

**CLEAN TECHNOLOGY FUND PROPOSAL**

**LINE OF CREDIT TO A NIGERIAN COMMERCIAL BANK FOR  
RENEWABLE ENERGY AND ENERGY EFFICIENCY PROJECTS**

**AFRICAN DEVELOPMENT BANK**

**MARCH 2014**

## **Abbreviations and Acronyms**

AfDB	African Development Bank
CO <sub>2</sub>	Carbon Dioxide
CTF	Clean Technology Fund
ECN	Energy Commission of Nigeria
ECOWAS	Economic Community Of West African States
EE	Energy Efficiency
GHG	Greenhouse Gas
GEF	Global Environment Facility
MDB	Multilateral Development Bank
NCCP	National Climate Change Policy
NEP	National Energy Policy
RE	Renewable Energy
REMP	Renewable Energy Master Plan
REPG	Renewable Electricity Policy Guidelines
SE4ALL	Sustainable Energy for All
UNDP	United Nations Development Programme

<b>Cover Page for CTF Project Approval Request</b>			
<b>1. Country/Region:</b>	Nigeria	<b>2. CTF Project ID</b>	<i>Trustee will assign</i>
<b>3. Project Title</b>	Line of Credit to a Nigerian Commercial Bank for RE/EE		
<b>4. Type of project</b>	<del>Public sector</del>	Private sector (financial Intermediation)	
<b>5. Terms and Amount Requested</b>	USD 25 million loan with 7-year tenor, including 3 years grace. Pricing will be disclosed under the Non-Disclosure Agreements (NDAs). Loan terms will be no more concessional than 75 bps fixed but will most likely be significantly higher.		
<b>6. Implementing MDB</b>	African Development Bank		
<b>7. National Implementing Agency</b>	Not applicable		
<b>8. Contact Information of MDB Focal Point and Task</b>	Mafalda Duarte <a href="mailto:m.duarte@afdb.org">m.duarte@afdb.org</a> +216 71 10 2447	Caroline Otonglo <a href="mailto:c.otonglo@afdb.org">c.otonglo@afdb.org</a> +216 71 10 1510	
<b>9. Brief Description of Project (including objectives and expected outcomes)</b>			
<p>AfDB intends to extend a 7 year line of credit (LOC) to Nigerian Bank targeting RE/EE projects in Nigeria. The objective is to facilitate the provision of financing to projects on terms and conditions relevant for RE/EE. More specifically, the LOC will allow Nigerian Bank to offer loans with maturities of up to 7 years, which is far beyond what is currently offered in the market. In addition, the LOC will facilitate more affordable interest rates, compared to the 20 - 40% interest rates currently charged by Nigerian banks.</p> <p>Currently, Nigerian Bank's indicative pipeline of RE/EE projects - which are aligned with CTF's financing criteria – requires total financing of around USD 300 million. To finance part of this pipeline of opportunities, AfDB seeks USD 25 million of CTF resources to complement USD 25 million of AfDB financing focused on RE/EE.</p>			

## 10. Consistency with CTF Investment Criteria

(i)	Potential GHG Emission Savings	Significant; 0.15 million tons / year
(ii)	Cost Effectiveness	High; 0.2 ton per USD CTF
(iii)	Demonstration Potential at Scale	High; growing energy needs provide significant opportunities
(iv)	Development Impact	High; co-benefits include reduced costs for households and businesses along with health benefits
(v)	Implementation Potential	High; enabling environment steadily improving
(vi)	Additional Costs and Risk Premium	Medium; support for some of the costs of early movers
(vii)	Financial Sustainability	Medium; development of RE is especially likely to require continued support
(viii)	Effective Utilization of Concessional Finance	High; LOC will provide much-needed financing for the development of RE/EE solutions Not applicable
(ix)	Mitigation of Market Distortions	Medium; increasing interest by RE/EE solution providers and sponsors combined with Nigerian Bank's interest in the market along with Federal Government's focus on the energy sector
(x)	Risks	

## 11. Stakeholder engagement

In line with AfDB's approach for such projects stakeholder engagement entailed discussions with local banks, providers/sponsors of renewable energy/energy efficiency solutions and agencies/entities tracking the development and prospects for renewable energy/energy efficiency solutions in Nigeria.

## 12. Gender considerations

There is opportunity for the improvement of women's participation in the labor market and ownership of small and medium enterprises. Access to finance is often viewed as a major constraint and accordingly Nigerian Bank promotes special financial products for women-owned businesses. Nigerian Bank also tries to ensure that most of the projects it supports have a gender component in terms of participation by women.

<b>13. Indicators and targets (consistent with results framework)</b>		
Core indicators		Targets <i>(estimate as per Nigerian Bank's indicative pipeline)</i>
GHG emissions reduced or avoided		Estimated at 0.15 million tons / year; resulting in 5 million tons / over the lifetime of the projects
Volume of direct finance leveraged		USD 250 million
Installed capacity		107 MW
Annual energy saving		150,000 MWh
<b>14. Co-financing</b>		
MDB	USD 25 million	RE/EE AfDB portion of LOC
Private Sector	USD 250 million <i>(estimate as per Nigerian Bank's indicative pipeline)</i>	Project sponsors and other lenders
<b>15. Expected date of MDB approval</b>		
March / April 2014		

## **PROJECT DESCRIPTION**

### **Fit with Investment Plan**

Following the Clean Technology Fund (CTF) Investment Plan (IP) endorsed by the CTF Trust Fund Committee (TFC) in November 2010 and the subsequent confirmation of the availability of funds in late 2012 for the private sector financial intermediation work stream, this proposal is the first private sector project under the IP to support renewable energy and energy efficiency investments.

### **Country and Sector Context**

Nigeria's grid-connected generation capacity is estimated to be around 6,000 MW, albeit operating capacity is lower, against a requirement of well over 10,000 MW. This significant capacity gap is evidenced by wide usage of private diesel generators, which by some estimates is as high as 28,000 MW.<sup>1</sup>

According to the World Economic Forum's Global Energy Architecture Performance Index (EAPI) Report 2014, Nigeria ranks 93rd out of 124 countries based on performance of energy systems on economic growth and development, environmental sustainability, and energy access and security. Nigeria's power sector has scope for improvement in comparison with its peers with regard to elements such as capacity factor, system losses and average revenue per kWh and the duration of accounts receivable.

---

<sup>1</sup> The Global Energy Architecture Performance Index Report 2014, World Economic Forum

## Sub-Saharan Africa EAPI Performance

Sub-Saharan Africa SSA	EAPI 2014		Economic Growth & Development		Environmental Sustainability		Energy Security & Access	
	Score	Rank	Score	Rank	Score	Rank	Score	Rank
Congo, Rep.	0.55	53	0.53	46	0.58	25	0.55	96
South Africa	0.54	54	0.59	29	0.38	94	0.64	81
Cameroon	0.46	80	0.35	85	0.63	13	0.40	110
Namibia	0.46	82	0.45	62	0.51	48	0.41	107
Ghana	0.45	83	0.34	87	0.59	22	0.42	105
Zambia	0.44	92	0.35	83	0.71	6	0.27	118
Nigeria	0.44	93	0.38	69	0.61	18	0.33	114
Botswana	0.44	95	0.48	57	0.37	96	0.46	104
Cote d'Ivoire	0.43	97	0.29	104	0.59	24	0.41	109
Senegal	0.42	99	0.37	71	0.49	55	0.42	106
Mozambique	0.42	106	0.29	105	0.71	5	0.26	119
Eritrea	0.41	107	0.35	80	0.55	36	0.33	113
Kenya	0.41	109	0.28	109	0.63	14	0.31	116
Ethiopia	0.39	113	0.26	113	0.71	4	0.19	123
Togo	0.37	119	0.25	119	0.65	11	0.20	122
Tanzania	0.36	121	0.26	112	0.65	10	0.17	124
Benin	0.35	122	0.32	96	0.49	54	0.25	120
<b>SSA Average</b>	<b>0.43</b>		<b>0.36</b>		<b>0.58</b>		<b>0.35</b>	

The insufficient generation capacity and unreliable distribution has resulted in users connected to the grid – with one of lowest grid-power rates – tending to rely heavily on self-generation equipment. This leads to a true electricity cost for the grid-connected users being among the highest in the continent at around USD 0.30 - USD 0.45 kWh. This puts a significant financial burden on households and entrepreneurs. For example, the cost of running a generator for a photocopying shop could be around USD 100 per week<sup>2</sup>.

MTN – a large mobile phone company – has nearly 6,000 base stations powered by generators and believes that operating and maintenance costs of around USD 27,000 per unit could be reduced by at least 50% by switching to solar photovoltaic solutions.<sup>3</sup> A significant portion of the population is not connected to the grid and meet their energy demand by using localized generation capacity, which are often inefficient, expensive and imply high GHG emissions. Overall, 60 million people use generators to provide electricity for their homes and businesses at a high cost. Furthermore, logistical issues with the fuel for the generators often creates additional inefficiencies and costs.

Nigeria is amongst the world's leading crude oil producers but owing to its inadequate refining capacity imports most of its domestic fuel requirements resulting in a high oil import bill and a significant outlay on subsidies. Addressing subsidies remains a key challenge for Nigeria in terms of improving the affordability of the overall energy system. Increasing efficiency would not only lower energy bills, but it would also contribute towards improving the country's balance of trade and reduce its exposure to global energy price volatility.

Nigeria's energy sector needs to deal with balancing current supply and demand issues as well as demand growth in the coming years, driven by increasing economic activity and high energy

<sup>2</sup> <http://www.bbc.com/news/world-africa-25056721>

<sup>3</sup> <https://www.mtn.com/Sustainability/pages/CaseStudyFullView.aspx?pid=21>

intensity. The reforms and privatization in power sector will contribute towards meeting the needs. However, there are challenges and realizing the expected benefits will take time.

The Nigerian policy framework for RE development is centered on the Renewable Energy Master Plan (REMP) that was adopted in 2011 and is being updated. REMP supports RE deployment through a moratorium on import duties for RE technologies and provides guidance on the design of further incentives in the form of tax credits, capital incentives and preferential loan opportunities. The policy framework for EE development revolves around a National Energy Efficiency Policy (NEEP) that is being developed by the Energy Commission of Nigeria (ECN) with support from the United Nations Development Programme (UNDP) and the Global Environmental Facility (GEF).

While the policy framework broadly supports the objectives of reducing GHG emissions and increased access to reliable and affordable electricity, progress is hampered by factors such as limited long-term funding capacity of local financial institutions as providers of the necessary debt financing to realize the abovementioned objectives.

About 80% of local bank funds currently have maturities of up to one year and are mainly sourced from equally short-term deposits. As a result, banks essentially offer short-term (less than a year) loan maturities and invest mainly in low-risk government securities providing high liquidity. Overall, financing tenors are driven by perceived credit risk profiles of borrowers, in addition to tenor of available funds. Medium- to long- term financing whose tenor is more aligned to RE/EE project maturities are extremely rare and only accessible to blue-chip clients with perceived low credit risks. This results in virtually no funding options for RE/EE projects.

In general, the level of awareness about RE/EE solutions and applications is low, reflecting, to a certain degree, lack of specific interest in investing in RE/EE projects or perceived lack of compelling commercial reasons to do so. In addition, lack of clear energy efficiency targets, also constitute barriers to the development of the energy efficiency market in Nigeria.

## **Opportunities**

Nigeria is taking various steps to facilitate private sector participation in renewable energy, for instance, through the ongoing standardization of the framework for power purchase agreements and allowance for 100% foreign equity in projects. In fact, Nigeria and the MDBs are working on a revision of the CTF Investment Plan to propose reallocation of resources specifically for the renewable energy sector, especially solar photovoltaic projects.

With regard to energy efficiency the industrial sector - production of food and beverages, chemicals etc. – it accounts for a significant portion of growth in energy demand. These industries could benefit from technologies like heat recovery systems and efficient motors to improve energy consumption. Since most businesses sector rely significantly on on-site carbon-intensive generation the application of renewable energy / energy efficiency solutions would greatly reduce GHG emissions. The services sector, which includes hotels and commercial buildings, is also energy-intensive and efficient lighting and air conditioning systems would offer demonstrably high energy savings due to long operating hours. There are significant opportunities on the supply-side too, considering the significant losses in the distribution networks.

## **Project**

The project entails African Development Bank's collaboration with the Nigerian financial sector with a view to support the country's nascent renewable energy and energy efficiency investments. In the context of a request from a Nigerian Commercial Bank ("Nigerian Bank" or "Bank") for a line of credit ("LOC") the AfDB envisages providing a 7 year loan comprised of USD 25 million of AfDB resources and USD 25 million from the CTF for funding renewable energy and energy efficiency projects. The proposed intervention is expected to be amongst one of the first attempts to use the financial intermediation approach to support the development of renewable energy and energy efficiency investments.

## **Use of the CTF Resources**

In the context of Nigeria, where the AfDB has a significant financial intermediation portfolio, the CTF would allow AfDB to provide appropriate financing in terms of volume and pricing that would encourage and facilitate Nigerian Bank's engagement with RE/EE projects. The Bank will use funds from the LOC to on-lend to eligible projects with amounts ranging from USD 2 million to USD 20 million with appropriate tenors. The sponsors of the projects will complement this financing with equity and, if required, further debt financing.

## Terms of the CTF Resources

CTF resources will be provided at concessional terms to encourage and facilitate Nigerian Bank's engagement with emerging RE/EE opportunities. The concessional interest rate will contribute towards helping offset some of the transaction costs associated with engaging with such projects and also allow Nigerian Bank to pass on the benefit of lower financing costs to the projects thereby supporting the project sponsors, to some extent, with the additional costs arising from being first movers or early adopters. The CTF financing is additional both on account of the volume and its concessional nature.

## Eligible Investments

Renewable energy and energy efficiency opportunities cover a range of sectors and applications (Annex I has examples of eligible projects). The eligible investments must demonstrate GHG emission reductions and financing is for new projects, not refinancing of existing loans. At this juncture, the Nigerian Bank's pipeline opportunities include grid-connected and off-grid renewable energy generation and supply-side energy efficiency.

## Nigerian Bank's Product Offerings and Indicative Pipeline

Nigerian Bank's current loan offerings have the following general features.

Type of client	Collateral type	Tenor
Small enterprise	<ul style="list-style-type: none"><li>› Project equipment</li><li>› Tangible assets</li></ul>	Up to 1 year
Medium and large enterprise	<ul style="list-style-type: none"><li>› Contracts &amp; receivables</li><li>› Cash collateral</li><li>› Various pledges (for medium and large enterprises only)</li></ul>	Up to 3 years

Using the line of credit, Nigerian Bank plans to provide RE/EE loans with the following parameters:

- › Tenors of up to 7 years: This would be a considerable improvement on the current 1- 3 years tenor. These loans would better match the payback period of the eligible projects. One major reason why RE/EE projects are not being implemented in the country is that financing currently offered by local banks is so short-term that it is only suitable for trade finance and working capital financing. Investment projects with payback periods beyond 1 year are financed out of equity. Therefore, offering loans with maturity of up to 7 years provides significant support for RE/EE project uptake.
- › More affordable interest rates: Market rates are presently in the region of 20-40%, based on perceived borrower credit risks and banks' limited access to affordable long-term capital. This makes commercial bank loans unattractive and very expensive for projects with payback periods of over one year. Therefore blending more affordable and long-tenor funding from AfDB and CTF will enable Nigerian Bank to offer more affordable interest rates to early movers in the RE/EE arena, after taking into account the additional costs of engaging in such projects.

At this juncture, Nigerian Bank has provided an indicative pipeline of four projects, with an estimated total cost of around USD 300 million, which would be partly supported by the AfDB and CTF line of credit. Three projects concern generation - including two off-grid projects - while one is an electricity distribution project.

<b>Indicative Pipeline Project</b>	<b>Category</b>	<b>Eligibility Assessment</b>
Utility-scale solar photovoltaic (PV) farm	Independent Power Producer	Clean energy
4 MW Biomass thermal generation	Retrofit or expansion of self-generation capacity for a SME	Palm kernel waste replaces diesel
2.5 MW Biomass thermal generation	Retrofit or expansion of self-generation capacity for a SME	Palm kernel waste replaces diesel
Electricity distribution grid	Improvement of supply-side energy efficiency	3% reduction in distribution losses will reduce contribute to generation capacity needs

The indicative pipeline projects' estimated financing needs are generally expected to be financed by 30% equity and 70% debt. The LOC funding is expected to account for around 15% of total project costs, as indicated in the following table.

<b>Indicative Pipeline Project</b>	<b>Estimated Funding from LOC (AfDB+CTF) (USD million)</b>	<b>Estimated Other Debt (USD million)</b>	<b>Estimated Equity (USD million)</b>	<b>Estimated Total Cost (USD million)</b>
Utility-scale solar (PV) farm	20	169	81	270
Biomass thermal generation	3	0	2	5
Biomass thermal generation	2	0	1	3
Electricity distribution grid	20	0	8	28
<b>Total</b>	<b>45</b>	<b>169</b>	<b>92</b>	<b>306</b>

### **Achieving Market Transformation**

The lack of RE/EE market potential awareness and commercial banks' negligible exposure to RE/EE project assessment, combined with inadequate funding structures is an impediment to

Nigeria's transformation towards a lower carbon economy. The need to help banks support RE/EE investments is therefore essential, in order to help Nigeria achieve its objectives of GHG emission reductions, provide affordable and reliable energy to the population and boost the economy.

AfDB and CTF by providing an appropriate financing solution will play a role in market transformation by facilitating Nigerian Bank's engagement with relevant RE/EE projects thereby further developing the Bank's understanding of the area and also reducing some risks of the early movers in RE/EE space. Nigerian Bank engagement with RE/EE projects will also be facilitated by the fact that it is part of a larger banking group, which is a financier of RE/EE projects in Africa.

Nigerian Bank's client list includes the largest businesses in Nigeria but their strength also lies with mid-tier Nigerian business clients which are candidates for RE/EE solutions and this fits well with the Bank's intentions to grow its energy portfolio, including expanding into RE/EE.

Nigerian Bank is currently considering a variety of RE/EE opportunities as demonstrated by the indicative pipeline. The identified investment opportunities will directly contribute to the CTF investment objectives by fostering RE/EE projects. The participation of local banks alongside MDBs or other experienced financiers in emerging sector increases the potential for future conventional debt financing.

AfDB will also use its experience in RE/EE financing to backstop Nigerian Bank on monitoring and evaluation.

## **FIT WITH INVESTMENT CRITERIA**

### **Potential GHG Emission Savings and Cost-Effectiveness**

The estimated emission reduction from Nigerian Bank's indicative pipeline is outlined below (see Annex II for methodology). Overall, the LOC is expected to result in the reduction of about 158,580 tons CO<sub>2</sub> per year and total of 4,940,040 tons CO<sub>2</sub> over the life of the projects.

Indicative Pipeline Project	Estimated Generation or Saving per annum (MWh)	Project's Useful Life	Replacing	Estimated Emission Reduction		Estimated Overall Cost Effectiveness (tons CO <sub>2</sub> / USD)	Estimated CTF Investment (USD million)	Estimated CTF Cost Effectiveness (tons CO <sub>2</sub> / USD)
				tons CO <sub>2</sub> per annum	tons CO <sub>2</sub> over project life			
Utility-scale solar (PV) farm	175,200	33	Gas	78,880	2,603,040	0.01	10	0.26
Biomass thermal generation	9,500	25	Diesel	7,500	187,500	0.04	1.5	0.13
Biomass thermal generation	4,200	25	Diesel	3,300	82,500	0.03	1.0	0.08
Electricity distribution grid	153,000	30	Gas	68,900	2,067,000	0.07	10	0.21
<b>Total</b>	<b>341,900</b>			<b>158,580</b>	<b>4,940,040</b>	<b>0.02</b>	<b>22.5</b>	<b>0.22</b>

At per current estimates, the CTF cost effectiveness of the utility scale solar PV project is the highest – driven by the significant decline in photovoltaic prices in recent years and the fact that the project expects to leverage the maximum amount of additional financial resources. The biomass electrical generation market is immature in Nigeria resulting in higher implementation and operating costs. The LOC would support the early adopters of such technology and foster the development of this promising market sector.

Overall, it is expected that the cost effectiveness of the indicative pipeline will be substantially below the marginal abatement cost of USD per ton of CO<sub>2</sub>-equivalent.

## Demonstration of Potential at Scale

Nigeria's growing energy needs, as the country transitions to an industrialized economy, means that the replication and scalability potential for RE/EE projects is significant. As per a recent report<sup>4</sup>, a low-carbon scenario to achieve Nigeria's objectives - as envisaged in the Vision 20:2020 - through a more diversified mix of generation, could reduce cumulative emissions through 2011 – 2035 from 4,335 to 2,475 million tons of CO<sub>2</sub>.

The majority of the country is viable for solar applications ranging from stand-alone pico units to large-scale grid-connected projects. For instance, covering 1 percent of Nigeria's landmass with approximately 1,046 GW of solar photovoltaic would produce about 1,833 terawatt hours of energy per year. This illustrates that Nigeria's potential for solar photovoltaic is limited not by the physical resource potential but rather by capital availability and related bottlenecks.

The biomass projects show potential for demonstration effect and scalability because of the wide and inefficient usage of biomass<sup>5</sup> which is mainly used through direct combustion. The market is consuming around 50 million tons of wood fuel annually and if used efficiently such biomass could provide the necessary energy to support the transition to a more industrialized agricultural sector.

The supply-side efficiency project envisaged in a newly-privatized electricity distribution company will help demonstrate the potential for energy saving and contribute towards reducing the technical losses from transmission and distribution estimated at around 17% to potentially 8% in a low-carbon scenario by 2035.

---

<sup>4</sup> Assessing Low Carbon Development in Nigeria, World Bank, 2013

<sup>5</sup> Biomass resources consist of wood, forage grasses and shrubs, animal wastes from forestry, agricultural, municipal and industrial activities as well as aquatic biomass.

## **Development Impact**

Considering Nigeria's growing energy needs, the proposed LOC, by supporting early mover projects would help foster currently immature markets allowing them to play a role in the country's growth. In the long-term, this would lead to stronger GDP growth, job creation and improvements in the standard of living. In particular, projects such as the utility-scale solar photovoltaic project reduce the need for additional gas generation capacity. The location of the solar projects in areas that are relatively less developed will also contribute towards Nigeria's efforts to fostering economic development e.g. Strategic Initiatives for North East. The biomass projects would reduce the need to import refined products (diesel) and thereby contribute towards improving the country balance of trade and reducing exposure to price volatility and risk of shortage. The supply-side efficiency projects will improve the reliability of and electricity supply with a range of attendant benefits for over half a million households and businesses. The line of credit, along with implementation support from AfDB, will also contribute towards financial sector development as it will strengthen Nigerian Bank's interest in engaging with RE/EE projects and thereby send a signal to other financial institutions on the potential and attractiveness of RE/EE projects.

## **Implementation Potential**

The policy environment is gradually becoming more conducive to RE/EE investments and has several elements that support the development of RE/EE projects. The National Energy Policy, Renewable Electricity Policy Guidelines, National Climate Change Policy and the Renewable Energy Master Plan contribute towards laying a foundation for low-carbon development.

### ***National Energy Policy***

*In 1990, the Energy Commission of Nigeria (ECN) set up a committee to produce the National Energy Policy (NEP) which was submitted to the Federal Government in 1993. The last revision of the policy document was approved by the Federal Government in April 2003 and was launched by the President in June 2005. In the electricity sector, NEP focuses on the deregulation, privatisation and establishment of legal and regulatory environment to attract private investments (indigenous and foreign) to the sub-sector. NEP also proposed rural electrification and rapid expansion of overall electricity access with diversified power generation to achieve 75% access by 2020. The policy stipulated*

*that the nation shall fully harness the renewable energy sources such small and mini hydropower, solar, biomass, wind, hydrogen and other renewable source to increase access to energy for national development and environmental sustainability. The NEP also stipulates policy to promote improved efficiency in the use of fuel wood.*

### **Renewable Electricity Policy Guidelines**

*The Renewable Electricity Policy Guidelines (REPG) is the government's overarching policy on all electricity derived from renewable energy sources. The REPG, which was initiated by the Federal Ministry of Power in 2006, sets out the vision, policies and objectives for promoting renewable energy in the power sector. REPG stipulated that the Federal Government shall expand the market for renewable electricity to at least five percent of total electricity generating capacity and a minimum of 5TWh of electric power production, excluding large hydropower by 2016. The strategies to achieve this will be to encourage local manufacturing and assembly of RE products, provide subsidies, introduce technical standards and certification and licensing of RE personnel and providers and create public awareness.*

### **National Climate Change Policy**

*The National Climate Change Policy (NCCP) highlighted renewable energy policies and strategies for dealing with the challenges of climate change. It was developed to ensure the implementation of existing national energy policies, plans and regulations to make them responsive to mitigating GHG emissions as well as increasing national adaptive capacity to climate change impacts, mainly in terms of promoting diverse EE mix with increasing proportion from renewable and other sources using clean technologies and generating energy from renewable sources to account for a minimum of 30% by 2030.*

### **Renewable Energy Master Plan**

*The Energy Commission of Nigeria produced in 2005 the Renewable Energy Master Plan (REMP) for Nigeria. The overall objective of the REMP is to articulate a national vision, targets and a road map for addressing key development challenges facing Nigeria through the accelerated development and exploitation of renewable energy. The REMP which is being updated envisages that renewable energy will contribute up to 20% of the entire energy mix by 2030.*

With reforms and privatization of power sector, a new institutional landscape is emerging along with significant private sector investments. Hence, at this inflexion point, it is imperative to demonstrate grid-connected renewables generation in particular solar photovoltaic to attract private sector investment and streamline renewables into the new emerging power institutional landscape whilst also reducing and diversifying its dependence on fossil-fuel based power generation.

Furthermore, at the regional level, in 2012, the Economic Community of West African States (ECOWAS) Energy Ministers adopted regional policies on Renewable Energy and Energy Efficiency. The policies are a voluntary commitment of ECOWAS to the UN Sustainable Energy for All (SE4ALL) Initiative and the policies' targets are in line with the SE4ALL targets. Subsequently, in July 2013, the ECOWAS Authority of Heads of State and Government renewed its commitment to the provision of access to sustainable energy services in West Africa by adopting the ECOWAS Energy Efficiency Policy as well as the ECOWAS Renewable Energy Policy.

Although the regulatory framework at the national and regional levels supports the implementation of RE/EE projects, access to affordable funding with long tenor is proving to be a significant constraint for the penetration of RE/EE technologies. The proposed line of credit would therefore address a key barrier for first movers and early adopters in the area of RE/EE by facilitating the provision of long term financing.

### **Additional Costs & Risk Premium**

One of the key non-financial barriers to RE/EE financing is the perception of the risks of the projects. Through facilitating Nigerian Bank's participation in the projects mentioned the LOC will help demonstrate to the Nigerian business and financial community that RE/EE projects have a reasonable risk return profile. In fact, the risks with regard to energy efficiency solutions might be lower than alternative business investments as they entail no additional/new market risk and limit the borrowers' exposure to energy prices and in some instances uncertainty of supply.

## **Use of Other Donor Funding**

At this juncture, the CTF funds will be the only donor funding envisaged in the LOC to Nigerian Bank. However, AfDB is aware of other initiatives by various development partners that will target Nigeria directly or as part of a wider group of countries with a view to support the uptake of RE/EE solutions. Examples of such initiatives include the United Nations Development Programme's cooperation with the state-owned Bank of Industry and the proposed Renewable Energy Performance Platform being launched by the European Investment Bank and the United Nations Environment Programme.

## **Financial Sustainability**

The LOC will contribute towards the sustainability of RE/EE lending operations by helping to increase Nigerian Bank's familiarity with RE/EE projects. Energy efficiency projects in Nigeria can have attractive payback period of around 3 years, and sometimes even be as short as 1½ years. Hence, if Nigerian Bank builds further on the interest that it has demonstrated it could be able to identify project opportunities, especially in energy efficiency, which have pay back periods that fit the parameters of their mainstream lending. As long-term funding sources become more readily available for Nigerian Bank and other banks, the financing of projects with long-term financing needs, e.g. utility-scale photovoltaic, will become more sustainable.

Other initiatives such as the United States' Power Africa Initiative and the UN-led Sustainable Energy for All (SE4All) Initiative are expected to contribute towards the development of the energy sector and hence will contribute to improving the sustainability of early efforts such as this LOC.

## **Effective Utilization of Concessional Finance**

Nigerian Bank's indicative project pipeline has projects, e.g. utility-scale solar photovoltaic plant, which are unlikely to proceed without long-term concessional finance. It's likely that such projects will also attract additional financing from development partners.

With regard to the choice of the LOC approach, it should be noted that, in general, entering new sectors is a challenge for financial institutions and hence using a relatively simple LOC is better than more involved approaches such as a risk sharing facility which would potentially create additional complexity.

## **Mitigation of Market Distortions**

The LOC will not crowd out other private sector investments in the RE/EE field as local commercial banks are essentially not financing RE/EE projects.

## **Risks**

Implementation risks relate to factors such as (i) low uptake of loans (ii) insufficient focus on RE/EE opportunities by Nigerian Bank and (iii) Nigeria's lack of focus on the energy sector resulting in enabling environment related constraints.

Overall, such risks are well mitigated owing to the following reasons (i) RE/EE solution providers and sponsors increasing interest in playing a role in the market (ii) Nigerian Bank's position as a part of a larger banking group – which has RE/EE exposure – will contribute to ensuring appropriate focus on emerging opportunities and (iii) the Federal Government is focused on developing the energy sector, as evidenced by the recent reforms, and is working toward launching a process to develop an Action Agenda, along with accompanying Investment Prospectuses, to meet the SE4ALL objectives by 2030.

## Performance Indicators

The following elements will be tracked periodically

- › Overview of individual loans (amount, financing plan, borrower, sector, purpose, confirmation of compliance with eligibility criteria)
- › Energy-related information (types of fuels involved in the projects, baseline data and cost for each fuel type, energy production or energy savings and CO<sub>2</sub> emissions reductions)

This will form the basis of evaluating the LOC's impact as per the following indicators and targets (estimated as per Nigerian Bank's indicative pipeline):

- › GHG emissions reduced or avoided: 0.15 million tons / year  
5 million tons / over the lifetime of the investments
- › Volume of direct finance leveraged: USD 250 million
- › Installed capacity: 107 MW
- › Annual energy saving: 150,000 MWh

## ANNEX I EXAMPLES OF RENEWABLE ENERGY AND ENERGY EFFICIENCY PROJECTS

### Demand-side, brownfield energy efficiency<sup>6</sup>

#### Commercial and Residential Sectors (buildings)

- ✓ Energy-efficiency improvement in lighting, appliances and equipment
- ✓ Substitution of existing heating/cooling systems for buildings by cogeneration plants that generate electricity in addition to providing heating/cooling
- ✓ Retrofit of existing buildings: Architectural or building changes that enable reducing energy consumption
- ✓ Waste heat recovery improvements

#### Public Services

- ✓ Energy-efficiency improvement in utilities and public services through the installation of more efficient lighting or equipment
- ✓ Rehabilitation of district heating systems
- ✓ Utility heat loss reduction and/or increased waste heat recovery
- ✓ Improvement in utility scale energy efficiency through efficient energy use, and loss reduction.

#### Agriculture

- ✓ Reduction in energy use in traction (e.g. efficient tillage), irrigation, and other agriculture processes

#### Industry

- ✓ Industrial energy-efficiency improvements through the installation of more efficient equipment, changes in processes, reduction of heat losses and/or increased waste heat recovery
- ✓ Installation of cogeneration plants
- ✓ More efficient facility replacement of an older facility (old facility retired)

### Demand-Side, Greenfield Energy Efficiency<sup>7</sup>

#### Construction of New Buildings

---

<sup>6</sup> The principle for brownfield energy efficiency activities involving substitution of technologies or processes is that: the old technologies are substituted well before the end of their lifetime and the new technologies are substantially more efficient or new technologies or processes are substantially more efficient than those normally used in greenfield projects.

<sup>7</sup> The principle for greenfield activities is that they prevent a long-term lock-in in high-carbon infrastructure (urban, transport and power sector infrastructure).

- ✓ Use of highly efficient architectural designs or building techniques that enable reducing energy consumption for heating and air conditioning, exceeding available standards and complying with high energy efficiency certification or rating schemes

## **Supply-Side, Brownfield Energy Efficiency**

### Transmission and Distribution Systems

- ✓ Retrofit of transmission lines or substations to reduce energy use and/or technical losses, excluding capacity expansion
- ✓ Retrofit of distribution systems to reduce energy use and/or technical losses, excluding capacity expansion
- ✓ Improving existing systems to facilitate the integration of renewable energy sources into the grid

### Power Plants

- ✓ Renewable energy power plant retrofits
- ✓ Energy-efficiency improvement in existing thermal power plant
- ✓ Thermal power plant retrofit to fuel switch from a more GHG-intensive fuel to a different, less GHG-intensive fuel type
- ✓ Waste heat recovery improvements

## **Renewable Energy**

### Electricity Generation, Greenfield projects

- ✓ Wind power
- ✓ Geothermal power
- ✓ Solar power (concentrated solar power, photovoltaic power)
- ✓ Biomass or biogas power that does not decrease biomass and soil carbon pools
- ✓ Ocean power (wave, tidal, ocean currents, salt gradient, etc.)
- ✓ Hydropower plants only if net emission reductions can be demonstrated

### Transmission Systems, Greenfield

- ✓ New transmission systems (lines, substations) or new systems (e.g., new information and communication technology, storage facility, etc.) to facilitate the integration of renewable energy sources into the grid

### Heat production, Greenfield or Brownfield Projects

- ✓Solar water heating and other thermal applications of solar power in all sectors
- ✓Thermal applications of geothermal power in all sectors
- ✓Thermal applications of sustainably-produced bioenergy in all sectors, including efficient, improved biomass stoves

## ANNEX II METHODOLOGY FOR GHG ESTIMATION

Emission reduction is estimated by quantifying the amount of GHG generated by production and distribution assets that will be replaced by the proposed projects. The process is summarized below.

1. Identify the source of energy replaced by the proposed project
2. Quantify the amount of energy (GJ) replaced, taking into consideration the heat rate of each technology
3. Convert the amount of energy (GJ) reduction into kg of CO<sub>2</sub>
4. Determine the total expected GHG reduction resulting from the implementation of the proposed project, by multiplying the expected annual reduction by the project's useful life.

### Step 1:

The energy replacement selection is based on whether the project is on- or off-grid.

On grid projects: The typical marginal generators used to supply the grid are gas driven. Hence, the baseline assumption is that the saved energy or added capacity will replace energy otherwise generated using gas generators.

Off grid projects: The typical off grid generators are diesel driven. Hence, the baseline assumption is that the energy produced will result in a reduction of self-generation using diesel generators.

### Step 2 & 3:

The heat rate for the two generation technologies and the emission factors were obtained from the United States Energy Information Administration (EIA).

<b>Fuel type</b>	<b>Heat rate<sup>8</sup> (GJ of fuel / MWh of electricity)</b>	<b>Emission Factor<sup>9</sup> (kg CO<sub>2</sub> / GJ of fuel)</b>
Diesel	11.4	69

<sup>8</sup> EIA's average operating heat rate for energy source

<sup>9</sup> EIA's fuel emission coefficients

Gas	9.0	50
-----	-----	----

Step 4:

The proposed generation projects useful lives were estimated using typical useful lives for similar technologies from the US Energy Information Administration. The useful life of the distribution project was estimated based on typical transformer lives.

<b>Biomass</b>	<b>Solar</b>	<b>Grid efficiency</b>
25	33	30