardized way and which subsequently comes up with cost effective de-risking instruments that reduce or transfer these risks. Another innovative feature of the project is the Working Capital Facility, which has been implemented by the World Bank in other countries, but not yet in Nigeria.

One of the promising business models in the sustainable off-grid lighting market that will be supported by the proposed project is the PAYG business model, which has shown significant growth in other countries in recent years. These businesses typically offer small solar home systems including the PV panel, the battery, a control unit as well as small appliances such as lights and a phone charger which the customer receives against a down payment (i.e., about \$30) followed by regular payments of around \$0.30 – \$0.50 per day for using the smaller watt systems and up to \$2 per day for larger systems. The daily fees for using the system and its appliances are usually aligned with, and less than, the stop-gap technologies, such as the daily costs of kerosene consumption, allowing customers to save money from the onset of the service. Payments are often made through mobile phones and the system is remotely controlled: i.e., via a built-in GSM chip or an activation code that is sent by SMS. The daily fee is usually paid for the service and not for the consumed electricity (i.e. kWh) and the customer either makes scheduled payments or tops-up an account, so the systems stops functioning when the account is empty. The customer either owns the system after a certain number of payments are made (rent-to-own) or makes continuous payments without ownership (perpetual lease model). By the end of Q3 2015, 450 - 500,000 households were using PAYG solar systems globally, of which more than half belonged to M-KOPA in Kenya. At the start of 2015, only 200,000 households were using PAYG solar systems, indicating significant market growth and therefore considerable potential in Nigeria if only upfront market barriers could be overcome.

*Sustainability:* Giveaway, fully grant-based programmes may be feasible for distributing the technologies quickly, such as in disaster situations, but evidence has shown that these programmes are very unsustainable once beneficiaries have to maintain or replace the lamps and tend to revert back to kerosene lamps, either due to a lack of capital or financing to repair or replace the equipment or because of a missing after-sales and distribution infrastructure. Thus, through its proposed interventions, the project will facilitate the creation of a self-functioning and sustainable market for off-grid lighting products and services in Nigeria. A focus on innovative business models in the sustainable off-grid lighting market, such as PAYG, can additionally lead to sustainability effects and benefits such as:

- Distributing the upfront costs of the systems over several installments can allow customers to afford larger and more sophisticated systems sooner;
- Technology risk is transferred from the customer to the distributor, meaning that the customer can have confidence in the financial interest of the distributor that the systems perform properly;

- The necessary close customer relationships make data collection on credit rating and historic track record possible, one of the key conditions of financiers to provide financing both for businesses and end-customers;
- Due to the close customer relations that are necessary for running a PAYG business model successfully, one could argue that PAYG service providers have an interest in the development of their clients, as this could mean that the company at a later stage might be able to sell larger systems to the same customer. A lease-to-own model additionally offers customers the opportunity to collateralise the panels once they are paid down, enabling them to invest in larger sizes; and
- The ability to connect energy technology/service providers, consumers and productive end-use technology/service providers raises productivity, income and employment, helping make off-grid energy and lighting services more affordable and desirable.

*Scale-up potential:* In general, sustainable off-grid energy markets, and in particular PAYG-based markets, have seen a significant increase and more than \$240 million has been invested in the PAYG market over the past three years. Despite the advantages of PAYG models, it is argued that countries with a relatively rich population but low electricity access levels and a highly unreliable grid (such as Nigeria) can see greater potential for direct cash sales instead of innovative energy service business models. However, 80 million people in Nigeria lack access to the electricity grid and have a daily income of less than \$2 per day. This, in combination with poor end-customer financing channels, makes upfront capital financing for off-grid lighting/energy technologies from reputable manufacturers difficult. In addition, an estimated 70 million people have access to GSM coverage but do not have access to electricity. However, the number of mobile money accounts in Nigeria has seen rapid growth within a year, from 5.7 million in December 2013 to 8.9 million in December 2014. These figures show that the market potential is beginning to grow and machine-to-machine connections (M2M), connecting machines, devices and appliances wirelessly via a variety of [mobile] communications channels, are expected to grow at CAGR 23% from 2016 to 2019 reaching over 4 million connections. Thus, the market for PAYG business models in Nigeria is potentially huge and some companies in the sector recently raised financing, such as Nova Lumos (\$15 million) or Solynta Energy which recently obtained long-term financing from the Bank of Industry for the installation of off-grid solar home systems in over 1,000 homes. This means at least some investors see potential in this market. In addition, and this also applies to cash sale business models, under the baseline, the market for solar PV systems and other sustainable off-grid lighting solutions is likely to grow, as the IEA projects that, by 2040, a total of 530 million people in Africa will have no access to the electricity grid. According to the IEA’s projection, the largest share of the un-electrified population in Africa will be located in Nigeria where, by 2040, an estimated 93 million people will not have access to the grid and 24 million are projected to have highly unreliable and intermittent grid connections.

2. *Stakeholders.* Will project design include the participation of relevant stakeholders from [civil society organizations](#) (yes  /no ) and [indigenous peoples](#) (yes  /no )? If yes, identify key stakeholders and briefly describe how they will be engaged in project preparation.

**Table 3: Stakeholders and their Roles and Responsibilities**

Stakeholder	Role and Responsibility
<b>Government Stakeholders (Ministry of Power, Ministry of Environment, Ministry of Finance, Rural Electrification Agency, Standards Organization of Nigeria)</b>	Collaborative partners for implementing the policy de-risking instruments under Component 1, as they are responsible for the policy and regulatory measures that promote the uptake of sustainable off-grid lighting solutions (such as quality standard-setting by the Standards Organization of Nigeria). Government stakeholders will also play a role in other components, such as Component 2 (Ministry of Finance) and will be closely involved in supporting scale-up under Component 3 as well as in promoting livelihoods promotion and small-scale enterprise development at the community level.
<b>World Bank Group</b>	The World Bank Group’s Lighting Africa initiative, currently operational in 11 countries including Nigeria, will be a key collaborator for implementing the necessary policy de-risking instruments under Component 1, such as through supporting the implementation and adoption of the Quality Standards of the initiative, and setting up the working capital finance facility under Component 2. Lighting Africa has already

	enabled more than 35 million people across Africa to access clean, affordable, safer lighting and energy, and aims to reach 250 million more people by 2030.
<b>Climate and Clean Air Coalition (UNEP-UNDP Collaborative Initiate)</b>	The ongoing UNEP-UNDP CCAC project on ‘Reducing Black Carbon Emissions by Transitioning to Clean and Sustainable Lighting’ will be a key collaborator under all components but specially in Component 1 through collaborative efforts at implementing the necessary policy de-risking instruments as well as in Component 3 to provide support on necessary scale-up and national policies on kerosene transitioning.
<b>International organisations and global initiatives</b>	Other international organisations and global initiatives, such as the Global Off-Grid Lighting Initiative (GOGLA), the ECOWAS Centre for Renewable Energy and Energy Efficiency (ECEEE) and bilateral development agencies such as GIZ, will closely collaborate on selecting the right mix of policy de-risking instruments that is necessary to facilitate an uptake of private sector investment in the sustainable off-grid lighting market (Component 1), as well as support productive use initiatives at the community and household levels. Based on international best practice and country-specific evidence, these organizations will also be consulted to advise on specific activities under Component 4 (i.e., international best practice on kerosene transitioning initiatives).
<b>National and international sustainable off-grid lighting (service) providers</b>	Key collaborators for the risk analyses in the project design phase, including the identification of appropriate policy and financial derisking instruments under Components 1 and 2. Sustainable off-grid lighting (service) providers will be also key partners for establishing and implementing the working capital finance facility under Component 2.
<b>Financing Institutions</b>	National and international finance institutions, such as the Standard Microfinance Bank (SMFB), will be key collaborators for identifying, analysing and implementing the most appropriate financial de-risking instruments under Component 2.
<b>Civil Sector and NGOs</b>	Non-governmental organisations will be a key partner for Component 1 by advising on the appropriate selection of specific off-grid lighting related policy de-risking instruments, and in productive/social end-use applications of off-grid lighting/energy solutions under Component 2. Their expertise in the rural sector, and service delivery systems in particular, will be key for reflecting the opinions and needs of end-consumers and SMEs in rural areas. Thus, their perspective will provide a balancing perspective on the stringency of policy de-risking instruments such as on developing and implementing quality standards. Their experience with distribution channels and issues in rural areas will also be an important component to build business development capacity. Lastly, NGOs such as Solar Sisters will be closely engaged in promoting social and productive uses by the provision of alternative off-grid lighting solutions and will provide support to ensuring the inclusion of marginalized groups of the population including women.

3. *Gender Equality and Women’s Empowerment.* Are issues on [gender equality](#) and women’s empowerment taken into account? (yes  /no ). If yes, briefly describe how it will be mainstreamed into project preparation (e.g. gender analysis), taking into account the differences, needs, roles and priorities of women and men.

Gender issues will be mainstreamed in the design of the project. Under Component 2 at least 40% of beneficiaries for training and capacity building related to sustainable off-grid lighting business development will be women and/or women-headed organizations (i.e. SMEs, off-grid lighting businesses, etc.).

The project will also address gender aspects in the following ways throughout the lifecycle of the proposed project: 1) Project preparation activities will include a baseline analysis of the impact of the project on women and their potential roles and capacities for promoting, disseminating, installing and maintaining sustainable off-grid lighting solutions in rural areas as well as engaging in livelihood improvement/drudgery reduction initiatives; 2) The project will apply a gender marker as per UNDP guidance; 3) The project will incorporate gender issues in the project results framework, including gender-sensitive actions, indicators, targets, and/or budget; 4) The project will monitor the share of women and men as direct beneficiaries; and 5) An analysis of women’s inclusion in project activities will be included in both

the mid-term review and the terminal evaluation of the project and will be explicitly stated in the terms of reference of those evaluations.

4 Risks. Indicate risks, including climate change, potential social and environmental risks that might prevent the project objectives from being achieved, and, if possible, propose measures that address these risks to be further developed during the project design (table format acceptable).

<i>Risk Description</i>	<i>Risk Rating</i>	<i>Mitigation Measures</i>
<p><b>Political</b> Despite political will and commitment to tackle the lack of electricity access in Nigeria, political instability or a change of Government could lead to potential policy reversals that may impact energy policy and discourage private investment.</p>	Medium	The project is designed and based on the national commitments and targets on electrification and renewable energy that have been adopted at the highest possible level, as well as in consultation with communities and local governance institutions ensuring that it is bottom-up and demand-driven. Any proposed revisions in the policies, as well as support on new policies and regulations by the project, will also have to secure the highest level of approval based on actual needs and realities at the ground level (communities and households).
<p><b>Economic</b> International oil prices have fallen significantly over the past year and are expected to continue fluctuating with a tendency to increase again in the medium and long term. The sustainable off-grid lighting solutions proposed in this project may not be economically competitive compared to baseline energy sources.</p>	High	Unless appropriate policies and regulations, supported by policy and financial de-risking mechanisms and incentives, are introduced and enforced, sustainable off-grid solutions will not be able to compete with fossil fuel-based lighting in Nigeria. Components 1 and 2 of this project therefore aim precisely at achieving these goals and levelling the playing field for sustainable energy alternatives.
<p><b>Technical</b> The domestic supply and value chains and capacities of sustainable off-grid lighting service providers in Nigeria are very limited. The global threat of generic products to the sector exacerbates this problem nationally. As a result, this may cause an inadequate implementation of sustainable off-grid lighting projects, leading to sub-optimal performance, malfunctioning, etc.</p>	Medium	Components 1 and 2 of the proposed project are designed to address this risk and will identify and implement a range of measures that are required for mitigating this risk, such as through the support to adopting and enforcing domestic quality certification standards or by providing procurement support for equipment and services to off-grid lighting businesses to avoid distribution and sales shortages that could, otherwise, lead to a switch to alternative off-grid products, including low-quality generics.
<p><b>Climate Change</b> Climate change is expected to change Nigeria's biomass production, accelerate land degradation, and modify hydrological systems. There is also a risk of an intensified frequency and scale of natural disasters threatening infrastructure, including sustainable off-grid lighting products and distribution channels. In addition, the projected rise in temperatures will increase the power demand for air conditioning.</p>	Medium	The project will put most emphasis on promoting sustainable off-grid lighting solutions through solar PV powered system kits, which are less likely to be affected by climate change and therefore represents a viable climate adaptation alternative to the Nigerian power sector (which currently depends for 30% of its capacity on hydropower generation). Other potential impacts will be assessed in detail during the preparatory stage, and appropriate measures will be identified for incorporation of adaptation measures in the investment programme.
<p><b>Financial</b> Co-financing for sustainable off-grid lighting projects and businesses does not materialise due to a lack of private sector interest and / or Government commitment.</p>	Low	Government and private sector co-financing and investment for sustainable off-grid lighting businesses and products will be confirmed through signed co-financing letters during the PPG stage, including expressions of interest from the private sector and financial institutions.

<p><b>Security</b> Political tensions in the Niger Delta between foreign oil corporations and a number of ethnic minorities seeking a share of oil profits have led to numerous violent attacks on oil infrastructure and staff in the last 20 years. The risk exists that a similar situation could happen to sustainable off-grid lighting solution providers and users from groups with vested interests or stakeholders along the kerosene supply chain.</p>	<p>Medium</p>	<p>While it is not possible to fully mitigate security risk within the framework of the proposed project, appropriate arrangements and precautionary measures will be taken during project design and implementation, including full participation of local communities in selected project sites. An advocacy campaign under Component 1 will raise awareness and secure buy-in for the proposed sustainable off-grid solutions. Additionally, close collaboration with local NGOs and CSOs throughout project design and development will help to address this risk as much as possible.</p>
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5. *Coordination.* Outline the coordination with other relevant GEF-financed and other initiatives.

*The UNDP-GEF “Derisking Renewable Energy NAMA for the Nigerian Power Sector”* project is currently in the final stage of project development and will support the Government of Nigeria to develop a Nationally Appropriate Mitigation Action (NAMA) for the Nigerian Power Sector. The NAMA will target solar PV, primarily in order to achieve a transformation in the electricity mix such that at least 20 GW of Nigeria’s electricity is generated from solar PV by 2030. The NAMA design will use a rigorous quantitative methodology based on UNDP’s derisking (DREI) methodology for large-scale renewable energy projects. From the project design phase, the proposed project will work closely with, and build on, first experiences of this project through regular exchange of knowledge and progress in DREI implementation and a systematic collection, analysis and presentation of DREI case-studies, assessment tools and lessons learned. In particular, the focus on applying the DREI methodology to large-scale solar PV investment in Nigeria will create multiple synergies in the design and assessment of the appropriate mix of policy and financial de-risking instruments for smaller scale, sustainable off-grid lighting solutions.

*The UNDP-GEF “Sustainable Fuelwood Management in Nigeria”* project: Since over half of Nigeria’s estimated 170 million inhabitants live below the poverty line, with over 70% of the population still relying on biomass for fuelwood, this project, which is currently in the final stage of project development, aims to tackle rapid deforestation through sustainable fuelwood production and consumption by supply-side management and demand-side management through the promotion of improved stoves/kilns in the domestic sub-sector to reduce fuel wood demand, improve health and reduce greenhouse gas emissions. The proposed project will closely collaborate and build on experience of this project, particularly on rural energy consumption patterns, necessary transitioning strategies and distribution as well as on supply chains in rural areas, ultimately to realize synergies and avoid duplication.

*The UNDP-GEF “Promoting Energy Efficiency in Residential and Public Sector in Nigeria”* project, which is currently under implementation, aims to improve the energy efficiency of end-use equipment currently used in residential and public buildings by introducing appropriate energy efficiency policies and measures as well as demand-side management programmes. The project aims to develop new energy efficiency legal requirements, train professional stakeholders and conduct public outreach activities, including transforming the lighting market through the promotion of energy-saving lamps. The proposed project will closely collaborate with, and build upon, the experience of this project, particularly in supporting the adoption and implementation of appropriate policy and mitigation instruments, including quality standard setting, the outreach and advocacy activities and in identifying synergies and collaborations on the promotion of energy-saving lamps.

In addition, the proposed project will closely coordinate with other initiatives in Nigeria on renewable energy and sustainable off-grid lighting, in particular the World Bank’s and IFC’s Lighting Africa initiative, UNEP’s en.lighten initiative and the ongoing UNEP-UNDP CCAC project on ‘Reducing Black Carbon Emissions by Transitioning to Clean and Sustainable Lighting’, as well as other development and financial initiatives and programmes. Indeed, the specific purpose of the DREI methodology that will be applied in this project is to assist in identifying a comprehensive package of the most cost-effective interventions, which can then be implemented both by UNDP and by possible coordinating partners.

6. *Consistency with National Priorities.* Is the project consistent with the National strategies and plans or reports and assessments under relevant conventions? (yes  /no  ). If yes, which ones and how: NAPAs, NAPs, ASGM NAPs, MIAs, NBSAPs, NCs, TNAs, NCSAs, NIPs, PRSPs, NPFE, BURs, etc.

The project reflects Government priorities as outlined in the Vision 20:2020 and the Transformation Agenda (2013-2018) to promote low-carbon, climate-resilient, high-growth, gender-sensitive, inclusive and sustainable development, and is aligned with the country's commitment to mitigate GHG emissions under the UNFCCC. In November 2015, the Government submitted its Intended Nationally Determined Contribution (INDC), committing to 20% unconditional and 45% conditional GHG emissions reduction by 2030. Among others, proposed measures to reach the proposed target in the INDC are (particularly decentralised) renewable energy solutions for rural electrification and enforced energy efficiency measures, making the electricity sector by far the largest contributor to the proposed GHG emission reductions.

In Nigeria's Second National Communication to the UNFCCC, the energy sector is identified as a critical sector where technology transfer is required, both in terms of harnessing clean and renewable energy sources and energy efficiency. Popularising the use of energy saving devices such as CFLs and LED bulbs is specifically mentioned as a possible project intervention. This is considered a high priority option for the energy sector, which can substantially reduce demand for electricity.

Most electricity-related policies and strategies are based on the Electric Power Sector Reform Act of 2005, which established the Rural Electrification Agency (REA) with the core function of coordinating rural electrification activities in Nigeria and managing the Rural Electrification Fund (REF). Whereas previously REA's focus was mainly on the implementation of electrification projects through grid extension, it has recently widened its activities to include the deployment of off-grid sustainable energy systems.

Parallel to the establishment of REA, the Draft Rural Electrification Strategy and Plan (RESP) was prepared by the Federal Ministry of Power in 2006 and updated in 2015. The plan stipulates that, by 2025, 75% and, by 2030, 90% of the rural and urban population will have access to electricity accompanied by 10% of renewable energy sources in the energy mix by 2025.

As for renewable energy, the Renewable Electricity Action Programme was launched in 2006, followed by the National Policy and Guidelines on Renewable Energy in 2010 and the Renewable Energy Master Plan (REMP) in 2012. The REMP stresses the importance of solar power in Nigeria's energy mix as it sets out the plan to increase the share of renewable electricity from 13% in 2015 to 23% in 2025 and to 36% by 2030.

7. *Knowledge Management.* Outline the knowledge management approach for the project, including, if any, plans for the project to learn from other relevant projects and initiatives, to assess and document in a user-friendly form, and share these experiences and expertise with relevant stakeholders.

The proposed project is one among several UNDP-implemented, GEF-financed projects that are being designed and implemented based on UNDP's DREI framework and methodology. UNDP will facilitate regular exchange of knowledge and progress in DREI implementation among these "sister" projects, as well as systematic collection, analysis and presentation of DREI case studies, assessment tools and lessons learnt through the corporate platform established at <http://www.undp.org/drei>. Other related approved projects include:

- UNDP-GEF "NAMA Support for the Tunisian Solar Plan";
- UNDP-GEF "De-risking Renewable Energy NAMA for the Nigerian Power Sector";
- UNDP-GEF "De-risking Renewable Energy Investment in Kazakhstan"

Furthermore, Component 3 has a strong knowledge management component, which will focus on documenting good practices, lessons learned, market assessments, demand-supply surveys, delivery models and business models, and producing guidelines for scaling-up, including creating a knowledge network.

**PART III: APPROVAL/ENDORSEMENT BY GEF OPERATIONAL FOCAL POINT(S) AND GEF AGENCY(IES)**

**A. RECORD OF ENDORSEMENT<sup>31</sup> OF GEF OPERATIONAL FOCAL POINT (S) ON BEHALF OF THE GOVERNMENT(S):**

(Please attach the [Operational Focal Point endorsement letter](#)(s) with this template. For SGP, use this [SGP OFP endorsement letter](#)).

NAME	POSITION	MINISTRY	DATE (MM/dd/yyyy)
Amos Ibrahim Tanko	Director, Planning, Research and Statistics	FEDERAL MINISTRY OF ENVIRONMENT	17 OCTOBER 2016

**B. GEF AGENCY(IES) CERTIFICATION**

**This request has been prepared in accordance with GEF policies<sup>32</sup> and procedures and meets the GEF criteria for project identification and preparation under GEF-6.**

Agency Coordinator, Agency name	Signature	Date (MM/dd/yyyy)	Project Contact Person	Telephone	Email
Adriana Dinu, UNDP-GEF Executive Coordinator		March 23, 2017	Faris Khader, Regional Technical Advisor	+251 91 250 3307	<a href="mailto:faris.khader@undp.org">faris.khader@undp.org</a>

**C. ADDITIONAL GEF PROJECT AGENCY CERTIFICATION (APPLICABLE ONLY TO NEWLY ACCREDITED GEF PROJECT AGENCIES)**

For newly accredited GEF Project Agencies, please download and fill up the required [GEF Project Agency Certification of Ceiling Information Template](#) to be attached as an annex to the PIF.

<sup>31</sup> For regional and/or global projects in which participating countries are identified, OFP endorsement letters from these countries are required even though there may not be a STAR allocation associated with the project.

<sup>32</sup> GEF policies encompass all managed trust funds, namely: GEFTF, LDCF, and SCCF

**Annex 1: Risks and barriers in the sustainable off-grid lighting market in Nigeria**

Risk Category	Description	Underlying Barriers	Significance
<p><b>1. POWER MARKET RISK</b></p>	<p>Risk arising from limitations and uncertainties in the off-grid energy market regarding market outlook, market access, and competition</p>	<p>Although the state developed electrification and renewable energy targets, there is to some extent uncertainty and skepticism regarding the feasibility of achieving these targets. For example, although a Renewable Energy Master Plan has been developed, it has not yet been adopted by the Government.</p> <p>Although the Government recently reduced the subsidy on kerosene, it remains uncertain whether this will be sustained in the future. In the past, the media documented numerous accounts of protests and violence when subsidies were eased or removed, which creates a risk for policy-makers and raises a material concern about the effect of rising energy costs on household and business budgets.</p>	<p><b>High</b></p>
<p><b>2. SOCIAL ACCEPTANCE RISK</b></p>	<p>Risks arising from lack of awareness and resistance in communities to sustainable off-grid solutions, including solar powered lanterns and kits</p>	<p>Among the Nigerian population, there is a low level of awareness of solar power and, where it exists, the reputation of solar technology is often low. Some estimates state that 40% of Nigeria's population is unaware of solar power, indicating that there is a considerable challenge in driving demand for solar power among rural SMEs or households. On top of this, evidence shows that solar power has acquired a poor reputation for reliability and performance. Past efforts by the Nigerian Government and international donors that applied a simplistic 'supply and install' model has led to inadequate maintenance and the rapid collapse of installed solar systems. The higher failure rates reinforced the view amongst consumers and financiers that solar PV as a technology is unsuitable for the Nigerian market.</p>	<p><b>High</b></p>
<p><b>3. TECHNOLOGY AND HARDWARE RISK</b></p>	<p>Risk arising from limitations in the quality and availability of sustainable off-grid technologies' hardware, as well as the customs treatment of hardware</p>	<p>Competition from low-cost generic products such as no-names, copycats, or counterfeits represents a major risk to the market as lower-quality products decrease customer satisfaction and trust significantly. It is estimated that, globally, at least half of the wider pico-solar market was comprised of these products. Relatively low market entry barriers make it probable that competition from low-quality, generic products is going to increase globally and in Nigeria.</p> <p>There are significant hurdles to the importation of solar products into the country. Solar companies importing products must comply with the Standards Organization of Nigeria (SON). The process for quality assurance of imported products is laborious as it includes applying for certification from SON for each shipment, as well as a physical inspection and sampling. These clearing processes for importing hardware leads to delays in delivery and increased costs for solar providers. SON also does not recognize international solar standards (i.e. IEC/ISO) and carries out its own individual investigation of solar products before permitting importation.</p>	<p><b>High</b></p>

<p><b>4. DIGITAL PLATFORMS/ TELECOM SECTOR RISK</b></p>	<p>Risks arising from issues around software communications (machine to machine, mobile-money platforms), telecom sector interactions and lack of consumer data protection</p>	<p>Although Nigeria has a competitive telecom market (seven active Mobile Network Operators (MNOs), a 2G coverage of 87.2 % and around 86 million people who own a mobile phone, there are only 13 million mobile money accounts in the country. The Central Bank of Nigeria excludes MNOs from providing mobile financial services, thus limiting their role to channelling other providers' mobile money services. Although there are 19 licensed mobile money service providers in Nigeria, this situation has resulted in underinvestment in mobile money by MNOs. The limited reach of banked and non-banked mobile money services prevents scale-up of PAYG energy providers. This is also exacerbated by high financial illiteracy, as a recent survey by the Central Bank of Nigeria revealed that over 70% of Nigerians have not yet heard of the term mobile money.</p>	<p><b>High</b></p>
<p><b>5. LABOR INPUTS RISK</b></p>	<p>Risks arising from the lack of skilled and qualified potential employees</p>	<p>Nigeria has a considerable unskilled workforce. Some estimates state that nearly four in ten Nigerians are unskilled laborers. With little demand for solar, there are only a few experienced solar technicians capable of installing and maintaining systems. Even in Nigeria's economic powerhouse, Lagos, there is a limited supply of skilled solar technicians. The absence of large solar providers and international solar players in the Nigerian market has meant there has been limited private sector demand for hiring a local workforce and providing them with the necessary training.</p>	<p><b>Medium</b></p>
<p><b>6. DEVELOPER AND ENERGY SERVICE PROVIDER RISK</b></p>	<p>Risks arising from limitations in a company's capability to efficiently and effectively design, install, operate, maintain and monitor its off-grid lighting products and services</p>	<p>Due to the limited activities in the solar off-grid market in Nigeria, there is little experience among private companies to effectively plan, design, install, maintain, operate and monitor their sustainable off-grid lighting products and services. There are also ambiguities with regard to the credit worthiness and cash flow strength of sustainable off-grid lighting companies. Although the only currently active PAYG provider in the Nigerian market, Nova Lumos, raised a US\$ 15 million loan from OPIC in 2015, uncertainties and a lack of clarity of regulation for solar (service) business models make it potentially difficult to access financing. Unclear processes and guidelines and the lack of experience in establishing a viable and scalable business plan, including limited organizational and managerial capabilities, reinforce this problem. The limited ability and experience of sustainable off-grid lighting solution providers to effectively size and evaluate the market demand for their products and difficulties in forecasting demand and managing demand growth for electricity can lead to inadequacy of product offerings. As the majority of potential customers of sustainable off-grid lighting products live in remote rural areas, retail, customer acquisition and marketing can come with high costs.</p>	<p><b>High</b></p>
<p><b>7. PAYMENT AND CREDIT RISK</b></p>	<p>Risk arising from customers' willingness, ability and methods of payment for using the off-grid lighting system</p>	<p>Due to limited experience with sustainable off-grid lighting business models, there is also a lack of information on customer creditworthiness, such as customer credit data. This data includes, for example, the ability of customers to pay for the initial connection fees or down payments, ongoing energy expenses and costs for ancillary appliances such as lights and phone chargers. For example,</p>	<p><b>High</b></p>

		PAYG service providers offering a lease-to-own service model with a payback rate of 18 months need at least the same amount of time to collect data on customer creditworthiness. This makes it very difficult for these businesses to attract longer-term consumer financing capital as lenders require a historical track record that is not yet available. In addition, the lack of data also causes an exposure for PAYG-focused sustainable off-grid lighting companies to delayed, reduced or non-payment by customers due a changing ability to pay during seasons, social dynamics, inefficient billing and collection. Finally, consumer's access to finance is limited as only 2% of Nigeria's adult population have received loans from a financial institution in the past year. A 2009 survey concluded that 64 million, or 74% of, Nigerian adults and 86% of rural adults have never had access to a bank account.	
<b>8. FINANCING RISK</b>	Risks arising from scarcity of domestic investor capital (debt and equity) for sustainable off-grid lighting solutions, and domestic investors' lack of familiarity with sustainable off-grid lighting solutions and appropriate financing structures	Capital is scarce as there is an under-developed local financial sector and there is limited domestic investor experience with financing sustainable off-grid lighting products, services and business models. The lack of information, assessment skills and track-record for off-grid projects in Nigeria amongst the investor community ultimately leads to a lack of familiarity and skills with appropriate finance structures. In general, Nigerian SMEs suffer from chronic underinvestment. According to the World Bank, only 14% of Nigerian SMEs have access to a loan or overdraft account. Where access to financing exists, interest rates are usually high. A combination of these high capital costs and credit lines with tight payment terms of suppliers represent a major barrier for cash sales and PAYG specialized sustainable off-grid lighting companies to obtain short-term financing for their supply and distribution chains, as well as for the inventory. Inventory-finance and working capital constraints of companies in other, much larger, markets have held back sales and contributed to the uptake of generic, low-quality products reinforcing social acceptance and technology sourcing risks.	<b>High</b>
<b>9. CURRENCY RISK</b>	Risks arising from currency mismatch between hard currency debt/equity and domestic currency revenues	Although the Nigerian Naira depreciated in 2014, the currency has been relatively stable since then. Nevertheless, uncertainties due to volatile local currency and unfavourable currency exchange rate movements remain and can result in domestic currency revenues that are not sufficient to cover debt or equity servicing.	<b>Medium</b>
<b>10. SOVEREIGN RISK</b>	Risk arising from a mix of cross-cutting political, economic, institutional and social characteristics	Limitations and uncertainty related to conflict, political instability, economic performance, weather events/natural disaster, legal governance, the ease of doing business, crime and law enforcement remain a problem in Nigeria.	<b>Medium</b>