CTF PRIVATE SECTOR PROPOSAL

Name of Project or Program	**Utility-Scale Solar PV Program**
CTF amount requested	Investment: USD 29.3 million Implementation and supervision budget: USD 0.7 million Total amount: USD 30.0 million
Country targeted	Nigeria
Indicate if proposal is a Project or Program	Program

1 DETAILED DESCRIPTION OF THE PROGRAM

1.1 Proposal Context

The original *Nigeria Country Investment Plan* (CIP)[1] allocated USD 250 million of CTF funds across transport, renewable energy (RE), and energy efficiency (EE) sectors. The CIP included USD 100 million of CTF funds for the *Financial Intermediation for Clean Energy and Energy Efficiency* component implemented by the AfDB and IFC. This component envisioned providing CTF-supported lines of credit or risk products to local Financial Institutions (FIs), to catalyze financing for EE and RE projects (such as solar PV, wind, efficient hybrid generators, etc.).

In July 2014, the CTF Trust Fund Committee (TFC) endorsed the *Update Note to the CTF CIP for Nigeria* that freed up portions of funds from some of the components and aggregated them to establish a USD 125 million *Utility-scale Solar PV* component implemented jointly by the AfDB and the WB[2]. After the 2014 CIP update, IFC has continued engaging with FIs in order to originate sufficient volume of eligible EE/RE projects that would lead to rapid portfolio ramp up and implementation. The process, however, is taking time, as the local FIs remain rather constrained by the lack of experience in financing power projects (particularly RE and EE), exacerbated in the context of limited liquidity and difficult lending environment. While IFC continues actively exploring opportunities, it does not seem likely that a sufficient pipeline of projects with FIs will be able to reach advanced enough stage in time, so that IFC will be able to present the *Financial Intermediation for Clean Energy and Energy Efficiency* component to the CTF TFC for review and approval.[3]

In the meantime, capitalizing on the continued efforts of the Government of Nigeria (GoN) to improve regulatory environment for private sector RE investments, over the past two years IFC has been engaged in building a pipeline of utility-scale solar PV projects. To capture the momentum and help the GoN increase the impact of its current regulatory reform, IFC is reallocating USD 30 million from the *Financial Intermediation for Clean Energy and Energy Efficiency* component to the *Utility-scale Solar*

[1] Endorsed by the CTF Trust Fund Committee in November 2010

[2] CTF Funds of USD 125 million were reallocated from the World Bank Bus Rapid Transit Lagos (LUTP2) project (USD 50 million), from the World Bank Bus-based mass transport support for Abuja, Kano, and Lagos (NUTP) project (USD 50 million) and the AfDB Financial Intermediation for Clean Energy and Energy Efficiency (USD 25 million).

[3] In August 2016, the CTF TFC approved the CTF Pipeline Management and Cancellation Policy. In application to the projects and programs in the CTF current pipeline that have not been submitted to the TFC for funding approval, the policy established June 30, 2017 as a deadline for submitting them to the TFC for funding approval.

PV component of the CIP. An Amendment to the CTF Nigeria CIP, reflecting this reallocation is submitted concurrently with this *Program* proposal.

Current IFC's solar PV project pipeline fully conforms to the objectives and scope of the *Utility-scale Solar PV* component of the Nigeria CIP and will allow achieving greater synergies between AfDB, WB, and IFC efforts in developing the Nigerian RE market. With this program proposal, IFC seeks an approval to utilise the reallocated USD 30 million for its *Utility-Scale Solar PV Program* (the *Program*).

1.2 Country Context

The Federal Republic of Nigeria ("Nigeria") is the World's 7th largest country by population (around 182 million people) and the largest economy in the Sub-Saharan Africa.[4] Rich in natural and mineral resources (with enough gas reserves to power the West Africa region) Nigeria has consistently been among top seven largest crude oil exporters, over the last 20 years.[5]

Yet, despite Nigeria's significant natural endowment, the country remains poor with a GDP per capita of $2,671 (2015 estimate) and over 50 percent of its population living below the extreme poverty line (and over 75 percent living below the poverty line).[6] Development efforts have been constrained by corruption and, more recently, security threat from the Boko Haram terror group. Further, with over 90 percent of foreign earnings coming from the oil sector, the Nigerian economy is heavily dependent on external conditions of the oil market. While over the past decade heightened oil demand and favorable commodity pricing have helped fuel Nigeria's strong economic growth (averaging about 6 percent during 2005-2015[7]), following the recent fall in global oil prices, the country's economic growth has slowed considerably. In 2016 the Nigerian economy contracted by 1.5 percent, and the IMF projects that it would pick up slightly by 0.8 percent in 2017[8]. The GoN's objective of lifting its population out of poverty is now at risk, which puts additional focus on reviving the drivers of the country's economic growth.

Over the past decade Nigeria's economy has become more diversified. The service sector contribution to the growth increased to about 57 percent, while agriculture and manufacturing delivered about 21 percent and 9 percent, respectively[9]. However, the underdeveloped power sector in Nigeria is seen as a key constraint to sustaining the country's economic growth[10]. In addition to insufficient power supply that slows down growth of businesses, many enterprises experienced average of 33 power outages a month in 2014[11], which noticeably affected their productivity and sustainability. Both the slow expansion and

[4] The World Bank, *The World Bank Databank*, 2017. Accessed in May 2017 at http://databank.worldbank.org/data/reports.aspx?source=world-development-indicators

[5] EIA, *International Energy Statistics*, 2017. Accessed in May 2017 at http://www.eia.gov/beta/international/rankings/#?prodact=57-4&cy=1999&pid=57&aid=4&tl_id=4-A&tl_type=a

[6] The World Bank, *Poverty & Equity*, 2017. Accessed in May 2017 at http://povertydata.worldbank.org/poverty/country/NGA

[7] The World Bank, *The World Bank Databank, World Development Indicators*, 2017. Accessed in May 2017 at http://databank.worldbank.org/data/reports.aspx?source=world-development-indicators#.

[8] IMF, *Nigeria : 2017 Article IV Consultation- Press Release; Staff Report; and Statement by the Executive Director for Nigeria*, 2017. Accessed in May 2017 at http://www.imf.org/en/Publications/CR/Issues/2017/04/05/Nigeria-2017-Article-IV-Consultation-Press-Release-Staff-Report-and-Statement-by-the-44792

[9] The World Bank, *World Bank Data Bank*, 2017. Accessed in May 2017 at http://databank.worldbank.org

[10] Larossi, G., Mousley P., and Radwan, I., *An Assessment of the Investment Climate in Nigeria*, the World Bank, 2010.

[11] The World Bank, *World Bank Enterprise Surveys, 2017*. Accessed in May at http://www.enterprisesurveys.org/

inefficiencies in the power sector have led to significant supply-demand imbalances and an inability to increase electrification rates in the country.

1.3 Energy Sector Context

Decades of lack of investments in expansion and maintenance have left the current formal capacity of Nigeria's power sector at a mere 2,000MW – 4,000MW level, with variation explained by varying available capacity of power plants, including seasonality associated with hydro power plants. Irregular supply of gas as well as sabotage of pipelines in the Niger Delta region further increase capacity uncertainty. In addition, there is a considerable level of technical and commercial loss in the transmission (8 percent) and distribution (~32 percent) of power and a notable inefficiency in commercial management of the grid system. For example, according to the Federal Ministry of Power[12], on March 20, 2016 the system peak generation was at the level of 3,857.4 MW, which was not even close to meeting the estimated peak demand of 12,800 MW on that day. As a result, only about 40 percent of Nigeria's population has access to electricity, marking the 2nd largest 'deficit in access to energy' globally (~100m people).[13]

The 40 percent of population with access to electricity receives one of the most erratic power supply in the world. For example, a Distribution System Reliability index called System Average Interruption Duration is extremely high for Nigeria at values exceeding 60,000 min where the value of this index for the US is 88 min.[14] The industries, businesses, and residential sector make-up for power deficiency and inconsistency with onsite generation using miniature plants that run mostly on petrol and diesel. As a result, Nigeria has become one of the largest markets for expensive diesel/petrol power generators – as a source of main or back up power. Widespread reliance on expensive diesel power results in the cost of power to often represent up to 40 percent of business' operational expenses, with over 80 percent of Nigerian business owners considering the lack of stable power supply to be the biggest obstacle to business growth[15]. The high cost of production and services, in turn causes flight of industries and businesses from Nigeria and rise of unemployment.

In 2010, in order to put the power sector on an economically and financially sustainable path, while expanding access to electricity, the GoN embarked on an ambitious energy sector reform process. Over the next few years, the reforms generated a set of tangible results, including inter-alia:

- Creation of Nigeria Bulk Electricity Trading Plc. (NBET), a single buyer entity to facilitate the trading of power between private generators and distribution companies;
- Introduction of the framework for a cost-reflective electricity tariff regime;
- Unbundling and privatization of 6 generation and 10 distribution assets of the formerly vertically-integrated national utility;
- Putting in place a private management contract for the state-owned entity responsible for the

[12] Federal Ministry of Power, Works and Housing, *Power Statistics, Energy Generation for Nigeria*, 2016. Accessed in May 2017 at http://www.power.gov.ng/

[13] Sustainable Energy for All, World Bank/Energy Sector Management Assistance Program (ESMAP) and the International Energy Agency (IEA), *Global Tracking Framework*, 2016. Accessed in May 2017 at http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2013/05/28/000112742_20130528084417/Rendered/PDF/778890GTF0full0report.pdf

[14] Oyedepo SO. *On energy for sustainable development in Nigeria*. Renew Sustain Energy Rev, 2012, 2583–98.

[15] The Economist, *Special Report: Business in Africa : Not Making it*, 2016. Accessed in April 2016 at http://www.economist.com/news/special-report/21696785-successful-manufacturing-sector-requires-many-things-africa-lacks-not-making-it

transmission and independent system operator functions;

- Launching a Gas Master Plan, with a new gas pricing regime established in order to incentivize production of gas for domestic consumption; and
- Framework for the privatization of 10 National Integrated Power Plants financed and built by the government with a total capacity of circa 5,000MW.

To guide pricing for electricity generation, transmission and distribution companies, the National Energy Regulatory Commission (NERC) approved a Multi-Year Tariff Order (MYTO) for the period July 1, 2008 - June 30, 2013. The MYTO became the first tariff schemes that had ever been established; in 2012 a second MYTO (MYTO 2) was issued.

Notwithstanding these important achievements, a number of obstacles and slowdowns hampered further progress and prevented the reforms from fully achieving intended outcomes. There remain a number of significant concerns about the viability of the power sector, which threaten to further weaken the progress achieved with the reform so far. At the heart of these concerns is the accumulated sector deficit that is estimated to reach USD 3 billion by the end of fiscal year 2017, and which causes can be attributed to:

- the inability to implement cost-recovery tariffs since mid-2013;
- weak regulatory oversight;
- low power generation; and
- continued changes in macroeconomic parameters (exchange rate, inflation, etc.).

To improve the sector sustainability, the GoN embarked on a concerted effort – supported by the World Bank Group – to develop and implement a "Power Sector Recovery Program: 2017 – 2021". The Recovery Program was approved by the Federal Executive Council of Nigeria on March 22, 2017 and aims to address the sector's liquidity and sustainability issues. Adequate progress of this Recovery Program will be critical to the successful implementation of new private sector projects, including those under this *Utility-Scale Solar PV Program*.

Significant improvement of power system efficiency can be achieved by increasing reliability of power supply and decreasing reliance on expensive back-up diesel generation. While the country is struggling to come up with measures to stabilize its power sector, the widespread and expanding use of on-site fossil-fuels based generators has become a major source of Nigeria's GHG emission and continues to rapidly drive the GHG emission up[16]. The GHG emission reached 301 million tCO_2e in 2012, equivalent to 1.65 tCO_2e/per capita per year.

Recognizing an urgent need to reverse this trend as well as recognizing the remarkable potential across various RE resources in Nigeria, the GoN has committed to diversify the country energy mix by introducing new RE generation. With the existing RE portion of the energy generation comprised solely of hydro technology (3 hydro power plants of roughly 1,900 MW in aggregate nameplate capacity), the GoN is keen to see other RE technologies in the mix. The country's Vision 2020 pronounces an ambitious goal for the installed electricity capacity to reach 40,000 MW in 2020. Among various measures geared towards reaching that goal, the NERC set a target of 2,000 MW of electricity from RE by 2020.[17] In addition, the MYTO 2 included generation tariffs for RE technologies, such as solar PV with 1MW to 5MW of installed capacity.

[16] Cervigni, R., Rogers, J.A., and Dvorak, I., *Assessing Low-Carbon Development in Nigeria: An Analysis of Four Sectors*, World Bank Study, 2013

[17] NERC, *Renewable Energy Sourced Electricity*, 2017. Accessed in May 2017 at http://www.nercng.org/index.php/home/operators/renewable-energy

1.4 Solar PV Sector Context

Nigeria enjoys a good solar resource, particularly in the more arid Northern regions where Direct Normal Irradiance (DNI) can reach 2,000 kWh/m^2 per year[18]. With that irradiation, the country could install up to 1,046 GW of solar PV capacity, which would generate 1,833 TWh of electricity per year, satisfying not only current demand but also significant future demand growth. While intermittent by nature, solar PV power can still help Nigeria balance energy mix, as Nigeria's hydro generation capacity includes a reservoir which allows for planed dispatches and the PV solar installation can partially make-up for the underperformance of the hydro. Yet, for many years, the investment environment for large-scale RE sector had remained weak and government reforms and enhancements to enabling environment had failed to result in a pipeline of bankable projects.

Recognizing the need to unblock the bottlenecks for RE development, in April 2015, the GoN adopted National Renewable Energy and Energy Efficiency Policy. The policy set an objective of increasing the contribution of solar energy to the energy mix to 3 percent by 2020 and 6 percent by 2030[19]. This Policy authorized the Nigeria Electricity Regulatory Commission (NERC) to introduce and develop economic incentives and establish requirements for feed-in-tariffs (FiT) for various RE generation sources[20].

On December 8, 2015, the NERC approved the FiT Regulations for Renewable Energy Sourced Electricity (REFIT)[21], which covers wind, small hydro, biomass, and solar PV (between 1 and 5 MW) technologies. The FiT level approved by the NERC for 1MW-5MW Solar PV is 0.177 USD/kWh (around 35.4 Naira/kWh) and is expected to be revised in 2018.

However, the REFIT did not establish any incentives for grid-connected solar PV power plants with installed capacity over 5MW, even though that is the market segment that typically attracts the most interest. To stimulate that particular market segment and facilitate the development of large-scale solar power plants by Independent Power Producers (IPP), the NERC issued generation licenses to several IPP developers for a set of grid-connected solar PV projects that are not covered by the REFIT scheme. These projects include 10 MW power plant at Kafanchan, Kaduna State (licensed in October 2014), 24 MW at Kinkier, Katsina State (licensed in December 2014), and 100 MW at Ganjuwa, Bauchi State (licensed in March 2015). In addition, three 100 MW solar PV projects – Sinosun Investment Limited in Jibiya, Kastina, LR-Aaron Power Limited in Gwagalada and Middle Band Solar One Limited in Kogi State – received generation licenses in December 2015[22].

These projects now have Power Purchase Agreements (PPA) with a flat tariff of USD 0.115/kWh (over the 20-year life of the PPA). At this point in time, a standard Put-Call Option Agreement (PCOA) is still being negotiated with the offtaker and the GoN. The World Bank Guarantee program in support of private investment in power generation (and potentially also in the distribution sub-sector) will depend on satisfactory progress in implementing the Power Sector Recovery Program. The solar developers,

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[18] Cervigni, R., Rogers, J.A., and Dvorak, I., *Assessing Low-Carbon Development in Nigeria: An Analysis of Four Sectors*, World Bank Study, 2014

[19] National Renewable Energy and Energy Efficiency Policy (NREEEP) approved by Federal Executive Council (FEC) for electricity sector, April 20, 2015

[20] National Renewable Energy and Energy Efficiency Policy (NREEEP) approved by Federal Executive Council (FEC) for electricity sector, April 20, 2015

[21] The Nigerian Energy Regulatory Commission, *the Feed-in-Tariff Regulations for Renewable Energy Sourced Electricity*, 2016. Accessed in May 2017 at http://www.nercng.org/index.php/document-library/func-startdown/486/

[22] The Nigerian Energy Regulatory Commission, *NERC Issues Licences to Eight Companies*, 2016. Accessed in May 2017 at http://www.nercng.org/index.php/media-and-publicity/press-releases/322-nerc-issues-licences-to-eight-companies

therefore, remain keen to complete their PCOA negotiations with the offtaker while awaiting satisfactory progress in implementing the Recovery Program.

1.5 Barriers to Private Sector Investment

Solar PV investments in Nigeria have so far been limited to small-scale off-grid solar PV and small scale solar thermal projects. The recent policy (2015 National Renewable Energy and Energy Efficiency Policy) and regulatory (including MYTO2 and REFIT) advancements established a framework for RE generation investments, but many barriers remain, especially for grid connected utility scale solar PV with installed capacity exceeding 5MW:

- First mover challenges: The first utility-scale solar PV projects in Nigeria will face a multitude of financing and operational challenges and uncertainties. The projects will have to operate in the absence of established supply chains, local experienced EPC contractors, proven financing mechanisms, experienced off-taker, etc.;
- Limited ability to raise financing: International banks tend to shy away from the Nigerian power sector due to country and off-taker risk. Local/regional banks, on the other hand, face restrictions of regulatory capital and maturity mismatches, and have no experience in lending to solar projects. In the current macroeconomic environment, access to long-term debt is limited, and typical maturities (5 years or shorter) in the local commercial debt market are well below those needed to ensure bankability of projects. In addition, even if projects manage to secure commercial financing, the cost will come high due to the difficulties associated with designing non-standard, one-off financing packages;
- New regulatory environment: The first projects will experience high transaction costs due to the time required by developers to individually negotiate non-standard novel PPAs. This includes additional efforts in assessing, managing, and mitigating off-take risks; and also having to test commercially unproven arrangements associated with structuring a contract between the off-taker and the IPP, with only one IPP thermal project done so far (currently under construction);
- Grid unreliability and limitations: Currently, the transmission grid is seen as a significant bottleneck in the electricity supply chain in Nigeria. The transmission lines, operating at 132 and 330 kV, have aged. The electricity network equipment is outdated, reducing the transmission capacity. Besides, utility-scale solar PV power plants are often located in remote areas where transmission/distribution networks are not available at all. Therefore, grid-connected solar PV power plants are expected to incur additional cost related to building new transmission/distribution lines and additional uncertainty on how the existing grid will handle significant inflows of new – intermittent – generation.
- Security issues in the region with the best solar irradiation. Security concerns in the Northern Region leave the developers with a dilemma: face higher risk and increased cost in the area with better DNI values or accept lower DNI in more southern areas at the benefit of greater certainty and lower risk.

Given the above barriers, a blended financing structure will very likely be needed to achieve project bankability for the first private sector solar PV projects. In particular, the high investment risks and capital costs resulting from the absence of a proven enabling environment and high development costs require concessional financing in order to help achieve a tariff level sustainable in the longer term. This will help reduce the risk of renegotiation of the tariff and decrease the uncertainties for the developers and lenders.

1.6 Investment Services Component

The *Program* will build on IFC's experience in the solar PV sector across the globe and will draw on recent progress in similar solar PV CTF Programs in Honduras, Thailand, and other countries. The *Program* will support first-mover utility-scale private sector solar PV projects in Nigeria in order to: (a) generate a demonstration effect and help create a track record; (b) support emerging RE regulatory framework and demonstrate bankability of the new RE PPA; and (c) stimulate the entry of commercial developers and lenders into solar PV markets – in Nigeria and broadly in Sub-Saharan Africa. The *Program* will finance at least one utility-scale private sector solar PV project in Nigeria for a capacity (or aggregate capacity, if it is more than one project) of up to 100 MW.

The work under this *Program* will largely follow objectives, approaches, and investment structures, laid out in the two recent IFC's Sub-Programs under the Dedicated Private Sector Programs Sub-Programs (Stage 1, Honduras, and Stage 2, Africa and LAC). By delivering new RE capacity, increasing energy supply, improving quality of access to sustainable electricity, and displacing carbon-intensive generation in Nigeria, the *Program* will likely have a broader impact with spill-over effects across the African continent.

The sub-project(s) under the *Program* will aim to align with broader sectoral activities undertaken by the World Bank. Further, the pace of the development of sub-projects and specific pathways the sub-projects will take will depend on the progress and success of the Power Sector Recovery Program. While the GoN activities, supported by the World Bank, will seek to improve the overall sector attractiveness and sustainability, targeted and tailored concessional finance will be required to address the higher costs and risks of developing and financing the first ever utility-scale solar PV in Nigeria. IFC will use the CTF funds provided by this *Program* to reduce the tariff down to levels that can be sustained in the long term, ultimately benefitting the end consumers, while ensuring that lenders' debt service coverage requirements and sponsors' equity return expectations are met. The *Program*, however, will seek to retain flexibility in designing a specific customized financial structure according to sub-project's needs, including selection of financial instruments, their pricing and terms. IFC will ensure that the principle of minimum concessionality upholds and that the project development process follows the well-established IFC's blended finance governance.

IFC has been engaged with several solar PV developers with the most advanced projects in the country. That engagement is expected to help achieving high quality of project preparation and increase attention to integrity due diligence and E&S issues. IFC will continue pursuing the projects, success of which will depend on the speed and the progress of the Recovery Program and negotiations of the remaining key documents. In addition, the final decision to proceed with a project will be made taking into account the sponsors' commitment and ability to timely deliver on the project (as this is crucial for establishing a track record and enticing future developers). CTF financing will aim to leverage at least the same amount in IFC financing. Overall, IFC expects the *Program* leverage to achieve about 3.5x of the CTF amount (including IFC, other development finance institutions, private sector, etc.).

Final agreement to provide CTF funding to a project will be subject to full due diligence and approval by the IFC Board as well as an internal IFC approval body, governing blended finance operations. All investments are required to meet IFC Performance Standards, including environmental, social, governance and other compliance standards, as well as all country regulatory requirements. Investments undertaken by IFC will not require sovereign guarantees (except government guarantees to PPAs where necessary) and, therefore, will not be reflected on the country's debt service requirements, thereby not affecting the country's debt sustainability.

1.7 *Program's strategy to achieve market transformation*

The proposed *Program* has the potential to play a transformational role in Nigeria's RE sector by supporting some of the first grid-connected utility-scale solar PV projects in the country and establishing an initial track record that demonstrates the viability of financing utility-scale solar PV projects by the

private sector. By now, the GoN has undertaken significant steps to support private sector investments into RE projects, but numerous barriers remain. This *Program* is designed to help overcome these barriers and demonstrate that solar PV projects can be bankable, which will improve risk return perception of future projects and attract private sector players to the solar PV market in Nigeria.

In the long term, the need for concessionality for solar PV investments is expected to diminish in Nigeria for several reasons, including: (i) the pipeline of first-mover projects will establish track record, demonstrating capacity of the government to process needed contracts in satisfactory and bankable manner and reducing uncertainties and costs associated with the solar PV project preparation and execution process; (ii) there will be a reduction in investor risk perception, lowering the cost of capital, and enabling future projects to achieve reasonable returns and proceed with less or no subsidy; and (iii) there will be an increase in the overall market experience with grid-connected utility-scale solar PV plants in Nigeria, including establishing supply chains, potentially local manufacturing of components, specialized service and labor, etc.

2 FIT WITH INVESTMENT CRITERIA

2.1 *Potential GHG Emission Reduction*

The calculations of potential GHG emission reductions that can be achieved with the CTF funding are based on the following assumptions:

- The CTF funding is expected to support the construction of about 100 MW of solar PV capacity;
- An estimated capacity factor of 18%, based on initial assessment of annual average production for potential projects;
- A combined margin emission factor for solar energy[23] of about 0.474 tCO_2e/MWh[24]; and
- An anticipated lifetime of 20 years.[25]

Sub-projects under this *Program* are expected to directly generate GHG emission reductions of about 74,700 tCO_2e (0.474 tCO_2e/MWh x 100 MW x 8,760 hours x 18%) over a representative year of operation, and roughly 1,500,000 tCO_2e over the life of sub-projects (estimated at 20 years maximum).

Given that the *Program*, if successful, may help facilitate a scale up of solar PV generation in Nigeria, stimulating a series of follow-up projects, the replication effect can be significant. However, given the complexity of the energy sector and remaining high uncertainty of the degree of the GoN's support, a 2x replication factor is assumed for an estimation of the potential replication effect. As such, the *Program* could indirectly lead to nearly 3,000,000 tCO_2e of total GHG reduction.

[23] For grid-connected renewable energy IFC follows the International Finance Institution Approach to GHG Assessment in Renewable Energy. GHG emission reductions are estimated based on the combined margin emission factor.

[24] UNFCCC, *CDM-EB73-A03, Standardized baseline: Grid emission factor for the Southern African power pool*, 2013. Accessed in May 2017 at https://cdm.unfccc.int/filestorage/m/v/362UWIAX0NZK5CVBMS41EQDJTH9O8P.pdf/eb73_repan03.pdf?t=bVN8bm5sNWVhfDB286Kf6ySVZOlUO2LhhFJI

[25] The IFC GHG accounting methodology provides guidance on calculation of the GHG emission reduction on the basis of one representative year. For the purpose of assessing the indicative amount of the lifetime GHG savings, an anticipated life of the financial product is assumed to be 20 years.

Note, that the above amounts are expected to be achieved with the funds under this *Utility-scale Solar PV Program*, which will utilize only a portion of the original USD 50 million CTF allocation to the *Financial Intermediation for Clean Energy and Energy Efficiency* component.

2.2 *Cost-Effectiveness*

Based on the above calculations and the *Program* cost of USD 30 million, the direct GHG emission reductions per CTF USD will be around USD 20/tCO_2e (or 0.05 tCO_2e/USD) over the life of sub-projects and indirect GHG emission reductions per CTF USD will be USD 10/tCO_2e (or 0.1 tCO_2e/USD).

With the expected total investment cost of around USD 130 million, the total investment per direct life-time GHG emission reductions is expected to be around USD 87/tCO_2e.

2.3 *Demonstration Potential at Scale*

This *Program* proposal seeks to support the growth and market maturation of Solar PV projects in Nigeria. The objective is to promote private sector participation in developing first grid-connected utility-scale solar PV projects in Nigeria. The sub-projects under the *Utility-scale Solar PV Program* will: (i) pave the way for developers, investors and lenders to follow with solar investments; (ii) demonstrate to other investors the potential of technical and economic aspects of grid-connected solar technologies in Nigeria; and (iii) build local expertise, enabling adaptation and replication for similar grid-connected projects. In addition, as the first IPP solar project(s) in Nigeria connected to the national grid, the Program success will serve as a demonstration project to evaluate technical, institutional and economic viability in Nigeria and to build local expertise to foster rapid adoption and replication for similar grid-connected projects.

2.4 Development Impact / Co-benefits

The proposed Program will deliver the following impacts and co-benefits:

- Contributing to Government of Nigeria's objective to diversify the country's energy mix with RE sources. Sub-projects will also reduce fossil fuel consumption and the fiscal cost from heavily subsidized domestic supplies, while improving sector sustainability by reducing exposure to volatile gas supply;
- Continuing support to sector reform: The proposed sub-projects will not be covered by the recently adopted REFIT. However, the projects' experience of applying and obtaining a generation license, as well as signing a PPA with NBET, will provide valuable feedback to the Government, allowing it to improve the regulatory framework;
- Bridging supply-demand gap: the construction of utility scale grid connected Solar PV will increase supply of clean energy, increase the availability of power in a country plagued by regular shortages and brown-outs, and enable electricity access to more consumers;
- Promoting domestic economy: the increased energy access and reliability will benefit local manufacturing. The *Program* may also stimulate the emergence of local manufacturing of some components of solar PV systems. In addition, local employment will be created during the construction and operation phases.
- Reducing local pollution. Installing solar PV generation infrastructure will reduce the number of diesel/petrol power generators, which will reduce emissions, including SOx, NOx and particles in local communities

2.5 *Implementation Potential*

IFC has been engaged with several solar PV developers with the most advanced projects in the country. This engagement is expected to contribute to achieving high quality of project preparation and attention to integrity due diligence and E&S issues from the early stages of projects development.

At the moment, the project development activities are moving forward. The pace of the progress of the sub-projects will highly depend on the progress of the Power Sector Recovery Program, but IFC expects that the first sub-project under this *Program* proposal may move forward steadily reaching the Board approval in 2019. However, given the nature of the target market, which is characterized by high political volatility, relatively weak institutional capacity, and pending successful implementation of the Recovery Program, a greater-than-average level of uncertainties and delays are likely to be encountered. As such, eventual timelines cannot be predicted with high level of certainty at this stage, but they will comply with the CTF Pipeline Management and Cancellation Policy.

2.6 *Additional Costs & Risk Premium*

The sub-projects will likely be located in close proximity to the national transmission grid. However, this type of connection to the grid infrastructure has never been done before for utility scale Solar PV in Nigeria (first utility scale Solar PV project). This uncertainty could add costs and risks to the project(s).

2.7 *Financial Sustainability*

The first few grid-connected utility scale solar PV projects in Nigeria are expected to require concessional funding support due to high transaction costs, high risks, uncertainty, and lack of country experience. Over time, however, the need for concessional funds will likely diminish. The perception of risk will be expected to decrease, attracting greater interest from domestic and international financial communities. Equipment costs are expected to also continue to fall, allowing for prevailing market tariffs to become sufficient to deliver desired rates of return to investors. Transaction costs will also fall, the government will start seeing early benefits of scaling-up solar PV projects, and ultimately, market perception of the regulatory environment will improve.

Thus, the development efforts, persistence, and high costs encountered by the early movers in the sector, will ease the development and implementation process and lower entry costs for future project developers. These demonstration efforts will also improve the capacity of solar PV technology service providers (equipment supply, engineering, advisors etc.), and prove the technical and economic realities of solar PV. Through these mechanisms, the *Program* expects to promote the sustainability of utility-scale solar PV projects, thereby accelerating the development of the sector.

2.8 *Mitigation of Market Distortions*

Concessional finance is specifically targeted at addressing first-mover costs experienced by project developers who enter the new, evolving and un-proven solar PV markets in Nigeria. The *Program* targets a market that has seen few solar PV and no grid-connected utility-scale Solar PV investments, so initial market distortions cannot be foreseen or measured. After the first investments, and as the market matures and becomes better understood by financiers and developers, it is expected that commercial financing will flow, reducing the need for concessional funding.

The investment(s) supported under the *Program* will seek to minimize the use of CTF funds and maximize the leverage achieved from IFC and other private sector financiers. Actual pricing and terms of

CTF funds will be designed in a way to support a project, while adhering to a principle of minimal concessionality and avoiding market distortions. As any blended finance project at IFC, CTF transactions are subject to IFC's own internal governance for blended finance operations and will be reviewed by a corporate-level Blended Finance Committee.

2.9 Effective Utilization of Concessional Finance

The Concessional funding from CTF will:

- Absorb higher costs and higher risks associated with first mover grid-connected utility-scale Solar PV sub-projects under the untested regulatory regime;
- Enable sub-projects to obtain financing with terms not currently available on the market, but necessary for sub-projects to move forward;
- Allow IFC and other investors to provide financing to sub-projects, enabling them to reach financial closure;
- Directly contribute to the construction of a first-of-its-kind grid-connected utility-scale solar PV project, and accelerate a grid integration of RE generation in Nigeria;
- Further encourage private sector participation;
- Maximize leverage of the CTF funds by designing an effective blended finance structure.

2.10 Risks

Potential risks associated with the *Program* include:

- Market Environment – As no grid connected solar PV projects have been built in Nigeria, the sub-projects will operate in untested regulatory and technical environment. PPA negotiations with the off-taker (NBET) will be difficult on key technical and financial terms. ***Mitigation*:** IFC will continue to engage with NBET, the WB, AfDB and other project partners to ensure harmonized and most efficient approach;
- Project Economics – The sub-projects' economics seems tight for various reasons (location with lower irradiation in the more secure areas, lack of technical experience with utility-scale grid connected solar PV projects, etc.). ***Mitigation:*** The projects will seek further cost efficiencies among project parties. CTF's concessional funds will also be utilized to help further lower tariffs to sustainable level;
- Contractual issues - While the PPA can be largely considered bankable, there are ongoing discussions on the PCOA, which seems to have some bankability issues. ***Mitigation:*** IFC will support the negotiations with the aim to arrive at the bankable PCOA;
- Project Execution - Due to complexity of project execution (including security threats) in Nigeria and uncertainty of PRG timing, project may be delayed and may lead to cost overruns. ***Mitigation:*** (i) IFC's experience in the Nigeria power sector, (ii) Sponsors have a good track record of developing solar power plants; (iii) during due diligence, IFC will ensure that a strong EPC contract is negotiated with usual provisions for usual provisions to cover potential costs overruns;
- Tariff sustainability - Expected project(s)' tariffs, even after concessional funding, are expected to be higher than tariffs from gas-fired power and may become, as gas-fired power ramps up, unsustainable. ***Mitigation:*** Nigeria has a massive shortage of power, with diesel-fired "back-up" generation very common. Gas availability remains a considerable issue, hampering the growth of

gas-fired generation. While tariffs for solar PV are expected higher than gas fired plants, they will be lower than the cost of diesel-powered self-generation and at a flat nominal price, it is expected that its competitiveness (vs gas fired plants with escalation components in their tariffs) would increase. Solar PV therefore offers a fast way to extra power for the country at a cost lower than the diesel alternative;

- Macroeconomic risk - Nigeria continues to contend with the impact of negative fiscal developments, lower than expected oil production, delays to the implementation of an expansionary 2017 budget and a noticeable drop in investment inflows. All the aforementioned have resulted in slowdown in economic activities, rise in the cost of goods and services (inflation rate of 17.2 percent as of April'17), and sustained spread between the official and parallel market exchange rate between the NGN/USD. IMF projects that the Nigerian economy, which contracted by 1.5 percent in FY'16, would pick up slightly by 0.8 percent in FY'17. ***Mitigation:*** The effects of policy reforms under implementation and resolution of power sector liquidity concerns are expected to help stabilize the energy sector situation, supplying the needed driver for economic growth in the medium term.

3 PERFORMANCE INDICATORS

The performance indicators outlined below are derived from the CTF Results Measurement Framework. These indicators will be tracked at least annually.

Indicator	**Total under *IFC Allocation***
DIRECT IMPACTS:	
Increased supply of RE, MW	100
GHG emission reductions: per annum, tCO_2e over life of sub-projects, tCO_2e	 74,700 1,500,000
Incremental financing leveraged (of all non-CTF parties), USD million	100
Jobs created	na