United Nations Development Programme

Project title: National child project under the GEF Africa Minigrids Program		
Country: Nigeria	**Implementing Partner (GEF Executing Entity):** Rural Electrification Agency (REA)	**Execution Modality***: Full NIM*
Contributing Outcome (UNDAF/CPD, RPD, GPD)*:* By 2022, Nigeria achieves environmental sustainability, climate resilience and food security through efficient management of its cultural and natural resources.		
UNDP Social and Environmental Screening Category: Substantial	**UNDP Gender Marker:** 2	
Atlas Award ID: 00135668	**Atlas Project/Output ID:** 00126833	
UNDP-GEF PIMS ID number: 6339	**GEF Project ID number:** 10413	
LPAC meeting date: 3 December 2021		
Last possible date to submit to GEF: 19 June 2021		
Latest possible CEO endorsement date: 19 December 2021		
Project duration in months: 48		
Planned start date: 10 June 2022	**Planned end date:** 09 June 2026	
Expected date of Mid-Term Review: 10 June 2024	**Expected date of Terminal evaluation:** 10 January 2026	
Brief project description: As part of the UNDP-supported, GEF-financed Africa Minigrids Program (AMP), this project seeks to increase access to clean energy by increasing the financial viability, and promoting scaled-up commercial investment, in low-carbon minigrids in Nigeria with a focus on cost-reduction levers and innovative business models. Approximately 70 million persons are without electricity in Nigeria with the larger cohort found in rural areas. Nigeria has made significant strides in setting up a regulatory framework for enabling electrification of underserved communities using decentralized renewable energies, such as solar PV mini-grids. There is now a vibrant private sector value chain for developing solar PV mini-grids. The business environment in Nigeria is conducive for scaling up private investments in off-grid electrification. The UNDP-GEF project will contribute towards this goal in terms of supporting the integration of solar PV mini-grids in the agriculture value chain (i.e. productive energy uses). The commercially-oriented business model will be underpinned by cost reduction levers to increase the affordability to renewable electricity, including reducing financing and hardware costs through a derisking approach. This will be achieved through three outcomes: (i) operationalizing innovative business models to strengthen private sector participation in low-carbon mini-grid development; (ii) putting in place an innovative financing mechanism to incentivize private sector financing; and (iii) digitally-supported knowledge management through stakeholder networking, and capturing lessons lessons learned for scaling-up of project results within Nigeria and the AMP Community of Practice. The number of direct project beneficiaries is expected to be around 70,063 persons, of which approximately 34,559 women. The lifetime global environmental benefit is estimated at 74.2 $ktCO_2e$. Indirect emission reductions amounting to 4,170 $ktCO_2e$ are expected. The project yields a GEF abatement cost of 1.4 US$/$tCO_2e$.		
FINANCING PLAN		

FINANCING PLAN		
GEF Trust Fund grant	USD 5,905,046	
UNDP TRAC resources[1]	USD 0	
Confirmed cash co-financing to be administered by UNDP	USD 5,905,046	
(1) Total Budget administered by UNDP	**USD 5,905,046**	
(2) Total confirmed co-financing to this project not administered by UNDP	**USD 75,035,714**	
(3) Grand-Total Project Financing (1)+(2)	**USD 80,940,760**	

SIGNATURES:		
Signature: print name below STANLEY JONAH	**Agreed by Government Development Coordination Authority[2]**	**Date/Month/Year:** 25-07-22
Signature: AHMAD SALIHIJO AHMAD Rural Electrification Agency	**Agreed by Implementing Partner**	**Date/Month/Year:** 26/07/22
Signature: Resident Representative, UNDP	**Agreed by UNDP**	**Date/Month/Year:** 27/07/2022

Key GEF Project Cycle Milestones:

Project document signature: within 25 days of GEF CEO endorsement

First disbursement date: within 40 days of GEF CEO endorsement

Inception workshop date: within 60 days of GEF CEO endorsement

Operational closure: within 3 months of posting of TE to UNDP ERC

Financial closure: within 6 months of operational closure

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LIST OF ACRONYMS

AMP	Africa Minigrids Program
BPP	Bureau of Public Procurement
CBN	Central Bank of Nigeria
CREDC	Community Research and Development Centre
CO_2	Carbon Dioxide
CoP	Community of Practice
DREI	Derisking Renewable Energy Investment
ESMP	Environmental and Social Management Plan
FAC	Financial Advisory Committee
FGN	Federal Government of Nigeria
FMARD	Federal Ministry of Agriculture and Rural Development
FME	Federal Ministry of Environment
FMFBNP	Federal Ministry of Finance, Budget and National Planning
FMP	Federal Ministry of Power
FSP	Full Sized Project
GAP	Gender Action Plan
GDP	Gross Domestic Product
GEF	Global Environment Facility
GEFSEC	Global Environment Facility Secretariat
GHG	Greenhouse Gas
GIS	Geographic Information System
HDI	Human Development Index
ktCO2	Kilo tonne carbon dioxide
kWh	Kilo-Watt hour
LCOE	Levelized Cost of Energy/Electricity
M&E	Monitoring and Evaluation
MNO	Mobile Network Operator
MRV	Measurement, reporting and verification
MSME	Micro, Small and Medium Enterprise
MtCO2	Million tonnes of carbon dioxide
MTR	Mid-Term Review
NEP	Nigeria Electrification Project
NERC	Nigerian Electricity Regulatory Commission
NESP	Nigeria Energy Support Programme
NGN	Nigerian Naira
NGO	Non-Governmental Organisation
NREEEP	National Renewable Energy and Energy Efficiency Policy
PAYG	Pay-As-You-Go
PIR	Project Implementation Report
PM	Project Manager
POPP	Programme and Operations Policies and Procedures

PPG	Project Preparation Grant
PREEEN	Promoting Renewable Energy and Energy Efficiency in Nigeria
ProDoc	Project Document
PSC	Project Steering Committee
PV	Photovoltaic
QAF	Quality Assurance Framework
REA	Rural Electrification Agency
REF	Rural Electrification Fund
RESIP	Rural Electrification Strategy and Implementation Plan
RET	Renewable Energy Technology
RMI	Rocky Mountain Institute
RUWES	Rural Women's Energy Security
SDG	Sustainable Development Goal
SEP	Stakeholder Engagement Plan
SES	Social and Environmental Standards
SESP	Social and Environmental Screening Procedure
SDG	Sustainable Development Goals
SPAM	Spatial Production Allocation Model
TA	Technical Assistance
TE	Terminal Evaluation
ToC	Theory of Change
ToR	Terms of Reference
TPO	Third Party Ownership
TWG	Technical Working Group
UNDP	United Nations Development Programme

II. DEVELOPMENT CHALLENGE

1. With a population of ~202 million, Nigeria is the most populous country in Africa. The rural population accounts for 49.7% of the total population[1]; 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 2018 is 0.538, which is in the 'Low Human Development' category and positions the country at 158 out of 187 countries and territories.[2]

2. Nearly 87 million Nigerians are underserved or unconnected to the grid due to the poor quality of grid power and low electrification rates.[3] As a result Nigerians and their businesses spend almost $14 billion annually on off-grid power from small self-generators that is expensive (around $0.52/kWh), has poor quality, and is noisy and polluting.[4] The use of diesel based generators is widespread. Petrol and diesel generators generate 7 Terawatt-hours of electricity annually, which represents 25 percent of total electricity generated through the grid.[5] Power production from diesel generators in Nigeria is estimated to emit 29 million metric tons of CO_2 annually.[6] It is estimated that 69% of Nigerians that live in rural areas currently do not have access to the power grid.[7] The Council for Renewable Energy of Nigeria estimates that power outages cause an annual loss to the economy of $984 million.[8]

3. The development challenge has been exacerbated by the ongoing COVID-19 pandemic that continues to afflict countries worldwide. Africa's projected gross domestic product (GDP) growth of 3.2% for 2020 is now expected to fall to -0.8%.[9] The World Bank has projected the decline in Africa's economic growth to between -2.1% and -5.1% in 2020.[10] In the case of Nigeria, the COVID-19 related mortality rate has decreased over time to reach 1.7% in December 2020 showing the increasing capacity of authorities to deal with the health and sanitary crisis.[11] The socioeconomic impacts of COVID-19 have been:[12] (i) significant recovery in employment over time, especially among rural household and agricultural activities; (ii) employment loss highest among poorest and urban households; (iii) price inflation of food items and farming inputs leading households to cut down on food consumption and drawing down on savings that will have longer-term negative impacts.

4. Given the lethargic state of utility-scale power generation, the use of decentralised solar technologies, including solar PV minigrids has emerged as a strong strategic option for achieving higher levels of electrification. The supporting national policies and strategies are given in **Annex 13**. The prospects for electrification in Nigeria are bright. With dramatic cost reductions in sight, and increased attention from government, development partners, and the private sector, energy access technologies are poised to proliferate at breakneck speed. However, it is critical that these projects are accompanied by business models that electrify agricultural productive uses—failing to do so may compromise project economics and longevity. Pairing productive use and rural electrification with an effective deployment strategy will unlock local economic development and can serve as a springboard toward realizing the full potential of rural electrification.[13]

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[1] http://data.worldbank.org/en/country/nigeria; http://hdr.undp.org/en/countries/profiles/NGA - accessed 7 December 2020.
[2] http://hdr.undp.org/en/countries/profiles/NGA - accessed 7 December 2020.
[3] Based on an access rate of 57% in 2018 - https://trackingsdg7.esmap.org/country/nigeria; and using a population of 202 million.
[4] REA, Minigrid Investment Brief, 2017
[5] Farquharson, D; Jaramillo, P; Samaras, C. Sustainability Implications of Electricity Outages in sub-Saharan Africa. Nature Sustainability. 2018
[6] Moss, T; Gleave, M. How can Nigeria Cut CO2 Emissions by 63%? Build More Power Plants. 2014. https://www.cgdev.org/blog/how-can-nigeria-cut-co2-emissions-63-build-more-power-plants
[7] https://trackingsdg7.esmap.org/country/nigeria - accessed 7 December 2020.
[8] Council for Renewable Energy, Nigeria (CREN) (2009) Nigeria Electricity Crunch. Available at www.renewablenigeria.org
[9] https://www2.deloitte.com/tz/en/pages/finance/articles/impact-of-covid19-on-ea-economies.html - accessed 1 June 2020.
[10] https://www.worldbank.org/en/news/video/2020/04/13/africas-pulse-the-economic-impact-of-covid-19-coronavirus-in-africa - accessed 2 June 2020.
[11] As of 8 December 2020, there were 69,645 infections and 1,181 deaths - https://coronavirus.jhu.edu/map.html. The global average mortality rate was 2.3% (67,592,458 infections and 1,544,543 deaths).
[12] https://www.undp.org/content/dam/rba/docs/COVID-19-CO-Response/Socio-Economic-Impact-COVID-19-Nigeria-Policy-Brief-1-UNDP-Nigeria-April-2020.pdf - accessed 27 January 2021; https://blogs.worldbank.org/opendata/tracking-socioeconomic-impacts-pandemic-nigeria-results-first-three-rounds-nigeria-covid - accessed 8 December 2020.
[13] Scarlett Santana, Andrew Allee, Zihe Meng, Wayne Omonuwa, James Sherwood, Balaji MK, Kira Rosi-Schumacher. 2020.

5. Nigeria is leading the way in sub-Saharan Africa in establishing a regulatory and policy framework supportive of private sector led minigrid development. The Nigerian Electricity Regulatory Commission (NERC) established the Mini Grid Regulation (2017) that offers a clear framework for developers to follow, including the ability to practice cost-reflective electricity tariffs (**Annex 13**). The government of Nigeria ('FGN') has established a robust policy framework that includes incentives to promote private sector participation by attracting local and foreign investment, increasing access to concessionary finance, reducing costs for project development, enforcing contracts, limiting exposure to foreign exchange volatility, eliminating import taxes, and fast-tracking the customs clearance process.
6. REA has attracted significant sources of grant and concessional funding that it is mobilizing through REF. Two phases of the Nigeria Energy Support Programme (NESP) funded by the GIZ, and the Nigeria Electrification Project (NEP) funded by the World Bank have played prominent roles in promoting off-grid electrification using hybrid (solar PV-diesel) minigrids (**see Annex 13**). The REF provides capital grants to cover up to 75 percent of minigrid project costs and technical support for rural electrification. REA has obtained public financing through budget provisions and government loans. REA obtained US$86 million to develop 386 rural electrification projects in the 2016/2017 budget provision. In 2018, REA implemented an additional US$6 million capital grant scheme for off-grid projects. In the same year, it obtained a US$350 million loan from the World Bank to develop the off-grid market by providing detailed market data, grant funding, and technical assistance. US$150 million of this loan will develop minigrid projects.
7. Despite significant progress in establishing a clear policy and regulatory framework, and increased investments in minigrids, uneven enforcement and implementation has led to poor clarity among potential investors, limiting investor ability to benefit from it. For instance, FGN has implemented clear procedures for tax incentives to manufacturers of renewable energy and energy efficient equipment. However, implementation is still pending for similar incentives for manufacturing other systems components needed to build minigrid systems such as transformers and meters. Similarly, tax exemptions for importing equipment and other system components have not been implemented yet. Further, while minigrids offer a compelling case, return on invested capital is not high enough to scale a commercial market. The typical levelized cost of energy (LCOE) for a well-run minigrid today is at least $0.60 per kilowatt-hour (kWh). High costs require high electricity prices that limit the size of the market that can afford to pay for minigrid electricity and stand in the way of deploying minigrids at scale for rural electrification. In addition to high costs, multiple risks limit commercial sources of financing in Nigeria.
8. Another significant challenge is that energy access is necessary but insufficient to enable income growth and economic development. Many electrification projects across sub-Saharan Africa and in Nigeria have failed to stimulate the local economy because electricity itself does not lead to greater economic activity. Today, no viable business models exist for introducing agricultural productive uses of electricity in rural areas. In fact, productive uses have not been widely adopted in rural Nigeria. Minigrid developers and communities see the opportunity for productive uses to stimulate local economies, but as electricity experts they often have gaps in expertise, capacity, or partnerships to implement agricultural programmes.[14]
9. Market analysis shows that scaling up minigrid development using private investments is hindered by several barriers. The quantitative risks analysis (and underpinned by barriers) faced by private sector investors in solar PV minigrids market chains is detailed in **Annex 13** and **Annex 17**.

   Barrier #1: Energy market: Uncertainty regarding the credibility of electrification and renewable energy targets slows the progress of market mechanisms for solar PV minigrids despite offering safer, more reliable and cheaper long-term solutions when accompanied by business delivery models designed around cost reduction levers, including productive energy uses.

   Barrier #2: Social acceptance: There is a reasonable level of openness to new technologies for electrifying rural communities. Social acceptance issues arise during tariff negotiations as some communities compare the higher electricity rates of solar PV minigrids to subsidized grid electricity.

Agricultural Productive Use Stimulation in Nigeria: Value Chain & Mini-Grid Feasibility Study. Rocky Mountain Institute, Deloitte Consulting LLP. 2020. Prepared for the U.S. Agency for International Development Power Africa Nigeria Power Sector Program.

[14] REA & RMI. 2021. *REA Energizing Agriculture Programme* (draft version – 25 January 2021).

Barrier #3: Technology and hardware: Insufficient enforcement of quality standards 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 hardware and components for solar PV minigrids lead to delays in delivery and increased business costs. Also, there is lack of access to electric equipment which is not always evaluated alongside the development of minigrid systems and only considered after operations begin, which means electricity is available but electric agricultural processing equipment may not be.

Barrier #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.

Barrier #5: Developer and energy service providers: Although there have been improvements in the capacity of minigrid developers to design, implement, manage and operate solar PV minigrids, further capacity development is needed for scaling up investments and to adopt business delivery models based on cost reduction levers, including productive energy uses. When considering downstream agricultural activities, small-processors do not have enough business develop skills because of the lack of access to extension services.

Barrier #6: Payment: A lack of information on customer creditworthiness, such as customer credit data, makes it particularly difficult for pay-as-you-go (PAYG) service providers to attract longer-term consumer financing capital as lenders require historical track records which are not yet available. Also – and linked with Barrier#2 - there are examples of low willingness to pay by end-users even after minigrid tariffs have been negotiated and agreed upon.

Barrier #7: Financing: A combination of high capital costs and impatient capital represents a major barrier to obtain working capital to finance operations along the supply and distribution chains. When embedding minigrids in an agricultural value chain, this prevents minigrid developers and small-scale agricultural processors from obtaining new machinery.

III. STRATEGY

12. Strategy: The project adopts a systemic approach to increasing electricity access in off-grid communities using solar PV minigrids. It will support the scaling up of private investments through the deployment of innovative business models and financing with focus on achieving cost reductions in solar PV minigrids. The overall objective is to increase the commercial competitiveness of solar PV minigrids through their integration in the agricultural value chain; increase the affordability of renewable electricity for end users, thereby reducing reliance on the baseline technology (i.e. diesel minigrids). The use of electricity generated by solar PV minigrids in household applications and for productive energy uses will be accompanied by the uptake of energy efficient appliances and electrical equipment. While emphasis is placed on increasing the affordability of clean electricity, the project will support a multi-tier approach to electricity access,[15] which will result in overall reductions in greenhouse gas emissions.
13. The proposed strategy is squarely aligned with the GEF Strategic Focal Areas CCM-1-1 “Promote innovation and technology transfer for sustainable energy breakthroughs for de-centralized renewable power with energy storage”, and CCM-1-3 “Promote innovation and technology transfer for sustainable energy breakthroughs for accelerating energy efficiency adoption”. This strategy is substantiated by the results of quantitative derisking analyses given in **Annex 17** showing the influence of derisking instruments (i.e. Outputs and Activities in section IV) on reducing the financing costs of solar PV minigrids, thereby lowering the levelized cost and affordability of renewable electricity. Further, recent work in Sub-Saharan Africa by the Rocky Mountain Institute (RMI) has

[15] Sustainable Energy for All, Beyond Connections: Energy Access Redefined (Introducing Multi-Tier Approach to Measuring Energy Access); https://www.seforall.org/sites/default/files/Beyond-Connections-Introducing-Multi-Tier-Framework-for-Tracking-Energy-Access.pdf - accessed 17 June 2020.

revealed that reduced hardware costs can contribute to ~30% reduction in LCOE generated from solar PV minigrids by 2030.[16]

14. Theory of Change: The ToC is premised on a baseline context where, while good progress is being made, solar PV minigrids are currently not competitive with fossil-fuel based alternatives and their uptake is too slow to fully capture their potential benefits. Cost reduction levers and innovative business models and financing can improve the financial viability of solar PV minigrids. When renewable energy minigrids are more competitive, private capital will then flow resulting in multiple sustainable development benefits: investment at scale, GHG emission reductions, electrification and lower tariffs for end-users, triggering local socioeconomic development through productive energy uses and local commercial value creation, and job creation for men, women and youth. This will also improve access to basic services through electrification of public facilities such as health centers and schools.

15. The ToC diagram in **Annex 1** shows that the long-term impact of the project is to provide technical assistance to achieve GHG emission reductions with strong sustainable development co-benefits through the deployment of solar PV minigrids for multiple uses (household, public institutions and productive uses). A number of internal logical steps need to occur to achieve the long-term impacts:
    - → Renewable energy minigrids face a range of underlying investment barriers and risks as discussed in Section II. In the problem statement, solar PV minigrids are currently not competitive with fossil-fuel based alternatives and scaling up is too slow to fully capture their potential benefits. The result being that renewable energy minigrids do not get financed and built at scale.
    - → In this context, IF the UNDP-GEF project proposes gender sensitive technical and financial assistance on country-appropriate business delivery models; innovative financing modalities; and harmonized monitoring and evaluation approaches THEN Nigeria will have in place an enabling environment for private investments, commercially viable solar PV minigrid value chain, enhanced institutional and human capacities to design, plan, install, operate, maintain and manage minigrids, a diversity of energy uses supported by adequate technologies, and local practitioners with knowledge of best practices on cost reduction levers for developing solar PV minigrids. THEN, these conditions will increase private sector investments to support gender inclusive multi-tier electricity access for multiple uses RESULTING in global environmental benefits and local sustainable development benefits. Higher levels of investments in solar PV minigrids will also support ongoing government response to deal with and recover from the COVID-19 health and sanitary crisis.
    - → Different drivers (external or internal) of change and assumptions come into play at different levels in the ToC as shown in **Annex 1**.

16. Geographical coverage: It is estimated that 69% of Nigerians that live in rural areas currently do not have access to the national electricity power grid.[17] These communities are typically found in: [18]
    i. The far North-East and far North-West, up to the border with Niger Republic and Cameroun;
    ii. The coastal areas of the Niger-Delta;
    iii. The highlands of the South-West, up the border with the Republic of Benin; and
    iv. The mountainous regions of the South-East, up to the border with Cameroun.

17. The locations that are suitable for minigrids are shown in small circles in **Figure 1**, while the big circles show the coverage of the national grid. As discussed in Section IV, the GEF project will support pilots in two geographical areas representing two prominent agro ecological zones in Nigeria. Hence, the most suitable locations for the project sites will be at the intersection of the off-grid communities and the agro-ecological zones that are identified in **Annex 13**. The potential project sites are shown in **Annex 3**.

[16] Agenbroad, Josh, Kelly Carlin, Kendall Ernst, and Stephen Doig. 2018. Minigrids in the Money: Six Ways to Reduce Minigrid Costs by 60% for Rural Electrification. Rocky Mountain Institute; please also see Figure 6 in the AMP PFD.
[17] https://trackingsdg7.esmap.org/countries - accessed 8 December 2020.
[18] Federal Ministry of Power (2015), pg. 18.

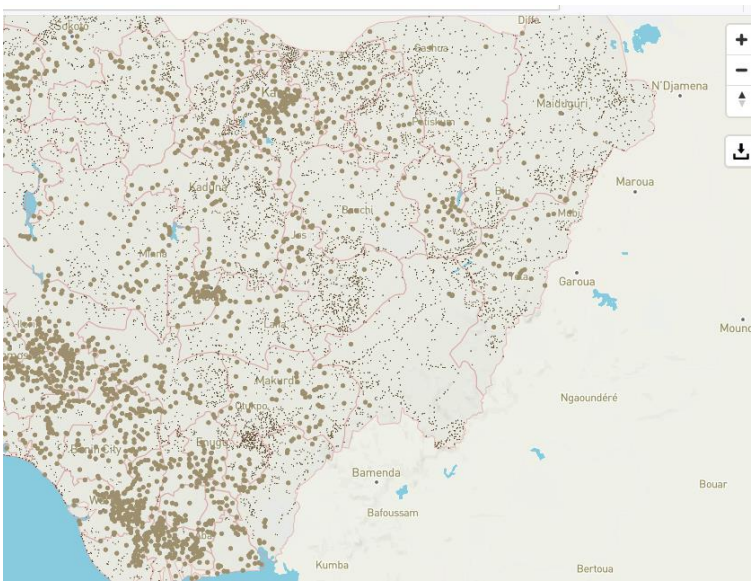


Figure 1. Map of Nigeria showing geographical locations appropriate for minigrids (small dots).

The large dots represent communities that are connected to the national grid.[19]

18. Gender mainstreaming: As discussed in the AMP Program Framework Document (PFD), men, women, and youth are affected differently by electricity access. Also, the benefits accruing from electricity access do not always flow equally to men, women and youth. Annex 11 lists the challenges that women and men face along the electricity access value chain. Consequently, a gender responsive strategy, which is reflected in the ToC, is applied across all project components as follows:
    - There is low level participation of women across the entire electricity access supply-demand chain be it in the form of entrepreneurial activities (access to finance, markets, institutions etc..) or decision making on energy use.[20] For GEF investments under Component 1, successful bidders will have to demonstrate the gender impacts of their solar PV minigrid projects across the entire value chain. For this, Calls for Proposals through the REF will make use of multi-dimensional gender markers for selecting successful bids;
    - Business delivery models (Component 1) and lessons learned reports (Component 3) will highlight the use of minigrids for women and youth empowerment, and the project will optimize the use of gender-responsive training materials that will be developed by the AMP regional project. Also, SDG Impact tools (Component 3) and technical assistance (Component 2) to private sector developers will ensure that the respective roles, and needs and interests of men, women and youth are taken into consideration at different stages of the minigrid project cycle (Figure 9 in PFD);
    - The project will adopt the following principles in the day to day management: (i) gender stereotypes will not be perpetuated; (ii) women and other vulnerable groups will be actively and demonstrably included in project activities and management whenever possible, and (iii) derogatory language or behaviour will not be tolerated;
    - The Project Manager (PM) will be the designated focal point for gender issues to support development, implementation, monitoring and strategy on gender mainstreaming internally and externally. The PM will be supported by UNDP experts (Country Office and Regional Service Centre) on gender transformation issues; and
    - For regular monitoring and evaluation of the project progress and reporting, the project makes use of gender-disaggregated indicators (Component 3), and will facilitate involvement of women in the M&E and the implementation of Grievance Redress Mechanisms.

[19] Map generated using database of the Rural Electrification Agency at database.rea.gov.ng – accessed 8 December 2020.
[20] O Osunmuyiwa and A Ahlborg (2019) Inclusiveness by design? Reviewing electricity access and entrepreneurship from a gender perspective, Energy Research and Social Sciences 53: 145-158.

19. Response to COVID-19: The project will directly support recovery from COVID-19 in off-grid areas through integration in the agricultural value chain and supporting local value addition and job creation. The COVID-19 pandemic has further heightened the electricity-health nexus, especially in off-grid communities. For example, making COVID-19 vaccines and other temperature sensitive drugs more accessible to larger sections of the population will increase the demand for electricity in primary health centers (PHCs).[21] In PHCs, electricity is also needed for illumination and for powering diagnostic and life support equipment. The project will support ongoing initiatives by the REA to promote the use of solar PV minigrids to power PHCs in order to increase access to better health care and supporting the achievement of SDG3 in off-grid communities.

20. Knowledge management: Outcome 3 seeks to capture and disseminate lessons learned and best practices within Nigeria. This Outcome will also develop a replication strategy and action plan for scaling up the private-sector led business model in other regions of Nigeria. The project will also capitalise on and promote South-South cooperation through participation in the Community of Practice and its technical cohorts that will be established under the AMP regional project. The project will support the adoption and operationalization of an augmented Quality Assurance Framework (QAF) that will integrate a MRV mechanism for GHG emission reductions and a SDG Impact Framework for measuring the impacts of investments in solar PV minigrids on the SDGs.

21. As discussed above, the design of the UNDP-GEF project has been informed using UNDP's derisking approach, the quantitative details of which are given in **Annex 17**. The derisking approach is also a central part of the ToC underlying the proposed project. While the project will generate knowledge products based on lessons learned during implementation, its design has drawn from lessons learned and best practices on the development and application of UNDP's derisking approach. The first is the application in 2016 of the derisking approach for designing the UNDP-GEF project in Nigeria entitled 'Derisking Renewable Energy NAMA for the Nigerian Power Sector',[22] and the second application was in 2019 for the formulation of the UNDP-GEF project in Nigeria entitled 'De-risking Sustainable Off-grid Lighting Solutions in Nigeria'.[23] Further, the present project has benefitted from the use of knowledge tools and resources developed for derisking investments in off-grid electrification using decentralised solar technologies.[24]

22. The project will develop several knowledge products under Component 3. The target audience for each knowledge product will be as follows:
    - Lessons learned report: This report that will capture lessons learned across all project outcomes will be applicable to a broad range of audiences, namely public, private organisations and off-grid communities that are interested in using a private sector led model for enabling commercially-viable use of solar PV minigrids for rural electrification. Also, the lessons learned in Nigeria will be shared in the AMP regional project Community of Practice (CoP) and its technical cohorts. In particular, this knowledge product will be useful for replication and scaling up investments in solar PV minigrids in Nigeria and elsewhere in the world;
    - Replication Plan: The replication plan will make use of the lessons learned to develop a road map for scaling up private investments in solar PV minigrids using innovative approaches in business delivery models and financing. Hence, it will be useful for guiding public electrification policy and strategy; providing guidance to private investors in terms of market potential; and rural communities in terms of future off-grid electrification perspectives.

23. In the AMP, knowledge management will be bidirectional. In as much as the Nigeria Child Project will generate the knowledge products mentioned above, it will also contribute towards the generation of knowledge products under Outcome 1 (Activity 1.1.1) of the Regional Project through sharing of data generated by the pilots developed under its Output 1.1. At the same time the Nigeria Child Project will benefit from lessons learned and best practices generated by other National Child Projects and the knowledge tools and technical assistance provided by the AMP Regional Project (Outcome 1 and Outcome 3). Knowledge sharing will also take place by

[21] O Babatunde et al. (2019) Evaluation of a grid-independent solar photovoltaic for primary health centres (PHCs) in developing countries. Renewable Energy Focus 24, 16-27.
[22] https://www.thegef.org/project/de-risking-renewable-energy-nama-nigerian-power-sector - accessed 8 December 2020.
[23] https://www.thegef.org/project/de-risking-sustainable-grid-lighting-solutions-nigeria - accessed 8 December 2020.
[24] https://www.undp.org/content/undp/en/home/librarypage/environment-energy/low_emission_climateresilientdevelopment/derisking-renewable-energy-investment.html - accessed 1 August 2019.

participation in the AMP Regional Project CoP through peer-to-peer sharing using three main modalities, namely: (i) regional forum; (ii) webinars; and (iii) technical cohorts. In addition, Nigeria will benefit from Output 3.3 of the Regional Project – i.e. 'Facilitation support to national projects convening sessions'.

24. Linkages to the AMP Regional Child Project. The project will align with the AMP Regional Project to foster knowledge sharing, learning, and synthesis of experiences in a multi-directional manner– i.e. flowing from the AMP Regional Project to the Nigeria project, and vice versa, and between the Nigeria project and other national projects within the Program. The AMP Regional Project will connect countries to knowledge, resources and networks of best practice and will support the rapid deployment of expertise, solutions and tools to support on-the-ground implementation. The main role of the AMP Regional Project is to make best practices in regulations and policies, innovative and inclusive business models, digitalization and financing available to all AMP beneficiary countries.

IV. RESULTS AND PARTNERSHIPS

24. Expected Results: Three components and outcomes have been developed to scale up solar PV minigrids based on cost reduction levers, while simultaneously embedding the renewable minigrids in the agriculture value chain for productive energy uses and renewable electricity-induced local commodity value addition. UNDP's derisking approach (**Annex 17**) will be adopted as a financing cost reduction lever to increase private sector investments in the off-grid rural energy market. In doing so the activities proposed under the three project outcomes will seek to: (1) propose innovative business model approaches, such as the Processing Centre Model (PCM) (**Annex 13**), coupled with cost reduction levers to strengthen private sector participation in solar PV minigrid development for maximizing SDG impacts. The innovative business models will be on how best to integrate the implementation of solar PV minigrids in agricultural value chains. It is pointed out that the minigrid delivery model will be one of private sector ownership with the application of cost-reflective tariffs as discussed in paragraph 30; (2) make low-cost financing more accessible, and financial schemes more attractive to private investors through the Rural Electrification Fund (REF); and (3) support the scaling up of rural electricity access for the sustainable development of communities through a sound and robust knowledge management framework.

25. Post-COVID19 recovery: An important contribution of the child project is boosting local socio-economic development that will support Nigeria's recovery from the COVID-19 pandemic in several ways, including: (i) jobs will be created in the energy-agriculture value chains (Core Indicator 4 in the Results Framework) that will generate disposable income at the local level (Output 1.1). This will have direct and indirect effects on increased expenditures on food, education and health (hygiene and sanitary measures); (ii) primary health clinics (among other public infrastructures like schools and religious centers) will be electrified (Core Indicator 2 in Results Framework) that will ensure better access to health care and also increased capacity for the storage of vaccines (Output 1.1); and (iii) the main economic activity in rural areas in Nigeria is agriculture, and by supporting the energy-agriculture nexus, the project will squarely create more value added in this sector that will have both direct and indirect benefits that will be captured using the digitally-enabled common monitoring and indicator framework that the project will establish (Output 3.7). There is also strong gender responsiveness to the COVID-19 situation. The COVID-19 pandemic is a national risk that cascades into project operational risk as captured in the Risk Register (**Annex 7**).

26. Linkages to the AMP Regional Project: there are strong linkages with the AMP Regional Child Project across all project components, in particular with the Regional Project Component 2 which will provide access to (if requested) a variety of dedicated technical and operational support as described in Box 1 below.

Box 1: Linkages to the AMP Regional Project –Access to technical and operational support

As part of the AMP network, the project will have access to (if requested) a variety of dedicated technical and operational support from the AMP regional project as follows:

1) **Access to specialized expert international consultants in selected areas** (DREI, data, GIS modeling, mini-grid business models, etc.) hired, retained, contracted and paid for by the AMP regional project and made available to all participating national project staff and selected beneficiaries on as needed basis. The areas of support, listing of available firms/individual consultants under contract by the regional project and protocol for how the project can request and/or access such expertise (if needed/requested) will be elaborated in the first year of regional project implementation and disseminated to this project and the staff of all other participating AMP national projects. This support may range from virtual assistance to in-country missions. All requests for such assistance must be approved by the project manager of the AMP regional project management unit.
2) **Provision of a database of qualified international consultants and firms** disaggregated by their expertise in the four main components of this national project and other key operational areas (procurement, M&E, communications, etc.). These individuals will not be retained or contracted under the regional project but rather provided to the project for informational purposes only in an effort to assist in identifying high-quality experts and firms who may be available for contracting by national governments under their own procurement rules and modalities.
3) **Provision of generic terms of reference (ToR) for various standard activities** (mentioned above) under the four main components of the national project.
4) **Advisory support by the AMP regional project management unit** to staff of the project on trouble shooting (operational support, ToR reviews and problem solving) on an ad-hoc and as-needed basis. These services will be paid for the regional project and available on a first-come/first-serve bases under a protocol to be established by the regional project.
5) **Specialized advisory support for implementing UNDP's minigrid DREI analyses.** During project implementation, the UNDP DREI Core team, working with the regional project, will make available to national teams and consultants the resources and tools to conduct full quantitative DREI applications, and will provide ongoing support and quality assurance.

A full detailed elaboration of these offerings and the protocols attached to each service will be communicated to the project at the inception workshop of the regional project and at the inception workshop of each national project.

27. **Project objective:** *Supporting access to clean energy by increasing the financial viability and promoting scaled-up commercial investment in solar PV minigrids in Nigeria.*

28. An adaptive approach has been used to develop the project document. Changes have been brought to the project design based on more informed baseline assessments (**Table 1**). Baseline assessments have shown that the REA has recently finalized private bids for the development of 7 interconnected solar PV-hybrid minigrids under the NESP II (**Annex 13**), and that they would rather focus on isolated minigrids to achieve the off-grid RESIP electrification targets. Consequently, the biggest change relates to Output 1.2. The other changes are only incremental.

Table 1. Changes brought to the project design due to changes in baseline activities.

Changes made	Reasons for change
Output 1.2 Output 1.2 (*Interconnected minigrids for underserved urban areas in Port Harcourt and other cities in Nigeria*) has been changed to "Standardized online REF Calls for Proposals for enhanced transparency in developers bidding process"	The reasons for this change are: • The REA has recently approved 7 private sector bids for developing interconnected solar PV-hybrid minigrids for undergrid communities. These are communities that already have power supply networks but that have not received grid electricity for several years. One of the projects is promoted by Darway Coast Nigeria in the Port Harcourt DisCo region. The other interconnected minigrids are in the DisCo regions of Abuja, Benin, Ibadan, Ikeja, Jos and Kaduna. Consequently, REA has deemed Output 1.2 in the Child Concept Note to be no longer relevant; • The capacity assessment of the Implementing Partner (IP) has revealed the REA to be a 'low risk' IP. Nevertheless, the micro-assessments revealed a few weaknesses of which one was: "Procurement system and contract administration: The IP should acquire and operate a computerized procurement system for effective procurement and contract administration. Procurement reports should be prepared and filled as soon as the procurement process is complete. There should also be a staff dedicated

	to monitoring contract expiration and other risk management instruments. The IP should maintain a database of past performance of contractors."[25] • New Output 1.2 has been formulated in response to this weakness as an IP risk mitigation strategy.
Output 1.6 The scope of Output 1.6 proposed in the Nigeria Child Concept Note has been broadened to "Scaled up support for upstream equipment manufacturers and suppliers" rather than just focusing on standardization upstream in the technology supply chain.	• The proposed change only broadens the scope of Output 1.6, implying that the initially proposed focus on hardware standardization and modular technologies will still be retained. • The solar PV minigrids market in Nigeria has passed the infancy stage and it now in a growth stage. While Nigeria has initially been an import market for solar PV minigrid systems and components, the scale of economies can be availed in the growth stage for supporting indigenous technology assembly and manufacturing. • Further, embedding solar PV minigrids in agricultural value chains will require the market availability of agricultural electric equipment. This opens up the opportunity for the indigenous manufacture and assembly of such equipment. Hence, the scope now covers both upstream technology supplies and manufacturers that need technical assistance to effectively respond to scaling up of solar PV minigrids.
Component 2 The word 'Innovative' has been changed to 'Scaled-up'	This change has been carried out across all the national child projects to better reflect the overall results sought – i.e. scaling-up financing for solar PV minigrids. In the case of the Nigeria child project, it reflects the emphasis on developing catalyzing private sector investments in solar PV minigrids using a derisking approach and cost-reduction levers. This is squarely aligned with the theory of change discussed in the previous section.
Outcome 3 1) The words 'Digital' and 'monitoring and evaluation' have been added to the title of Component 3 without changing the outcome objective. 2) Three new outputs have been added to this outcome as follows: Output 3.1: Inception Workshop Output 3.2: Project monitoring Output 3.3: Project evaluations	1) This change emphasizes the strong role of digital technology in enabling knowledge management, learning, and monitoring and evaluation. Digital platforms for data collection and sharing can strongly enable sharing of lessons learned on all aspects of minigrid delivery models and business models. 2) This change follows new guidance from UNDP and GEF that projects should have a component dedicated to 'knowledge management and monitoring & evaluation', that reflect the M&E Plan given in section VI of the Project Document.
Output 3.3 Output 3.3 in the Nigeria Child Concept Note is now new Output 3.6 with scope enlarged to "Renewable Energy and minigrid Development Associations supported and strengthened to promote minigrid development"	• In the Nigeria Child Concept Note, Output 3.3 that sought to promote networking of local actors in the renewables minigrids value chains was centred on the Nigeria AMDA Chapter only. Stakeholders deemed this approach to be too narrow since there were other associations and networks that promoted renewables minigrids. • Hence, it was decided that this output should be inclusive of all associations and networks supporting and promoting renewables minigrids in Nigeria.
Output 3.4 Output 3.4 in the Nigeria Child Concept Note is now new Output 3.7 with scope enlarged to also include process for verification / auditing by independent body: "*Project Digital Strategy developed and*	• At present, the REA uses a minigrid Quality Assurance Framework (QAF) that is aligned with the requirements of the Minigrid Monitoring Dashboard[26] operated by the Federal Ministry of Power. Discussions with the REA revealed that in addition to the existing Dashboard, it would be necessary to develop a QAF that will cover a larger scope of indicators such as gender markers and sustainable development co-benefits of minigrids, and that it was important also to have a third party verification process in place to audit the data that were collected and reported.

[25] UNDP. 2019. Micro Assessment Report for Rural Electrification Agency – Final.
[26] https://nigeriase4all.gov.ng/ - accessed 25 January 2021.

Quality Assurance Framework augmented *and independent verification process in place* for measuring, reporting and verification of the sustainable development impacts of MGs, including GHG emission reductions".	• Emphasis is placed on the use of digital technology / platform for monitoring the performance of minigrids; to manage Calls for Proposals in a transparent way; and for knowledge management.

29. The project is aligned with and will directly support the implementation of the REA Energizing Agriculture Programme (EAP) that aims to accelerate the electrification of agricultural productive uses across peri-urban and rural areas of Nigeria (**Annex 13** for more details). The AMP Nigeria child project can therefore be seen as the first child project of the EAP for promoting solar PV minigrids within the energy-agriculture nexus. The alignment of the AMP child project with the EAP is shown in **Figure 2**. Today, no viable business models have been demonstrated for introducing agricultural productive uses of electricity in rural areas. In fact, productive uses have not been widely adopted in rural Nigeria. Minigrid developers and communities see the opportunity for productive uses to stimulate local economies, but as electricity experts they often have gaps in expertise, capacity, or partnerships to implement agricultural programmes; regardless, they are often asked to do so to access concessional financing.

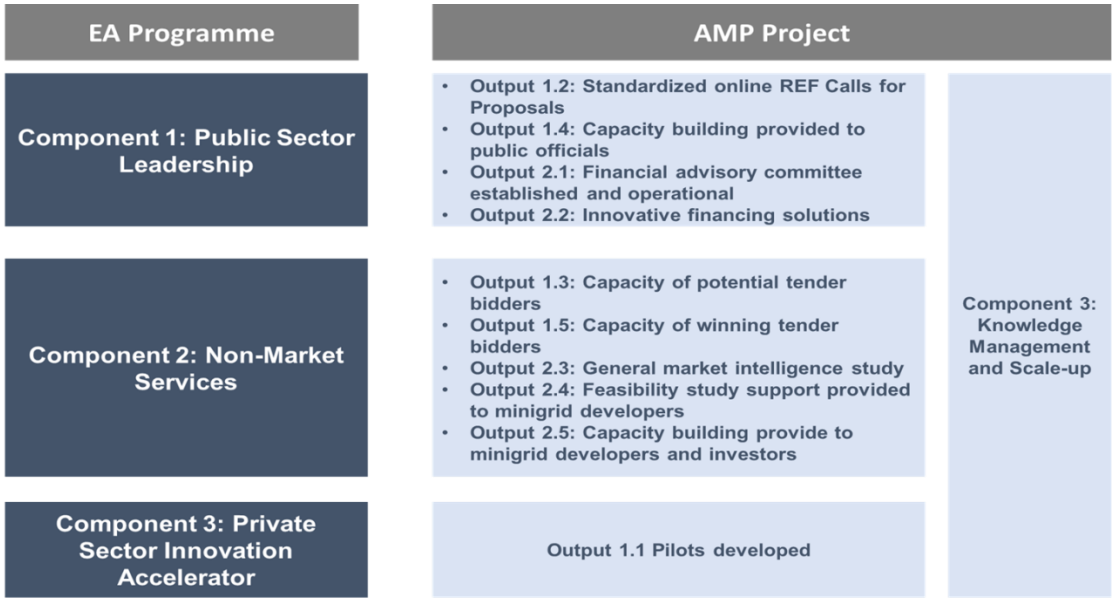


Figure 2. Alignment of the AMP Nigeria project with the Energizing Agriculture Programme design.
(Source: RMI)

30. **Component 1: Business Model Innovation with Private Sector Engagement:** Component 1 centres on providing a combination of financial support and technical assistance for embedding low-carbon minigrids into the agriculture value chain that directly supports REA's new initiative on Energizing Agriculture (**Annex 13**). As per the ToC discussed in the previous section, the main focus of the project's interventions will be on increasing the commercial viability of low-carbon minigrids at scale using cost reduction levers (i.e. a derisking approach to lowering financing and hardware costs). In the proposed business delivery model, the focus is on the agriculture-energy nexus, wherein a commercially viable downstream agriculture value chain (pre- and post-harvesting value addition) becomes a cornerstone element in creating reliable and predictable energy load that creates a pull for renewable electricity demand from minigrids. As shown in **Figure 3**, the productive energy uses arising from a strong agriculture value chain has multiple positive feedback effects on multi-tier electricity supply that drive reductions in GHG emissions and generate multiple sustainable development benefits that can be

quantified using the augmented Quality Assurance Framework (QAF) adopted under Output 3.7 and operationalized under Output 2.5. The nexus approach shows that the generation of electricity from low-carbon minigrids cannot be viewed in isolation from downstream energy consumption activities that have a bearing on the minigrid capacity utilization[27] and disposable income in off-grid communities that increase the capacity to pay, and, hence, the affordability of renewable electricity. Then there is a positive feedback effect related to spill-over effects of local socioeconomic development, which, in turn, drive the demand for clean electricity. **Figure 3**, therefore, shows that the sustainability of low-carbon minigrids hinges on the incremental contribution of downstream value addition in the agriculture sector, especially through increased capacity utilization that has positive impacts on several determinants of electricity access such as: increased affordability (higher capacity to pay through more disposable income), increased availability of renewable electricity, and improved reliability to electricity. [28] Improved capacity utilization also reduces the cost of hardware (minigrid and agricultural equipment) per unit of output (kWh for minigrid and tonne of commodity processed). It is pointed out that the minigrid DREI analyses shown in **Annex 17** have made use of a load profile of productive energy uses in agriculture for an existing successful solar PV minigrid operation. The market analysis of the agriculture-energy nexus in Nigeria is summarized in **Annex 13** to justify the project's approach.[29]

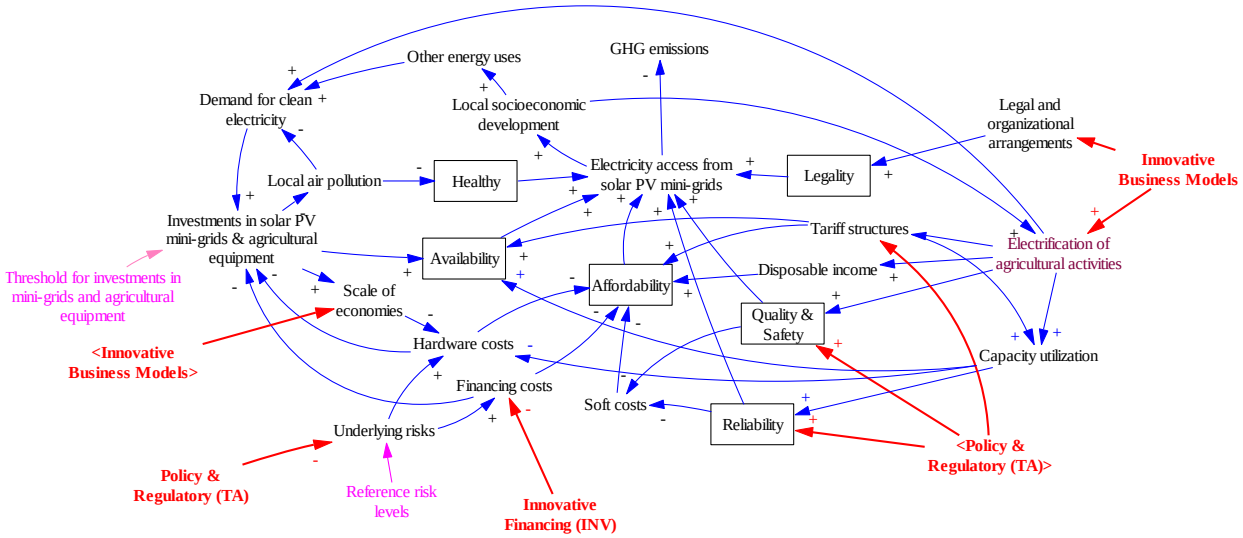


Figure 3. Causal Loop Diagram illustrating the agriculture-energy nexus.

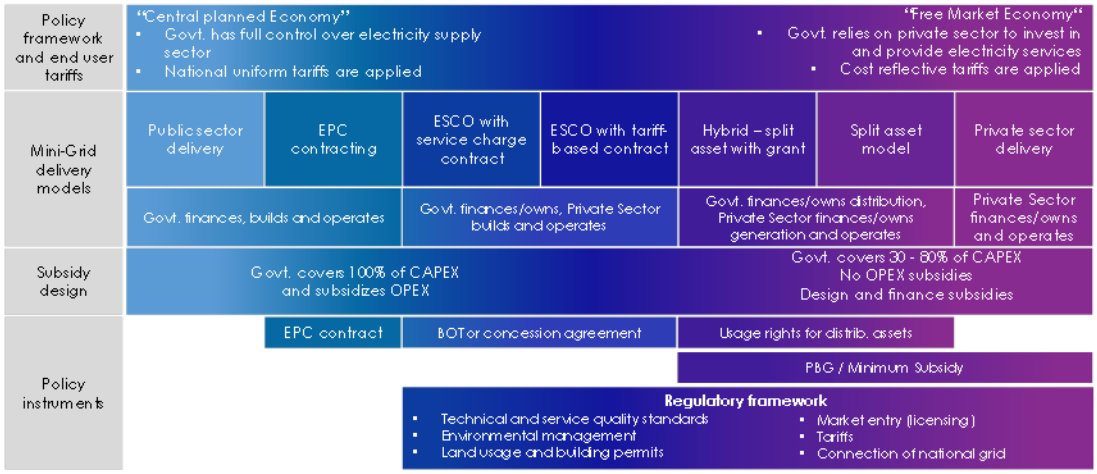
31. Minigrid delivery model: In the case of Nigeria, the implementation of solar PV minigrids framed within the agriculture- energy nexus shown in **Figure 3**, will be carried out using a specific minigrid delivery model. The delivery model is distinctive and different from the business models (PCM, FM) that seek to provide the most appropriate approaches to integrate solar PV minigrids in agricultural value chains, and which are further discussed below. The minigrid delivery model is framed by the enabling environment comprised by factors including the minigrid policy and regulatory framework, as well as the pricing mechanism for electricity tariffs and any incentive mechanisms in the form of subsidies (capital subsidies, split-asset or performance-based). Another factor is the level of private sector participation financing, building, owning, and who operating and maintaining the minigrids. The diversity of delivery models based on the state of the enabling environment is shown in **Figure 4**. As detailed in **Annex 13**, Nigeria already has an adequate minigrid enabling environment that

[27] Discussions with the REA have shown that there are numerous solar PV-hybrid minigrids in Nigeria that have suffered from overcapacity leading to lower capacity utilization that eventually have a significant bearing on tariffs that are practiced. This situation critically undermines the financial viability of these minigrids.

[28] Scarlett Santana, Andrew Allee, Zihe Meng, Wayne Omonuwa, James Sherwood, Balaji MK, Kira Rosi-Schumacher. 2020. *Agricultural Productive Use Stimulation in Nigeria: Value Chain & Mini-Grid Feasibility Study.* Rocky Mountain Institute, Deloitte Consulting LLP. 2020. Prepared for the U.S. Agency for International Development Power Africa Nigeria Power Sector Program.

[29] The market analysis draws from the recent study carried out by Santana et al. (2020).

is conducive to private sector participation in off-grid electrification. Also, solar PV minigrid development in Nigeria has benefitted from a number of development partner initiatives (**Annex 13**) that have helped to shape the private sector delivery model either through the split-asset model (e.g. GIZ-supported NESP) or private sector finance with public subsidy on capital expenditure. In both cases, the in-kind (split-asset model) or subsidy aim to make the cost-reflective electricity tariff more affordable for end-users. The GEF-financed project will continue supporting the delivery model where solar PV assets are owned and managed by a private sector investor or operator; tariffs are set using the regulatory framework enabling cost-reflective tariffs; and using the capital subsidy incentive through REA's Rural Electrification Fund (REF). Hence, providing further support on solar PV delivery models is not an object of the GEF-financed project. Rather, and as discussed below, the focus will be on innovative business models - marketing, pricing, service offer, system sizing, and stakeholder coordination decisions – for the integration of solar PV minigrids in productive, and more precisely, agricultural value chains. Any innovative business model that will be tested and validated under Output 1.1 will use the private sector minigrid delivery model with minimum subsidy/concessionality. The capital subsidy will be set using the principle of LCOE parity. In this case, it will be the minimum subsidy level required to achieve LCOE parity of solar PV electricity with that of baseline diesel LCOE, while at the same time avoiding market distortions relative to the performance-based grant mechanism that is being applied by parallel initiatives (Output 1.1 below).



Source: JAKOB SCHMIDT-REINDAHL, Mini-grids Policy Expert, INENSUS

Figure 4. Conceptual outline of minigrid delivery models.

32. To achieve the goals of Outcome 1 and the goals of the Energizing Agriculture Program, the UNDP-GEF project will first focus on ground-truthing the electrification of agricultural value chains through pilots, and thereafter to propose the most appropriate business model(s) for scaling up solar PV minigrids in off-grid communities. All data that will be collected from pilots will be shared with the Regional AMP project for developing knowledge products. In turn, these knowledge products will be used to guide the design of the most appropriate business model(s) to scaling up deployment of commercially viable, lower cost solar PV minigrids in Nigeria. The focus of the two business models is on integrating solar PV minigrids in agricultural value chains. However, the business models lend themselves to other types of productive energy uses. In brief, the FM is led by a facilitator who enables small-scale processors to invest in equipment by serving as their education resource and connection point to finance providers. Once the viability of lending to small-scale processors is proven, the role of the facilitator would be phased out or reduced and the private financial institution (PFI) assumes the role of identifying and selecting would-be processors. One key benefit of the FM is that it de-risks participation by third parties to provide financing and capacity building, which enables equipment purchases and reduces the burden on the minigrid developer. In contrast, the PCM relies on a mini-grid developer based in a rural community to invest in, own, and operate the equipment for a new processing service that existing entrepreneurs are not able to provide. Under the PCM, the minigrid developer is ultimately responsible for the credit and operational risk. It is appropriate for activities where there is proven demand for the product, but the activity is not prevalent in the local community. Consequently, the PCM is an example of third party ownership (TPO) model, where the

developer owns the productive use equipment and effectively leases or offers its usage as a service. Using the ToC and energy-agriculture nexus illustrated in **Figure 3**, it has been argued that the agricultural value chains must form an integral part of the minigrid operation - from the perspective of capacity utilization while mitigating risks given in **Table 2** and **Annex 6**) – in order to ensure global environmental benefits related to reductions in greenhouse gas emissions. This logic is subtended by a third party ownership (TPO) model, where electrical equipment used in the agricultural value chains is integral to investments in solar PV-battery minigrids. Hence, the project will test the PCM model or any hybrid model that is aligned with a TPO-type model.

33. In parallel, the results of the derisking study given in **Annex 17** will guide the REA and other public institutions put in place an appropriate mix of derisking instruments to reduce the financing costs of solar PV minigrids. The project interventions are substantiated by the ToC given in Section III in order to overcome barriers (Section II and **Annex 17**) and risks (**Annex 17**) faced by solar PV minigrid developers.

34. It is pointed out that the various crop and processing activity combinations summarized in **Annex 17** present different barriers to implementation. This is why different business models have been proposed to overcome value-chain specific barriers. Also, there are fundamental human development aspects of the agriculture-energy nexus that need to be taken into account within the ambit of applying cost reduction levers to make solar PV minigrids commercially viable. For instance, depending on the choice of business model, electrification of productive agricultural activities may displace incumbent actors (farmers or processors) who rely on fossil-powered mechanization. Also, mechanization (and electrification using solar PV minigrids) of labour intensive agricultural activities (like threshing) may result in job losses with a significant gender impact.[30] Consequently, a single business model may not apply to all situations and crop-activity combinations. Instead, understanding when each option is most appropriate will ensure success for both the agricultural community and mini-grid operator, and allow implementers to further adapt based on the conditions and needs they face in specific communities. For this, ground-truthing is necessary through pilot studies, and the results of these studies will then inform the adoption of most appropriate business delivery model(s) for scaling up.

35. The expected outcome from outputs proposed in Component 1 is *"Innovative business models based on cost reduction operationalized to support and strengthen private participation in low-carbon minigrid development"*, and it will address Barriers #1 through to #6. The outputs that contribute to this outcome are incremental to those deployed by ongoing partner initiatives (below and **Annex 13**).

    Output 1.1: Pilots developed, including on productive use/innovative appliances and modular hardware/system design, leading to cost-reduction in mini-grids and sufficient growing demand for minigrid systems

    Output 1.2: Standardized online REF Calls for Proposals for enhanced transparency in developers bidding process

    Output 1.3: Capacity of potential tender bidders (private sector developers) strengthened to consider innovative business models and cost-reduction levers

    Output 1.4: Capacity building provided to public officials (regulator, ministries) specifically to design procurement/tender processes that incorporate cost-reduction levers and innovative business models

    Output 1.5: Capacity of winning tender bidders (private sector developers) strengthened to develop and implement innovative business models and cost-reduction levers

    Output 1.6: Scaled up support for upstream equipment manufacturers and suppliers

36. *Output 1.1: Pilots developed, including on productive use/innovative appliances and modular hardware/system design, leading to cost-reduction in mini-grids and sufficient growing demand for minigrid systems*. Despite ongoing efforts in Nigeria to develop productive use of electricity in minigrids, many efforts rely on the minigrid developer to create—effectively—a new business unit to do so, which these developers are not particularly well suited or well incentivized to do. At the same time, existing programs often heavily or completely subsidize the capital costs of the effort, resulting in pilots that are not testing or encouraging commercial viability. As explained above, the GEF-financed project will use a private sector delivery business model. The emphasis will

[30] Scarlett Santana, Andrew Allee, Zihe Meng, Wayne Omonuwa, James Sherwood, Balaji MK, Kira Rosi-Schumacher. 2020. *Agricultural Productive Use Stimulation in Nigeria: Value Chain & Mini-Grid Feasibility Study.* Rocky Mountain Institute, Deloitte Consulting LLP. 2020. Prepared for the U.S. Agency for International Development Power Africa Nigeria Power Sector Program.

be on piloting and showing proof-of-concept business models for the integration of greenfield solar PV minigrids in agricultural value chains. Consequently, a number of interlocking activities will be carried out to further develop and implement innovative productive use business models using emerging approaches including bringing microfinance into communities, connecting state agriculture extension programs and agricultural cooperatives, and facilitating co-creation with the community's minigrid operator.[31] It is reiterated here that the GEF investments will have a direct positive impact on post-COVID-19 recovery in local communities (paragraph 25 and Risk Register in **Annex 6**).

37. Both the FM and PCM models described in **Annex 13** involve significant private sector participation. In order to ensure long-term sustainability, jumpstarting deployment will require proof points showing financial returns on equipment investment and demonstrated business model feasibility to derisk and attract private investment. As explained above (paragraph 31), the project will test the PCM or any other hybrid model that is TPO-like. However, this does not mean that the FM cannot be scaled up as a viable business model for scaling up integration of solar PV minigrids in agricultural value chains. The only qualification relates to the attribution of emissions reductions. In the PCM model, the electrical equipment used in downstream agricultural activities is included in the minigrid investment boundary. Hence, investments in minigrid assets and equipment in agricultural value chains combine to generate emissions reductions. Here, ownership of all assets and equipment are owned by the minigrid developer or operator. The feasibility study summarized in **Annex 13** shows that there are two Tiers of agricultural activities that can be piloted. Pilots will be deployed in two steps:[32] (i) pilots to test equipment for Tier 1 and Tier 2 activities and collect operational data to refine financial models; and (ii) use pilot data to design and test commercial business models and develop financial instruments, in parallel with equipment pilots (i.e. electrification of agricultural value chains that currently are either mechanized using fossil fuels or employ human labour).

38. Minigrid Pilot Plan (MPP): At the PPG stage, considerable initial consultations, analysis and planning have been performed to advance the design of these minigrid pilots. This is described in the paragraphs directly below and associated annexes. At the beginning of project implementation, as an initial preparatory step, the PMU, in consultation with key stakeholders, and with support from the AMP regional project, will update and finalize the proposed approach to the design of the minigrid pilots, compiling a 'Minigrid Pilot Plan'[33]. The project's Minigrid Pilot Plan will then (i) need to be reviewed and cleared by UNDP (Nigeria CO and BPPS NCE) and (ii) shared with the Project Board. The Minigrid Pilot Plan will also take into account the impacts of climate change on agricultural value chains as proposed under Activity 2.3.2. The MPP will straddle Activities 1.1.1 and 1.1.2, and the sequencing of pilots (i) to validate design and financial model through data analytics, and (ii) to validate business models are illustrated in **Figure 5**. Using the LCOE parity principle described below and using the DREI results (**Annex 17**), GEF investments may be used to fund 25 solar PV-battery minigrids each of 121 kW installed capacity. Activity 1.1.1 will support an initial number of six (6) such minigrids, and the remaining nineteen (19) will be deployed under Activity 1.1.2. The minigrids supported under Activity 1.1.1 will be dedicated to validating the design of minigrids embedded in Tier 1 and Tier 2 value chains, as well as underlying financial models. Where necessary,[34] Activity 1.1.2 may extend first phase pilots (i.e. Activity 1.1.1) in complementary Tier 1 and Tier 2 agricultural value chains and geographical locations (or agro-ecology zones). Nevertheless, the main objective of minigrids supported under Activity 1.1.2 will be to validate the appropriate business models (paragraph 37). Further, the MPP will anticipate any stimulation in new electricity demand arising from energy access as captured in **Figure 3** by proposing novel minigrid design approaches based on modularity and redundancy. This will counteract the use and reliance on diesel generators for meeting energy demand over-and-above that generated from solar PV-battery minigrids.

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[31] Scarlett Santana, Andrew Allee, Zihe Meng, Wayne Omonuwa, James Sherwood, Balaji MK, Kira Rosi-Schumacher. 2020. *Agricultural Productive Use Stimulation in Nigeria: Value Chain & Mini-Grid Feasibility Study.* Rocky Mountain Institute, Deloitte Consulting LLP. 2020. Prepared for the U.S. Agency for International Development Power Africa Nigeria Power Sector Program.

[32] Ibid.

[33] Amongst other matters, the project's 'Minigrid Pilot Plan' will include specifications for the project's approach on pilots that ensure the approach is aligned with key design principles addressed elsewhere in this project document, including but not limited to: ensuring minimal concessionality for GEF INV resources; the use of third party ownership models; and alignment of the IP's modalities with UNDP's policies and financial rules.

[34] To be decided at implementation start.

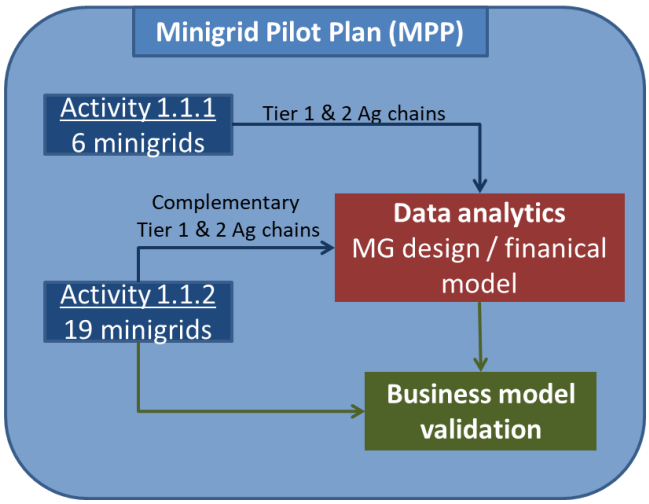


Figure 5. Sequencing of minigrid pilots.

39. Pilots will be designed to showcase the advantages of improved digitalization within the broader ambit of the digital strategy that will be formulated under Outcome 3. For example, a national data framework will be built to provide:
    - Developers with access to technical assistance and resources like standardized technical designs;
    - A framework for best practice financial reporting to support business operations (for example tracking site ARPU and ROI);
    - A remote monitoring portal that links with on-site equipment such as smart meters;
    - Enabling agencies with oversight on the industry in order to support more effectively;
    - Improved due diligence for external investors, easing inward investment;
    - Data and evidence of the efficacy of mini-grids as a viable electrification route;
    - External development programs to track impact and hence facilitate the flow of funding.

40. Output 1.1 will also serve to provide synergies between the GEF –financed off-grid lighting project (PIMS 5691) and the AMP child project (PIMS 6339). Linkages between the two projects will be facilitated by the fact that both projects will be implemented by the REA, and more details are given in **Annex 20**. The REA will avail of the investment and technical assistance opportunities afforded by the two projects to investigate the possibility of promoting energy access using a mix of technologies – i.e. solar home systems (PIMS 5691) and solar PV-battery minigrids (PIMS 6339) – in the same geographical areas to serve different market segments based on energy needs and capacity to pay. Among all AMP child projects, the Nigeria child project provides this unique opportunity to investigate off-grid energy access using a bundle of technologies, which has implications for scaling-up off-grid electrification using mixes of renewable energy technologies. Further, there are opportunities for harmonizing the two projects under Component 1 as follows: (i) transparent tendering processes (Output 1.2); and (ii) protocols and procedures for recycling of batteries (Activity 1.1.4). Knowledge management (Component 3) also offers numerous opportunities for harmonized approaches between the two UNDP-GEF projects (paragraph 54).

    - Act 1.1.1: Pilot energizing Tier 1 and Tier 2 agricultural activities: This activity will develop greenfield minigrid pilots for Tier 1 and Tier 2 agricultural activities discussed in **Annex 13**. Tier 1 agricultural value chains already contain mechanized post-harvest processing using fossil fuel-powered equipment. These value chains can be electrified using solar PV minigrid electricity immediately. Tier 2 agricultural value chains contain post-harvest activities that are not mechanized but that can be electrified in the short-to-medium term.[35]

[35] https://www.crossboundary.com/wp-content/uploads/2021/04/CrossBoundary-Innovation-Lab-Appliance-Financing-1.0-Innovation-Insight-29-Apr-2021.pdf - accessed 20 May 2021.

Initial design information on the pilots is as follows. **Based on current data, it estimated a total of six (6) pilots will be developed through a transparent Call for Proposals to be carried out by the REA/REF using the online platform that will be developed under Output 1.2**. Gender markers will be used to ensure that the Call for Proposals is gender-responsive. The pilots will cover a combination of Tier 1 and Tier 2 agricultural activities, agro ecology zones (semi-humid and semi-arid zones), and agricultural processing modality (i.e. Buy and Sell, BnS or Fee for Service, FFS) as discussed in **Annex 13**. Energizing Tier 1 and Tier 2 activities will be displaced in time with pilots for Tier 1 activities taking place within the first 18 months of the project, and pilots for Tier 2 activities taking place as from Year 2 of the project. Data generated by the pilots will be used to validate the underlying business cases (e.g. financial models, barriers faced and measures to overcome barriers) using the digitalization strategy articulated under Output 3.7. Same data will be shared with the Regional AMP project for developing knowledge products.

A typical solar PV-battery pilot is described in the DREI modelling carried out in **Annex 17**. For this DREI modelling analysis, the load profile is based on the real case of a minigrid operated by Rubitec Solar that supplies renewable electricity to a combination of households (475 connections), public institutions (15 connections) and productive uses (24 connections). For such a minigrid, the optimized solar PV capacity is 121 kWp (**Annex 17**). These data comprise core indicators in the Project Results Framework (Section V) and the calculations are given in **Annex 13** and **Annex 18**. As mentioned in paragraph 29, the capital subsidy scheme used in the AMP Nigeria project will be based on the principle of LCOE parity. In this case, the minimum subsidy level will be worked out - as is demonstrated in **Annex 13** – so that solar PV-battery minigrids will achieve LCOE parity with an equivalent diesel generation in the baseline scenario. As per the DREI results shown in **Annex 17**, it is expected that the level of subsidy will be commensurate with the level of risks faced by the private sector investor or operator, and is expected to decrease over time when policy and financial derisking instruments are operationalized in off-grid electrification. The LCOE tool that is used in **Annex 17** can be applied by the REA-REF to estimate the level of subsidy required to achieve LCOE parity. Another consideration for establishing the level of subsidy is to avoid market distortions regarding incentives provided to minigrid developers by NESP and NEP (**Annex 13**). The NEP currently uses a performance-based approach giving minigrid developers or operators USD 350 per connection. The connection-based grant, therefore, provides an upper limit on the level of subsidy.

The application of the two approaches (LCOE parity and subsidy per connection) is illustrated in **Annex 13**. The method used to estimate subsidy levels will determine the number of solar PV minigrids that can be supported with GEF investments, and will have consequential impacts on core indicators given in the Results Framework. The core indicators have been estimated based on the LCOE parity approach (**Annex 18**), and it is understood that same will have to be re-calculated at project implementation if the capital subsidy used in the ProDoc would change.

In terms of indicative estimates, when using the performance-based grant of USD 350 per connection, the equivalent amount of capital subsidy is estimated at USD 179,900 per minigrid. The LCOE parity principle yields a lower capital subsidy at USD 117,977 per minigrid. Consequently, on this indicative basis, the GEF investments will be sufficient to support a total of 25 solar PV-battery minigrids as per **Annex 13** and **Annex 18**. The exact project sites will be determined at inception stage. Nevertheless, the geographical locations of potential sites in two agro-ecology zones are available (**Annex 13**) and are shown in **Annex 3**. An important aspect of allocating GEF investments is to promote gender transformation of the agriculture-energy value chains. In this case, at least 25% of GEF INV subsidies will target women entrepreneurs (**Table 6** and **Annex 11**). Similarly, all bids will need to demonstrate their gender impacts – i.e. impacts on Sustainable Development Goal 5.

As described in the previous paragraphs, the 25 minigrid pilots planned in this project will be funded through a CAPEX (partial) subsidy from the GEF grant, while the remaining of the CAPEX will be funded by third parties from the private sector. While the funds from third parties will not flow through UNDP accounts, they will directly contribute to the same mini-grid pilots the GEF and UNDP funds are contributing to and will be essential to realizing the project objectives. For this AMP child project, these are “co-financing activities included as project results”. The precise sources and amounts of these co-financing activities will only be known at implementation stage. UNDP is accountable to monitor all project results, including results to be delivered by these co-financing activities, to ensure consistency with UNDP and GEF policies and

procedures, including social and environmental safeguards policies and requirements (SES). This is further detailed in the ESMF (Annex 10).

For these co-financed activities included as project results with resources that do not flow through UNDP accounts (captured on Table 2 below), the following procedures will need to be applied before co-financing activities start:

1. The co-financing partner's capacities will need to be assessed through the Partner Capacity Assessment Tool (PCAT) and the co-financing partner will need to develop a risk management strategy if gaps are identified, for UNDP's approval and subsequent oversight/assurance.
2. The co-financing partner will need to sign a legal agreement with UNDP or the Implementing Partner to confirm accountabilities, mentioning in particular the following sentence: "*The co-financed activities will be undertaken in full compliance with [co-financing partner's] policies and procedures. However, because the activities are included in the results of the project the [co-financing partner] commits to monitor these activities consistent with the UNDP Project Document. The Project Board and UNDP will also assume an oversight and assurance role to further ensure the project, including the co-financed activities covered by this letter, remains consistent with UNDP policies and procedures. These arrangements will be confirmed through [signature of Project Document OR signature of Responsible Party Agreement with reference to the Project Document]*.".
3. Risks stemming from and/or to co-financed activities – as with risks from/to all other project activities – will be included in the project risk register and monitored accordingly. The risk description will clarify relation to the specific co-financing.
4. Social and environmental risks associated with the co-financed activities will be identified during project design and included in the SESP and relevant safeguard management plans. Relevant safeguards instruments prepared by the co-financing partner will be reviewed by UNDP for consistency with UNDP's SES, during project development and implementation; any gaps will be resolved in discussion with the co-financier.

Once the co-financing activities will have started, risks will need to be monitored (as per item 3 above) and results achieved through co-financed activities will be monitored and reported in the annual GEF PIR, the independent mid-term review and the independent terminal evaluation.

Table 2: List of co-financed activities included as project results

Co-financing source	Co-financing type	Co-financing amount (USD)	Included in project results?	If yes, list the relevant outputs
Private sector developers (To be confirmed at implementation stage)	Grant, Loan and/or Equity investment	4,017,600 (Estimate, to be confirmed at implementation stage)	Yes	Output 1.1
TOTAL		**4,017,600**		

- Act. 1.1.2: Design and propose pilot business models: As discussed in paragraph 38, additional pilots may be supported to extend data analytics (Activity 1.1.1) into complementary agricultural values chains and geographical locations. The pilot data from Activity 1.1.1 and any complementary minigrids under Activity 1.1.2 will then be used as lessons learnt to design and propose commercial business models and develop financial instruments (Output 2.1) for scaling up deployment of solar PV-battery minigrids for energizing agricultural value chains. This activity will test and validate the feasibility of the PCM discussed in **Annex 13**,

as well as other emerging business models.[36] **This activity is anticipated to take place in the second half of the project with an additional nineteen (19) minigrids that will be supported using GEF investments**. A transparent bidding process as in Activity 1.1.1 will be used. The identification of appropriate business models will also build on networking and partnerships that will be developed under Output 1.4 and Output 2.1.

- Act 1.1.3: Data collection to track the performance of solar PV minigrids: The pilots developed under Activity 1.1.1 will be used to measure data on the usage patterns and performance of equipment (minigrid and all electrical appliances and equipment). To enable data collection, remote monitoring sensors will be installed on all equipment. The data will be used to multiple purposes, namely: (i) to validate the underlying assumptions that were used to design the solar PV minigrid based on projected load demands; (ii) to track the performance of the systems (minigrid + productive agricultural uses + other loads) in real-time;[37] and (iii) to track performance enhancement in minigrid capacity utilization by effecting changes in load management through the application of processing equipment time-of-use behavioural changes and time-of-use tariffs. It is pointed out that data collected from pilots will be shared with the regional AMP project for aggregating and analysing data and developing knowledge products. It is anticipated that the types of data to be collected, as well as the modalities for data collection will be provided by the regional AMP project prior to initiation of the national child project in Nigeria and be based on the Quality Assurance Framework (QAF) for minigrids to be augmented with project support (Output 3.7). Further, the data generated by the pilots will feed into the feasibility studies that will be carried out under Output 2.4. It is anticipated that data collection will be carried out using digital technologies – i.e. remote monitoring – as far as practicable. The use of a digital platform for aggregating data from the project's minigrid pilots will be assessed as part of the process of defining a Project Digital Strategy (Activity 3.7.3). Data that are not amenable to be collected by remote monitoring will be collected either by the minigrid operator[38] and/or during the process of carrying out lessons learned surveys under Activity 3.4.2.
- Act 1.1.4: Take-back, storage and safe disposal of product components. The social and environmental screening procedure (SESP in **Annex 6**) has revealed that electronic and electrical waste related to batteries, control electronics and electrical appliances and equipment in the agriculture-energy value chains at the end of product lifetime will become an increasingly more severe issue as investments in these technologies for enhancing clean rural energy access is catalyzed. It will be dealt with in two complementary ways, namely: (1) one eligibility criterion for private companies / entrepreneurs to participate in the REF Call for Submissions that will allow them to access working capital grants under Activity 1.1.1 to be established under REF will be a product take-back clause at the end of product lives; and (2) developing an Environmental and Social Management Plan (ESMP) in collaboration with the Federal Ministry of Environment (and the Federal Environmental Protection Agency) on the environmentally-sound collection, storage and disposal of all electronic and electrical waste, including rechargeable batteries, associated with off-grid RETs. This activity will also be implemented in collaboration with the Alliance of Responsible Battery Recycling and the Renewable Energy Association of Nigeria, and the GIZ that is also supporting the development of ESMP for minigrid developers (**Annex 19**). The ESMP will be developed in Year 1, and it will also address all risks identified in the SESP (**Annex 6**), including potential job losses in the baseline value chains (e.g. diesel generator business and manual labour in agricultural value chains) and the impacts (current and future) of climate on agricultural value chains The formulation of the ESMP will follow the guidance contained the Environmental and Social Management Framework (ESMF) given in **Annex 10**.

[36] For instance, alternative TPO-like model like the KeyMaker Model or other business models that could be proposed by the Regional AMP project in its knowledge products and insight briefs or shared by other countries through the Regional project's Community of Practice (CoP).

[37] It is necessary to understand technical dynamics, such as inrush current, in order to optimize system capacity. Given the number of motors required in the post-harvest agricultural equipment, it is likely that the reference mini-grid would be capable of supporting inrush current under typical operations.

[38] An explicit condition for eligibility to REF Calls for Proposals and accessing capital grants under the GEF-financed project will be full cooperation of minigrid operators/developers to allow real-time data collection on the performance of minigrids.

41. *Output 1.2: Standardized online REF Calls for Proposals for enhanced transparency in developers bidding process*. As discussed in **Table 1**, this output serves to enhance the accountability of the REA through an increased capacity to manage REF Calls for Proposals in a transparent way. It is part of an Implementing Partner risk mitigation strategy. Hence, this output seeks to develop and operationalize an automated online bidding system, as well as developing a repository of potential sites for low-carbon minigrid development in Nigeria related to the agriculture-energy nexus. The REF has some experience with using the Odyssey digital platform for managing its Calls for Proposal. Typically, the REF would reach out to Odyssey and a submissions portal is created. Bidders can then access the submissions portal to download application templates and to submit their proposals through the portal. However, the REF only uses the digital platform on a needs basis, implying that the entire REF process is not yet digitalized. One issue is that, as a public institution, REF has to abide by the procedures and processes established by the Bureau of Public Procurement (BPP). It is also worth noting that financial support received from development partners to date has applied their own procurement modalities and procurement procedures – i.e. not necessarily those of the BPP. Since the Nigeria child project applies full NIM, its procurement procedures must be aligned with those of the BPP. This presents an opportunity for the GEF-financed project to support the digitalization of REF processes albeit in alignment with the rules laid out by the BPP.

    - Act 1.2.1: Digitalization of REF Calls for Proposals: The digitalization of REF processes needs to be aligned with the requirements of the BPP. Hence, the digitalization of REF Calls of Proposal will require the case to be made to the BPP that should be supportive of the process. For this, the digital strategy that is articulated under Output 3.7 will be implemented. The online system to manage REF Calls for Proposals in a transparent way, wherein the status of the review process, decisions made along with justifications for decisions made will be made available to bidders. For this, the project will leverage the existing capabilities of Odyssey or a similar platform to handle applications for results based financing.[39]
    - Act 1.2.2: Repository for potential low-carbon minigrid sites: The prominent sites in Nigeria for embedding low-carbon minigrids in the agriculture value chains will be identified under Outputs 2.3 and 2.4. The geographical locations and characteristics of these sites will be made available as a public good through a repository related to the Energizing Agriculture initiative of the REA. The repository will form part of the enhanced governance structure used by the REA to be transparent and equitable to all stakeholders regarding availability of information on rural electrification using solar PV minigrids under the umbrella of the agriculture-energy nexus.

42. *Output 1.3: Capacity of potential tender bidders (private sector developers) strengthened to consider innovative business models and cost-reduction levers*. A significant technical barrier faced by entrepreneurs in the agriculture-energy market chain is the lack of commercial and financing skills in putting together investment worthy projects.[40] This is also revealed by the derisking study (**Annex 17**) that shows 'developer risk'[41] to be among the highest risks facing minigrid developers. A capacity building programme will be tailored for the developers of low-carbon minigrids to develop these skills with the ultimate aim to better prepare them for responding to the Calls for Proposals, as well as financial models (and business models under Output 1.1) to attract equity and debt financing. As per the ToC, focus will be on cost reduction levers, including productive energy uses in the agriculture sector. This output will make use of results emanating from Act. 1.2.2 and Output 2.3. The technical assistance provided under this output will target the minigrid developers that will participate in the Call for Proposal related to the pilots in Activity 1.1.1 and using the online platform that will be developed under Output 1.2.
    - Act. 1.3.1: Supporting companies to develop business plans for productive energy uses in agriculture value chains: Using the results of Act 1.1.1 and 1.1.2, the project will support minigrid developers to develop business plans for serving the off-grid energy market, especially to embed low-carbon minigrids in agricultural value chains. Potential companies will be invited to participate in this activity through a two-

[39] https://www.odysseyenergysolutions.com/2019/12/18/nigeria-electrification-project/ - accessed 27 January 2021.
[40] RESIP (2016), pg.13.
[41] This risk is underpinned by developers' lack of C-suite talent and experience to ensure effective execution (business planning, financial structuring, plant design (resource and demand assessment), installation, operations and maintenance), and to manage challenges (limited information, unforeseen events).

step process combining sequentially a call for expressions of interest and a call for proposals for short-listed companies as described under Output 1.2. This activity will serve to increase the commercial competitiveness of low-carbon minigrids and female participation in the agriculture-energy value chains. An integral part of support provided will be to link solar PV minigrid developers with agricultural value chain actors in order to develop partnerships on agriculture-energy nexus applications. With these business plans, potential companies will be linked with financial institutions (Output 1.6).

- Act. 1.3.2: Strengthening the capacity of minigrid developers on financial reporting: Another barrier that hinders minigrid developers in developing bankable bids is the lack of credit worthiness (**Annex 17**). One way to circumvent this barrier is to provide minigrid developers with the managerial capabilities to carry out financial reporting that can then be used to make the business case and advocate for the commercial viability of their activities in the context of the agriculture-energy nexus. For this, the enhanced QAF that will be developed under Output 3.7 will be used since it will also contain standardized financial indicators. It is expected that better financial reporting will help bidding for tenders and for attracting investments. Templates for financial reporting will be developed.

43. *Output 1.4: Capacity of winning tender bidders (private sector developers) strengthened to develop and implement innovative business models and cost-reduction levers*. One of the barriers faced by minigrid developers is the ability to ensure optimal utilization of solar PV installed capacity, thereby allowing the application of lowest possible cost-reflective electricity tariffs. The project will provide technical assistance to winning tender bidders who had initially been supported under Output 1.3 and making use of the results of Output 2.4 to implement business models wherein the low-carbon mingrid is embedded into downstream agricultural activities as shown in **Figure 3**. Solar PV minigrid developers will be linked with stakeholders in the agriculture value chain (e.g. farmers, post-harvest processing enterprises, agriculture produce distributors/logistics), and schemes designed for minigrid developers to lease energy efficient equipment to these stakeholders. It is pointed out that it has been harder than expected to get developers to adopt agriculture processing as part of their offering. This output will facilitate partnerships with agriculture companies. These organizations understand the agriculture value chains well, and they will be able to advise on locating minigrids to strategically energize agricultural processing. They could even contract minigrid companies to energize new operations for them. Other links could include partnering with dedicated off-takers for agricultural produce to ensure a more reliable revenue (i.e. Tier 3 activities). It is posited that knowledge emanating from these networks and partnerships can also be embedded in the digital tools (Output 2.3) and platform that will be proposed by the digital strategy developed under Outcome 3.

    - Act 1.4.1: Networking arrangements between minigrid developers and stakeholders in agriculture value chains. The project will provide technical assistance to link up winning bidders of solar PV minigrid developers from Output 1.4 with partners in the agricultural values chains (**Annex 13**). The partnerships will be facilitated in several ways, including: (i) linkages with agricultural value chain actors that have already been identified,[42] (ii) through the institutional arrangement that has been proposed for cross-sectoral stakeholder coordination to support the energization of the agriculture sector (Output 2.1); and (iii) existing grass-roots organizations such as Solar Sisters[43] that already carry the mandate to connect actors across value chains with focus on energy access (**Annex 13**).
    - Act 1.4.2: Equipment leasing scheme developed. As discussed in the ToC and shown in **Figure 3**, the commercial viability of low-carbon minigrids hinges strongly on solar PV installed capacity utilization. This is intrinsically tied with sufficient and predictable electricity demand from downstream agriculture value addition activities. As an integral part of the solar PV minigrid ecosystem, GEF investments under Output 1.1 will be invested to fund uptake of energy efficient equipment in agriculture value addition. This output will therefore design the equipment leasing scheme between minigrid developers/operators and operators in the downstream agricultural value chains. As far as the project is concerned, GEF investments in productive use equipment in agricultural value chains will be used to ensure capacity utilization of solar PV

[42] Scarlett Santana et al. (2020).
[43] Identified as an example in Scarlett Santana et al. (2020).

assets. Using the rationale captured in **Figure 3**, the productive use equipment will be owned by the minigrid developer/operator and leased to actors in the downstream agricultural value chains.

44. *Output 1.5: Capacity building provided to public officials (regulator, ministries) specifically to design procurement/tender processes that incorporate cost-reduction levers and innovative business models.* With REA's focus on accelerating the deployment of low-carbon minigrids to energize the agriculture sector, it will be important to provide capacity building of public officials to be able to develop Calls for Proposals accompanied by adequate tendering documents, and to adequately assess the commercial feasibility of bids received (through the online platform that will be developed under Output 2.1). Also, current minigrids and other off-grid technologies charge customers a premium compared to grid tariffs. These tariffs are acceptable under Nigeria's 'willing buyer willing seller' policy ethos, but result in poor and rural customers paying tariffs that are significantly more expensive than wealthy urban customers served by the grid. There is a need to determine a policy solution that, over time, can enable the cross-subsidization across customers to provide cost relief to lower income minigrid customers. It is pointed out that there is currently no subsidy provided to minigrid customers whereas the main grid is subsidized. Reaching subsidy parity for all Nigerian energy users regardless of where they get their electricity from would be a good achievement.
    - Act 1.5.1: Training provided on the business models underlying the agriculture-energy nexus: The project will provide tailored capacity building of stakeholders from public institutions that have a stake in the agriculture-energy nexus. Examples of the public officials who will be targeted are those depicted in the institutional arrangement proposed under Output 2.1, and will cover officials from the REA, REF, Federal Ministry of Power, Federal Ministry of Agriculture and Rural Development and agricultural extension institutions. The underlying logic of this intervention is that public officials who advocate for policy changes, propose policy instruments for derisking rural energy access and support local socioeconomic development through agricultural value chains need to first of all be conversant with the mutually reinforcing feedback that exist between solar PV minigrid development and improved value additions in agricultural chains, and the different business models (**Annex 13**) that can be used to overcome barriers to operationalizing the agriculture-energy nexus at scale. This training will support of the work that these actors will carry out under Output 2.1, and more broadly for articulating coherent cross-sectoral policies and policy instruments.
    - Act 1.5.2: Design of tender process for minigrid developers: Standardized bidding documents will be developed for the REA-REF that will then be used for Calls for Proposals (e.g. Output 1.1) with the emphasis of leveraging agricultural values chains for enhancing the commercial viability of solar PV minigrids. In parallel, the electrification of agricultural activities will enhance value addition of these activities (**Annex 13**). As mentioned under Activity 1.1.1, the GEF funding will also support electrification projects that are gender responsive. This activity will therefore develop a tender process together with the tender documents that will focus on the agriculture-energy nexus and gender-responsiveness by building on existing institutional capacity at REA-REF for managing Calls for Proposals. The tender process will be automated through the online platform that will be developed under Output 1.2.
    - Act. 1.5.3: Training provided to REA staff to assess bids: Since the focus on cost reduction levers shifts the focus from a standalone solar PV minigrid to one that is integrated in an agricultural value chain, the financial viability of investments must be broadened to also take into account value addition in the agricultural activities due to electrification. Hence, the assessment of bids must be re-envisioned within the agriculture-energy nexus, as well as giving more attention to gender mainstreaming in the electrification of agricultural activities.
    - Act. 1.5.4: Long-term analysis of power markets to improve equitable electricity access: The GEF AMP program can provide technical assistance to the Nigerian Electricity Regulatory Commission (NERC), the Federal Ministry of Power (FMP) and the Federal Ministry of Finance, Budget and National Planning (FMFBNP) to analyze the long-term growth of the off-grid sector alongside anticipated improvement to the on-grid sector, and determine potential scenarios for cross-subsidy across customer types to improve equity. While the timeframe for implementation would be determined through this assistance, in addition to improved equity between low-income and wealthy customers, future cross-subsidy and balanced tariffs would dramatically increase the number of commercially-viable minigrid communities across Nigeria, supporting economies of scale and other cost reduction levers.

45. *Output 1.6: Scaled up support for upstream equipment manufacturers and suppliers*. This output will first identify the equipment (systems and sub-systems of solar PV minigrids, and post-harvesting electrical equipment) that are used to electrify Tier 1 and Tier 2 agricultural value chains, and to propose which of them could be assembled or manufactured in Nigeria. Technical assistance will then be provided to formulate a roadmap for domesticating the assembly and/or manufacture equipment that are used in the agriculture-energy nexus.
    - Act. 1.6.1: Identify and prioritize electrical equipment in agriculture-energy value chains: This activity will first identify all electrical equipment, systems and sub-systems that are used in solar PV minigrids and in post-harvest agricultural activities. This will cover both Tier 1 and Tier 2 value chains, as well as equipment identified under Outputs 1.1 and 2.4. Thereafter, a process will be put in place using techniques such as multi-criteria analysis and logical problem analysis,[44] among others, to prioritize the identified equipment for feasibility of local assembly or manufacturing.
    - Act 1.6.2: Develop a roadmap for promoting local assembly and manufacturing of equipment. Technical assistance will be provided for developing a roadmap for the potential local assembly or manufacturing of prioritized equipment and technologies. The strategic orientation will be based on lessons learned from other countries in terms successful domestication processes and understanding the underlying reasons for failed interventions. This will squarely support the policy of government to increase the local content and local participation in the technology value chain from materials, manufacture, construction and operation.[45] This activity will identify which products can be assembled or produced locally. The roadmap will provide the strategic orientations for barriers removal for the domestication of local assembly or manufacturing of equipment, as well as the policy instruments (e.g. economic and financial incentives, intellectual property rights framework, technical capacity building) that will be needed to put in support technology transfer. Low hanging fruits will be pursued such as the assembly of standardized, modular customization units using high quality imported technology. This entry point will minimize issues related to quality assurance.

46. **Component 2: Scaled-up Financing.** In order to support the scaling up of low-carbon minigrids through appropriate business models that will be identified under Output 1, Component 2 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 and private financial actors, financing initiatives and future partners including the World Bank National Electrification Programme (NEP) and the GIZ-funded NESP II. The main focus of this component is to ensure that financing for private investors in the agriculture-energy value chains is catalyzed or scaled-up most efficiently and cost-effectively. The expected outcome from outputs proposed in Component 2 is *"Financing mechanism and accompanying financial instruments in place to incentivize investments in the development of low-carbon minigrids".* The following outputs, which will address Barrier #6, will contribute to that outcome:

    Output 2.1: Financial advisory committee established and operational
    Output 2.2: Innovative financing solutions for minigrid development are identified and implemented through the REF
    Output 2.3: General market intelligence study on minigrids prepared and disseminated amongst public officials and finance community
    Output 2.4: Feasibility study support provided to minigrid developers, creating a pipeline of investible assets
    Output 2.5: Capacity building provide to minigrid developers and investors on measuring and reporting on impact indicators, building credibility in impact investment as an asset class

47. This component will incorporate, collaborate with and build upon Government policies and existing or planned funding schemes, especially the REF that has the mandate and operational capacity to launch Calls for Proposals to catalyze investments in off-grid energy access using decentralized solar technologies using a combination of capital grants, and debt and equity financing. **Annex 13** and **Annex 17** have identified a list of financial derisking instruments for supporting appropriate business models for overcoming barriers to the electrification of agricultural value chains using solar PV minigrids at scale.

[44] Criteria and indicators will be identified for prioritizing equipment identified by stakeholders in Technical Work Group (TWG) that will be put in place for implementing the project activities (see Section VII).
[45] RESIP (2016), pg.20.

48. *Output 2.1: Financial advisory committee established and operational*. The minigrids market is characterized by its fast evolving dynamics in terms of business delivery models and financing schemes. In light of a fast changing landscape, the REA has to play two vital roles, namely: (i) carrying out advocacy (towards external stakeholders), and (ii) providing innovative financing through the REF to support acceleration in scaling up low-carbon minigrids. A Financial Advisory Committee (FAC) comprised of stakeholders from the public and private sectors, including policy-makers, regulators, entrepreneurs (women-differentiated), financial institutions, and representatives of community support groups, among others will be established to advise the REA on these two roles. The stakeholders will be convened across the agriculture and energy sectors to coordinate, guide, and promote near-term activities required to achieve long-term commercial viability.

    - Act. 2.1.1: Terms of Reference for FAC: This activity will develop the ToR to establish the mandate, roles, responsibilities, composition and organizational structure of the FAC. An indicative organizational structure is shown in **Figure 6**, and it will be finalized during project implementation. The FAC is proposed to be presided and co-chaired by a high level representative from the REA and Federal Ministry of Agriculture and Rural Development (FMARD), respectively. The two positions can be alternated by the two institutions by mutual agreement. The working group will be comprised of three line ministries, including the FMARDP, the Federal Ministry of Power (FMP), and the Federal Ministry of Finance, Budget and National Planning (FMFBNP). The FMARD will also involve agricultural extension institutions where applicable. The FAC will also be comprised of representatives from renewable energy and minigrid associations (that will be supported under Output 3.6), financial institutions and the Central Bank of Nigeria (CBN). Representatives from other institutions can be co-opted on a needs basis and as determined by the committee.

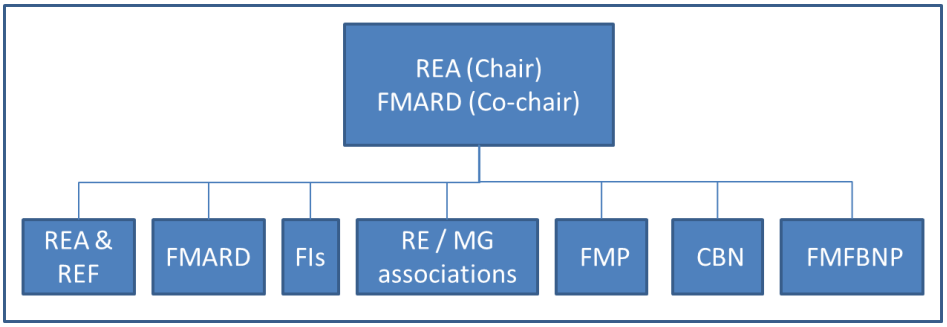


Figure 6. Proposed organizational structure for the FAC.

- Act. 2.1.2: FAC established and operational: The structure proposed in **Figure 6** will be operationalized according to the ToR that will be developed under Activity 2.1.1. The GEF project will support the institutionalization of the governance structure by ensuring that the FAC would meet regularly during the project lifetime, and by ensuring that the outcomes of its deliberations are used as inputs to Output 2.2. It is expected that by demonstrating the effectiveness of the FAC during the GEF project lifetime will increase its post-project sustainability.

49. *Output 2.2: Innovative financing solutions for minigrid development are identified and implemented through the REF*. Based on the recommendations of the Financial Advisory Committee (FAC), the GEF-financed project will facilitate and support the design of financing products for derisking investments in solar PV minigrids and agricultural value chains, ultimately promoting a vibrant commercially-viable market low-carbon minigrids. It is pointed out that the rural agriculture-energy value chains are multi-tiered and that different financial schemes may be required to service the different segments as given in **Annex 13** and **Annex 17**. (e.g. senior and subordinated debt, partial credit guarantees, public loans, public equity, insurance, grants). The financial viability of minigrids is exposed to climate risks in agricultural value chains (**Annex 7**). Importantly, financial derisking instruments can be tailored to mitigate the negative impacts of current and future climate change on agricultural production, and to climate-proof the financial viability of solar PV minigrids.

    - Act 2.2.1: Investigating the cost-effectiveness of alternative financing schemes: A preliminary derisking renewable energy investment (DREI) study has been conducted during PPG stage for minigrids, and the results are shown in **Annex 17**. Also, financial instruments have been identified in **Annex 13** to support the

business models for scaling up the electrification of agricultural activities. Activity 2.2.1 will build on the results in **Annex 13** and **Annex 17** to: (i) carry out capacity building of selected REF staff in the use of the derisking approach; and (ii) carry out modelling on the cost-effectiveness of alternative financing schemes, including instruments to climate-proof the financial viability of minigrids against climate impacts in agricultural value chains. The derisking analyses at mid-term and end-of-project (Activity 3.5.1) will be used to ensure that changes in private investors' risk profile is adequately monitored, and that the most appropriate financing schemes are developed with changing risk profile and agriculture-energy market dynamics.

- Act 2.2.2: Designing and piloting financial schemes. In order to achieve the objectives set by the Federal Government of Nigeria (FGN) to increase clean energy access as a means of alleviating poverty, a suite of financial schemes will be required to serve different segments of the rural and (peri) urban energy markets. Different financial schemes are also required to allow the participation of non-traditional operators, including community-based organisations, cooperatives, female entrepreneurs and small and medium enterprises in the energy market.[46] Once the most effective mix of financial instruments has been identified (Act. 2.1.1), financial schemes will be developed and piloted under the REF and/or in collaboration with other Financial Institutions (FIs). No GEF funding will be used to fund the financial schemes. Rather the GEF grants will be used to attract private and public sector funding in both foreign and local currencies.[47]

50. *Output 2.3: General market intelligence study on minigrids prepared and disseminated amongst public officials and finance community*. In order to support the generation of market intelligence regarding the geolocation of feasible markets related to the agriculture-energy nexus, the project will develop a GIS platform containing multiple layers of data such as suitability of solar PV minigrids, location of Tier1, Tier 2 and Tier 3 agricultural value chains, infrastructure for access to market, types of agricultural crops produced in different agro ecological zones, and impacts of climate changes on agricultural productivity, among others. Site specific market intelligence will then be developed to generate a pipeline of investible assets. Since climate change is known to have detrimental impacts on agricultural production (Risk Register in **Annex 7**), the commercial viability of solar PV minigrids is exposed to climate risks in the energy-agriculture nexus. It is, therefore, imperative for site specific market intelligence to also cover the potential impacts of current and future climate changes on agricultural productivity. Hence, market intelligence will capture the credit worthiness of agricultural end-users while taking into account the potential impacts of climate change. This opportunity will also be availed for carrying out sensitization and capacity building of farmers on the socioeconomic and environmental benefits of electrification of agricultural value chains using renewable electricity from solar PV-battery minigrids. As far as practicable, the empirical results generated from the pilots developed under Output 1.1 will be used as evidence for these benefits.

    - Act. 2.3.1: GIS-based modelling of agricultural value chains for stimulating the development of low-carbon minigrids. This activity will draw from knowledge and knowledge products that already exist. For instance, the project can make use of exist databases such as the SPAM dataset on agricultural land use,[48] and/or customizing a GIS-based database using Village Data Analytics that integrates some of the above-mentioned factors into minigrid viability modelling.[49] This activity will seek guidance and draw on lessons learned from the recent work by Power for All to develop a geospatial tool to map and size the market potential for energy access interventions for agricultural value chains in Uganda.[50]

    - Act. 2.3.2: Developing country-wide market intelligence for Tier 1 and Tier 2 agricultural activities. Using the GIS database from Activity 2.3.1, the project will generate market intelligence for Tier 1 and Tier 2

[46] RESIP (2016), pg.16.

[47] Local currency loans can be provided to agriculture-based productive users directly to finance their equipment. With a suitable QAF (Output 3.6) the energy purchases made by the productive user from the minigrid could be partially and continuously used to pay back the loan. With the data framework in place this could be an entirely transparent, low-risk transaction.

[48] https://datacatalog.worldbank.org/dataset/world-external-geospatial-platforms-food-agriculture/resource/fe913515-2fd1-4b66-9bac – accessed 25 January 2021.

[49] www.villagedata.io – accessed 25 January 2021.

[50] Power for All. *Powering Agriculture: Campaign Update*. Presentation made on November 25 2020.

agricultural value chains. Market intelligence will also incorporate an assessment of the risk posed by the impacts of climate change on the income and livelihoods and agriculture value chains in rural communities.

51. *Output 2.4: Feasibility study support provided to minigrid developers, creating a pipeline of investible assets*. While general market intelligence generated under Output 2.3 provides initial insight to identifying suitable locations for energizing agricultural value chains using solar PV minigrids, additional site-specific information and studies are warranted. For instance, the economic feasibility of integrating solar PV minigrids into agricultural value chains will depend on issues such as seasonality[51] and time of use of productive post-harvest equipment. Regarding the latter, displacing night time use of certain post-harvest activities using appropriate time-of-use electricity tariffs will require behavioural change on the part of the farmer or processor. Such information will not be captured in the initial GIS database. Two activities are proposed for creating a pipeline of investible solar PV minigrid assets.

    - Act. 2.4.1: Site-specific data collection: The most promising sites for embedding solar PV minigrids into agricultural values chains (Tier 1 and Tier 2 activities) will be identified using the results of Output 2.3. The project will then provide technical support to minigrid developers that will be identified through a Call for Expression of Interest to collect location-specific data such as those discussed earlier. The Expression of Interest will be open to both minigrid developers that are already operating solar PV minigrids but under the needed capacity, and minigrid developers that want to venture into previously unserved rural communities. The ground-truthed data will be used to enhance the GIS database developed under Output 2.3.
    - Act. 2.4.2: Develop feasibility studies using site-specific data collection: Using the data collected under Activity 2.4.1, and data generated by pilots under Activity 1.1.1, the selected minigrid developers will be provided with technical assistance to develop feasibility studies in order to develop a bankable pipeline of investible assets.

52. *Output 2.5: Capacity building provided to minigrid developers and investors on measuring and reporting on impact indicators, building credibility in impact investment as an asset class*. Local commercial banks in Nigeria are interested in the prospect of investing in low-carbon minigrid projects, but they lack the tools and experience to effectively evaluate proposed projects. As a result, they view the combination of relatively high loan requirements and limited technical and organizational assessments to be high risk, and either decline to issue debt to these projects or offer it at exceptionally high interest rates at short tenors. Also, developers do not have tools to demonstrate the developmental impacts of investments in low-carbon minigrids within the overall architecture of value addition in commercial chains to investors. Likewise, investors do not use impact indicators to showcase the developmental benefits of their investments in the agriculture-energy value chain.

    - Act. 2.5.1: Capacity building of financial institutions to invest in low-carbon minigrids for productive energy uses: Provide TA to build capacity and facilitate knowledge exchange for the domestic financial industry on providing long-term, end-customer financing for investors in the low-carbon minigrids that are embedded in commercial value chains. Provide TA for educating the banking sector about the peculiarities of novel business models and projects, their risk-return profiles, and support the design of, and training in, specific due diligence tools. This assistance will support local commercial banks to develop internal processes for minigrid project evaluation. Using international best practices and project-supported examples (e.g. UNDP's derisking approach under Act 3.5.1 and Output 1.1), support will be provided to the Government and partnering 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 (Output 2.2). This support can include topics such as minigrid cost and load benchmarking data, best practice design checklists, long-term project sustainability strategies and impacts (Act. 2.5.2), and pro forma analysis tools (that will be made available by the Regional AMP project). Further,

[51] Some agricultural processing activities can be highly seasonal and post-harvest activity level might vary depending on harvest. For example, if rice millers are only active for eight months of the year, because of the similar cost of maintaining the mini-grid system while revenue is decreased, tariff reduction would only be 7% instead of 12% compared to the BASE scenario (Annex 13). If seasonal productive loads are to be served by mini-grid, the seasonality should be more carefully calibrated when optimizing the system design.

the enhanced financial reporting of minigrid developers that will be supported under Activity 1.3.2 will be useful for investors to better understand the commercial viability of investments.

- Act. 2.5.2: Capacity building on operationalizing the indicator framework developed under Output 3.7: This activity will target minigrid developers, investors and downstream operators in the agriculture value chains, and it will be composed of two elements, namely: (i) training on the architecture of the augmented Quality Assurance Framework (QAF) for minigrids integrating SDG impacts and MRV mechanism for GHG accounting that will be adopted under Output 3.7; and (ii) operationalizing the use of the augmented QAF by applying the indicator framework on the minigrid pilots that support productive energy uses in agriculture that will be implemented under Output 1.1. Stakeholders will also be provided with a template for reporting the sustainable development impacts of investments around the agriculture-energy nexus.

53. **Component 3: Digital, Knowledge management, monitoring and evaluation, and scale-up strategy**. The third component addresses outreach, and capturing and dissemination of results for scaling up solar PV minigrids. It also seeks to ensure adequate monitoring and evaluation (M&E) of the project. Emphasis is placed on the use of digital technology and platform as an enabler of learning on all aspects of minigrid delivery model and business model, which in turn squarely support knowledge management and approaches for scaling up solar PV minigrids based on cost reduction levers. One distinctive opportunity for knowledge management is the interplay between the AMP Regional Project and the Nigeria child project. Details on linkages to the regional project as relevant for digital, knowledge management and monitoring and evaluation activities under the project are described in Box 2 below.

Box 2: Linkages to the AMP Regional Project – Component 3

The project will receive support and guidance from, as well as participate in activities led by the AMP Regional Project in the following key areas of interface between the AMP regional project and the AMP national projects:

- **Digital.**
    a. **Knowledge building/sharing.** The regional project will build and share knowledge with the project on the potential for use of digital tools and solutions, including leveraging minigrid projects' data to improve the commercial viability of renewable energy minigrids.
    b. **Data aggregation platform.** The AMP Regional Project will make a data management platform available to aggregate data from all national project pilots based on a common M&E framework to track Results Framework indicators as well as program objectives, SDG impacts and GHG emission reductions for all child projects.
- **Knowledge Management**.
    a. **Information sharing**. The AMP regional project will support and facilitate knowledge management and information sharing between the regional child project and national child projects, among national child projects, and between the program and the larger minigrid community.
    b. **Insight Briefs.** National projects will gather data and audio-visual content (video footage, photos, etc.) highlighting national project activities which will be the subject of an 'insight brief' to be developed by the AMP Regional Project. The 'insight brief' will be disseminated by the regional project to regional stakeholders and published on the AMP website.
    c. **Communities of Practice**. One of the primary ways national project staff will interface with the regional project is via the 'Communities of Practice' (CoPs) and associated activities/platforms. While it is expected that many of the activities will be undertaken virtually (via internet-based platforms, webinars or digital platforms) it is also expected that the CoPs will include actual in-person workshops, meetings or training events that project staff will participate on.
- **Monitoring and Evaluation (M&E).**
    a. **Common M&E Framework.** The AMP Regional Project will develop, with inputs from national projects, a common M&E framework with SMART indicators to ensure that the program is able to track progress toward its overarching objective. This common M&E framework will include both the Results Framework indicators as well as additional Key Performance Indicators (KPIs) which will be adopted by the national projects to track progress toward project and program objectives (i.e. minigrid cost-reduction). The project will thereafter provide on an annual basis (and to the extent feasible if requested on an ad-hoc basis) the following M&E information to the AMP regional project staff: (a) Standard reporting on all indicators in the results framework; and (b) Reporting on all additional Key Performance Indicators (KPIs) adopted by the project under the common M&E framework.
    b. **Operational support for national project M&E activities.** The AMP Regional Project will provide support to the project, through its PMU staff or by hiring or recommending subject matter experts, for the project to execute M&E activities such as the inception workshop, ongoing monitoring, and project evaluations. Further details provided in Section VI. MONITORING AND EVALUATION (M&E) PLAN.

54. The results of Component 3 in the Nigeria project will feed the AMP Regional Project for onward sharing with other participating countries. There will also be opportunities for these results to be shared directly with other countries through corresponding knowledge management activities built into each child project. This will serve better integration between national projects. Integration will also be enhanced through the programmatic approach proposed for national project design around three core thematic areas mentioned above. Given that Nigeria has more experience in creating the enabling environment for promoting solar PV minigrids using a private sector delivery model based on minimum public subsidies, lessons learned will be captured early in project implementation for onward sharing with the regional project for developing knowledge products that will be useful to other participating countries. Knowledge management will also capture lessons learned (Output 3.4) from the co-implementation of SHS and solar-PV battery minigrids in the same geographical areas to serve different market segments (paragraph 40). Beyond this, there are several other areas of alignment between the two UNDP-GEF projects lessons, namely: (i) formulation of replication plan for scaling up rural electricity access using technology mix (Activity 3.5.2); (ii) support to

technology providers and renewable energy associations (Output 3.6); (iii) harmonized Quality Assurance Framework (Output 3.7); and (iv) complementarity between DREI analyses (Output 3.5).

55. This component is aligned with the Monitoring and Evaluation Plan given in Section VI of the ProDoc. The expected outcome is "*Increased awareness and network opportunities in the minigrid market and among stakeholders, and lessons learned for scaling up rural electrification using low-carbon minigrids*". The following outputs will be implemented:
    Output 3.1: Inception workshop
    Output 3.2: Project monitoring
    Output 3.3: Project evaluations
    Output 3.4: Lessons learned captured and disseminated at the national level
    Output 3.5: Replication plan (including investment plan) for scaling up rural energy access developed
    Output 3.6: Renewable Energy and minigrid Development Associations supported and strengthened to promote minigrid development
    Output 3.7: Project Digital Strategy developed/implemented and Quality Assurance Framework augmented and independent verification process in place for measuring, reporting and verification of the sustainable develop impacts of minigrids, including GHG emission reductions
56. *Output 3.1: Inception workshop*. An inception workshop will be planned within 60 days of project CEO endorsement.

    - Act. 3.1.1. Planning and carrying out national inception workshop: The national inception workshop will be carried in Abuja at the beginning of project implementation in order to achieve the goals described at paragraph 77. The workshop will be organised by the PMU with support from REA.

57. *Output 3.2: Project monitoring*. Adaptive management is a prerequisite for successful project implementation. This is turn requires effective monitoring of the project.

    - Act. 3.2.1. Monitoring of results framework and GEF core indicators: The GEF Core indicators included at Annex 15 will be used to monitor global environmental benefits and will be updated for reporting to the GEF prior to MTR and TE. Also, the indicators found in the Results Framework will be monitored as per the Monitoring Plan given in **Annex 5**. The GEF core indicators will be monitored as per guidance given at paragraph 79.

    - Act. 3.2.2. Monitoring of project plans: The UNDP-GEF project is accompanied by various plans including Stakeholder Engagement Plan (**Annex 9**), mitigation plan for project risks (Risk Register in **Annex 7**), and Gender Action Plan (**Annex 11**). These plans will be reviewed according to the monitoring and evaluation requirements at paragraph 68. This activity also covers the contribution of the PM to organise PB (PSC) meetings.

    - Act. 3.2.3. Monitoring of social and environmental safeguards: The UNDP-GEF project is rated as a 'moderate' risk project. Consequently, there is a need to carry out continuous monitoring of the social and environmental safeguards as proposed in the ESMF (**Annex 10**). The ESMP that will emanate from the ESMF will also be monitored under this activity.

58. *Output 3.3: Project evaluations*. As per standard UNDP-GEF procedures, independent evaluations will be carried out at the mid-term and at the end of the project. The financials of the project will also be verified by an independent accredited auditor on an annual basis.

    - Act. 3.3.1. Mid-term review: An independent mid-term review (MTR) will take place at the half-way mark of project implementation according to paragraphs 80 to 83.

    - Act. 3.3.2. Terminal evaluation: An independent terminal evaluation (TE) will take place upon completion of all major project outputs and activities according to paragraphs 84 to 87.

    - Act. 3.3.3. Independent financial audits: As per standard procedures, the financials of the project will be verified by an accredited auditor every year.

59. *Output 3.4: Lessons learned captured and disseminated at the national level*. The project will prepare a lessons learned report based on the experience gained. The lessons learned from the two sets of pilots (Output 1.1) will be used to refine and implement the deployment strategy, formalizing the structures needed to finance and support wide scale equipment rollout for Tier 1 activities in mini-grid projects, as well as to address the barriers faced in the implementation of Tier 2 activities. The report will be shared with relevant ministries and provincial authorities, and a workshop will be organised to discuss key findings and recommendations to inform the subsequent deployment of solar PV minigrids based on cost reduction levers coupled with productive energy uses by integrating solar PV minigrids in agriculture value chains. A project website will also be developed for project visibility and knowledge sharing.
    - Act. 3.4.1: Project website developed and maintained: A project website will be designed, implemented and maintained for increasing the visibility of the project as well as for knowledge and data sharing.
    - Act. 3.4.2: Carry out lessons learned investigations. There are two aspects to this activity. First, as part of the adaptive management approach, lessons learned through project activities will be captured on an annual basis, and the results will be used to inform adjustments in annual project work plans. The results will also be shared with the regional project and other child projects. Second, being ahead of the learning curve, Nigeria already has successful stories to share with other child projects, some of which are carrying out solar PV minigrids as a first-of-its-kind for increasing energy access. Hence, Nigeria is well poised to share its experiences on (i) enabling framework (i.e. policy, strategy and regulation); (ii) institutional arrangements such as the setting up and operationalization of the Rural Electrification Agency and the Rural Electrification Fund; (iii) minigrid delivery models (e.g. private sector owned and operated assets, split-asset model, fully grant funded minigrids operated by NGO, and different types of subsidy schemes); (iv) adoption of digital technology / platform (e.g. Odyssey, GIS modelling to identify minigrid sites); and (v) minigrid performance monitoring system, among others. These experiences and lessons learned will be captured within the first six months of project implementation for sharing with the regional project for packaging into knowledge products. Third, Nigeria is in the unique position among all AMP participating countries to implement two off-grid electrification projects (PIMS 5691 and PIMS 6339) concurrently. Hence, lessons learned will also be captured on the co-implementation of SHS and solar battery-PV minigrids in the same geographical locations to provide energy access to different markets (energy needs and capacity to pay).
    - Act 3.4.3: Publish and disseminate results of lessons learned to all stakeholders. The lessons learned reports will be published and disseminated to all project stakeholders and made available to a broad public inside and outside Nigeria through a dedicated project website (Act. 3.4.1) that will be developed under this activity. In-country workshops are also planned to share the lessons learned. Compulsory M&E activities like the mid-term review and terminal evaluation will also form part of this activity.

60. *Output 3.5: Replication plan (including investment plan) for scaling up rural energy access developed*. In order to support scaling up of low-carbon minigrids in Nigeria, a replication plan will be developed based on two main activities, namely the application of UNDP's derisking approach to mini-grids, and the development of a replication plan from lessons learned (Output 3.4).

    - Act 3.5.1: Carry out DREI analyses for mini-grids. The DREI analyses that were carried during project design (Annex 17) will be reproduced at mid-term and at the end of the project in order to track the evolution of investors' risk environment over the project duration. The results will contribute towards developing a replication plan for scaling up solar PV minigrids in Nigeria.

    - Act 3.5.2: Develop a replication plan. Using the results of Output 3.3 and Act 3.5.1, a replication plan will be developed for scaling up the sustainable diffusion of solar PV minigrids, including elements of enhanced local assembly and manufacturing of technologies in Nigeria (Output 1.6). The replication plan will take note of all the risks that have been identified in the SESP (**Annex 6**) and address then adequately following the guidance given in the ESMF (**Annex 10**). In particular, attention will be given to the risks of job losses in baseline activities (e.g. diesel generator business and manual labour in agricultural activities) arising from the scaling up of solar PV-battery minigrids in agricultural value chains. The replication plan will also benefit from the lessons learned from the deployment of complementary off-grid renewable energy technologies – i.e. SHS and solar PV-battery minigrids – in the same geographical locations for servicing different energy market segments.

61. *Output 3.6: Renewable Energy and minigrid Development Associations supported and strengthened to promote minigrid development*. The project will strength the capacity of existing renewable energy and minigrid development associations (e.g. Nigeria Chapter of the African Minigrid Developers Association) to enhance their advocacy activities for promoting renewables minigrids in Nigeria. A national network will be supported so that industry associations and practitioners can better interface with public institutions, such as the Federal Ministry of Power, REA and NERC. Members of the network will be supported financially to participate in the activities and events of the AMP Regional Project Community of Practice and its technical cohorts.

    - Act 3.6.1: Outreach capacity of associations strengthened for promoting renewables minigrids: The project will provide technical support in the form of trainings and networking opportunities for the Renewable Energy Association and Nigeria Chapter AMDA to enhance their respective capacities for promoting renewables minigrids. The technical assistance will comprise supporting the formulation of a strategic plan for the associations in order to formalise their operation, and to enhance their networking, public outreach and advocacy activities.
    - Act 3.6.2: Supporting the setting up of a national coordination platform for stakeholders in the renewables minigrids value chains: To foster knowledge network, the UNDP-GEF project will support the establishment of a knowledge sharing and coordination platform for dialogues between industry associations, minigrids developers, financial institutions and public policy decision-makers. This knowledge network is expected to: (i) share the concerns and difficulties that renewables minigrids developers face in promoting low-carbon minigrids; and (ii) provide a conduit for the identification and prioritization of public policies and accompanying policy instruments to derisk private sector investments in Nigeria. The latter can be informed using the results of DREI analyses (**Annex 17** and Act. 3.2.1). Where needed, the technical assistance of the Regional Project will be sought to facilitate convening sessions of the knowledge network.[52]
    - Act 3.6.3: Support provided to local stakeholders to participate in the AMP Regional Project CoP. Based on the guidance received from the AMP Regional Project (e.g. profile of participants, number of participants, type and frequency of peer-to-peer exchange) local stakeholders will be selected to participate in the Regional Project CoP and its technical cohorts. One of the primary ways national project staff will interface with the regional project is via the 'Communities of Practice' (CoPs) and associated activities/platforms. While it is expected that many of the activities under Component 3 will be undertaken virtually (via internet-based platforms, webinars or platforms) it is also expected that the CoPs will include actual in-person workshops, meetings or training events.

62. *Output 3.7: Project Digital Strategy developed, and Quality Assurance Framework augmented and independent verification process in place for measuring, reporting and verification of the sustainable develop impacts of minigrids, including GHG emission reductions*. The REA already uses a minigrid dashboard that is operated by the FMP. However, the existing dashboard is not as comprehensive as the Quality Assurance Framework (QAF) for minigrids that defines (i) the levels of service framework, and (ii) an accountability and performance reporting framework.[53] REA will be provided with technical assistance to adopt the QAF will additional features such as a MRV system for tracking greenhouse gas (GHG) emissions reductions resulting from the deployment of low-carbon minigrids, and a framework for measuring the impacts of investments in renewables minigrids on the SDGs. The adoption of the augmented QAF will be supported by technical assistance from the AMP Regional Project (See Box 2).[54]
    - Act 3.7.1: Adoption and institutionalization of a common monitoring and indicator framework. Since the overarching objective of the project is the reduction of GHG emissions, while also delivering sustainable development benefits to local communities, the project will adopt and operationalize standardized systems to measure and report on their sustainable development impacts as determined under Outcome 1 of the AMP Regional Project. The framework will be accompanied by robust data management systems to ensure the quality assurance and quality control of data generated at the national level, and which will be reported

[52] This is expected to take place under Output 3.3 of the AMP Regional Project.
[53] Ian Baring-Gould et al. 2016. Quality Assurance Framework for Mini-Grids. NREL, CO.
[54] This will take place under Outcome 1 of the AMP Regional Project.

to the Regional Project. The monitoring and indicator framework will form an integral part of the M&E of GHG emission reductions targets given in the Results Framework (Section V).

- Act. 3.7.2: Establishing an independent verification process. In order to ensure the robustness of the augmented QAF and to ensure that data collected are accurate, the project will support the REA to implement a verification process based on independent third party auditing.
- Act. 3.7.3: Develop and implement a project Digital Strategy. As mentioned above, digitalization is a cornerstone approach supported by the AMP in order to support both the minigrid delivery model and the business model centered on cost reduction levers. A Digital Strategy will be developed to guide this digitalization approach from three perspectives: (i) to support the collection of data for the real-time monitoring of minigrid performance that will be carried out under Output 1.1; (ii) to propose the best approach for the digitalization of the REF Calls for Proposals that will be carried out under Output 1.2; and (iii) to provide a digital platform for integrating various forms of digital data that will be generated by the project such as GIS information (Output 2.3), market intelligence (Output 2.4), and the common monitoring and indicator framework (Output 3.7). Related to (ii), and complementary to information given in paragraph 37, the Digital Strategy will support a diagnostic of the pros and cons of available digital platforms, and support the business case for migrating the REF Calls for Proposals to a fully digital form, albeit in line with the BPP. The Digital Strategy will also ensure that appropriate stakeholder engagement process is used in deciding on technological choice, together with a digitalization capacity building plan. The Digital Strategy will be updated on an annual basis to reflect learnings from project implementation, integrate contributions from the AMP Regional Project on digital tools and solutions, and insights gained from minigrid pilot(s) data. Upon implementation of the Project Digital Strategy the project will develop, and share with key national stakeholders, a set of evidence-based recommendations to feed into Nigeria's ongoing process of rolling out digital solutions for minigrid development at the national level.
- Act. 3.7.4: A minigrids digital platform will be used to collect data from minigrid pilots which will be shared with the AMP Regional Project for aggregation into a program-wide dashboard. This platform may, as defined in the project Digital Strategy (Activity 3.7.3), also serve to integrate various other forms of digital data that will be generated by the project.

63. Global Environmental Benefits: The project will reduce GHG emissions through the substitution of diesel-based electricity generation with solar PV electricity, which will directly support implementation of the Nationally Determined Contribution (NDC).[55] It is expected that GHGs will be avoided as from the second year of project implementation. At the end of the 4-year project, the cumulative avoided emissions will be about 8.3 ktCO2e. The GHG emission reduction calculations, including the methodologies used, are found in **Annex 13**. Modelling over a 20-year economic life gives a total reduction of direct GHG emissions of 74.2 ktCO2e. The direct GHG emission reductions give a carbon abatement cost of 89.4 US$/tCO2e. When the indirect emission reductions are accounted for (see below), the carbon abatement cost reduces to 1.4 US$/tCO2e. It is pointed out here that only GEF investments have been used for estimating direct GHG emission reductions. The minimum concessionality principle to achieve LCOE parity with a diesel baseline has been used by drawing from the LCOE modeling given in **Annex 17**. The minimum concessionality given in paragraph 38 (and **Annex 13**) and GEF investments can support a total of 25 solar PV-battery minigrids of capacity 120.9 kW. As mentioned in paragraph 38, a Minigrid Pilot Plan will be validated at implementation start, and the lowest level of concessionality needed to achieve the LCOE-parity principle will be tailored to the site-specific diesel baseline and system sizing. Hence, the total direct GHG emission reductions will be adjusted accordingly during annual reviews of GEF Core Indicators.

[55] The NDC of Nigeria that was submitted in 2017 to the UNFCCC Secretariat (*NDC Registry; https://www4.unfccc.int/sites/NDCStaging/Pages/All.aspx*). Under a business-as-usual growth scenario, consistent with strong economic growth of 5% per year, Nigeria's emissions are expected to grow to around 900 million tonnes per year in 2030, which translates to around 3.4 tonnes per person. The key measures below could potentially reduce emissions by around 45**%** compared to business-as-usual – i.e. per capita emission of around 2 tonnes per person in 2030. Regarding its unconditional mitigation contribution, Nigeria has pledged to work towards Off-grid solar PV of 13GW (13,000MW) [i.e. 31 MtCO2e emission reductions per year in 2030].

64. Indirect emissions: Both bottom-up and top-down approaches were used to estimate indirect GHG emission reductions. Given the innovative approach of the Nigeria child project to leverage cost reduction levers to propose commercially-viable solar PV-battery minigrids, a high replication factor of 8 to direct emission reductions has been applied to estimate the bottom-up indirect emission reductions at around 481 ktCO2e. For estimating the top-dowm indirect GHG emission reduction, the post-project market potential to 2030 has been utilized. For this, the 2030 target of 3.25 GW of solar PV installed in the form of minigrids as indicated in REA's Rural Electrification Plan (**Annex 13**). This is the target that has been modelled using the DREI methodology in **Annex 17** to the project document to yield a total of 77.24 MtCO2e of emission reductions for solar PV minigrids. A time adjustment factor of 0.6 has been applied to get a post-project market potential of 46.34 MtCO2e. Taking the level of co-financing and the Theory of Change centred on cost-reduction levers, a causality factor of 10% has been attributed to GEF financing. Given that Nigeria is considered to be among the most advanced country in Sub-Saharan Africa and in the AMP regarding minigrid development, it is argued that the top-down approach provides a more adequate estimate of indirect emission reductions than the bottom-up approach. This is the reason why only the top-down value is reported for Indicator 6 in **Annex 15**. The top-down indirect GHG emission reduction is estimated at about 4,171 ktCO2e. At the AMP regional project, 10% of the indirect GHG impacts calculated at the Nigeria project level are allocated to the regional child project, in line with the apportioning of the overall program budget. This reflects the benefits of national projects accessing the regional project's support. To avoid double counting, this 10% is removed from the indirect totals for the Nigeria project.

65. Partnerships: For the project to achieve its objectives, a number of project partners have been identified using the multi-stakeholder approach described in the previous section. Since the project operates at several geographical and political levels (e.g. different States with autonomous local governance, national institutions, local households etc..) the importance of an inclusive approach to cater for the interests of key project partners cannot be overstated. Another important point to note is the cultural diversity that exists across the different States. This issue is more pronounced regarding gender-inclusivity as is discussed below. The project will be implemented in a context where there are parallel initiatives with which synergies should be formed to provide maximum benefits to the beneficiaries. The parallel and complementary initiatives are described in Annex 13 (Part A), and are reflected in the letters of co-financing that are given in **Annex 14**.

    As further described in Table 3 below, these co-financed activities correspond to funds not flowing through UNDP accounts and whose results are not included in the project results framework. In this case, UNDP is accountable to monitor the risk to realization of co-financing amounts and realization amounts annually in the GEF PIR, at mid-term and at terminal evaluation. Specifically, potential risks associated with co-financing that may affect the project, including safeguards related risks that fall within the project context or area of influence, will be considered in safeguards due diligence and the project risk register and monitored accordingly. Risk management measures identified will be only those within the control of the UNDP project (e.g. managing reputational risk). See the ESMF (Annex 10) for more details on the management of risks related to the different types of co-financed activities in this project.

Table 3: List of co-financed activities not included as project results

Co-financing source	Co-financing type	Co-financing amount (USD)	Included in project results?	If yes, list the relevant outputs
Government/REA	Grant	10,000,000	No	N/A
Government/REA	In-Kind	625,000	No	N/A
Donor Agency/African Development Bank	Grant	125,000	No	N/A
Donor Agency/African Development Bank	Loan	64,285,714	No	N/A
TOTAL		**75,035,714**		

66. Risks*:* The risks faced by the project and the countermeasures that have been proposed to reduce or eliminate them are detailed in **Annex 7**. The risks include those emanating from the SESP shown in **Annex 6** as well as risks related to COVID-19. Nevertheless, COVID-19 also offers opportunities for resilient local socioeconomic development. The project has been rated as being a 'substantial' risk project, and **Table 4** summarizes only the moderate, substantial and high risks. As per standard UNDP requirements, these risks will be monitored quarterly by the Project Manager. The Project Manager will report on the status of the risks to the UNDP Country Office, which will record progress in the UNDP ATLAS risk register. Management responses to critical risks will also be reported to the GEF in the annual PIR. Implementation Partner risks identified through HACT and PCAT are also covered.

67. COVID-19 risks and mitigation measures: COVID-19 poses a risk to project implementation both as a national and operational risk. The national level COVID-19 situation is given in paragraph 3. The pandemic is a national issue arising from a sanitary and health crisis that has negative socio-economic impacts. This translates into an operational risk for the project. The COVID-19 Pandemic may slow down project implementation. As discussed in paragraph 3, the response to COVID-19 in Nigeria has been strong with mortality rates falling below the world average. However, the pandemic is still evolving, and it poses a tangible threat to the continued constrained mobility of persons that can slow down project implementation. As summarized in Table 4 below, there is scientific evidence that the impacts of COVID-19 is less in rural areas where the Nigeria child projet will implement pilot activities. Nevertheless, several technical assistance activities will take place in urban areas. There is also a higher risk of transmission between urban and rural areas arising from internal movement of people. In order to mitigate these COVID-19 risks, the project design has incorporated a number of mitigation measures as summarized in Table 4.

68. Post-COVID economic recovery (opportunity): An important contribution of the child project is boosting local socio-economic development that will support Nigeria's recovery from the COVID-19 pandemic in several ways, including: (i) jobs will be created in the energy-agriculture value chains (Core Indicator 4 in the Results Framework) that will generate disposable income at the local level (Output 1.1). This will have direct and indirect effects on increased expenditures on food, education and health (hygiene and sanitary measures); (ii) primary health clinics (among other public infrastructures like schools and religious centers) will be electrified (Core Indicator 2 in Results Framework) that will ensure better access to health care and also increased capacity for the storage of vaccines (Output 1.1); and (iii) the main economic activity in rural areas in Nigeria is agriculture, and by supporting the energy-agriculture nexus, the project will squarely create more value added in this sector that will have both direct and indirect benefits that will be captured using the digitally-enabled common monitoring and indicator framework that the project will establish (Output 3.7). There is also strong gender responsiveness to the COVID-19 situation. The COVID-19 pandemic is a national risk that cascades into project operational risk as captured in the Risk Register (**Annex 7**).

Table 4. Assessment of key project risks and mitigation measures. See the complete list – in particular of social and environmental risks - in Annex 7 (Risk Register) and in Annex 6 (SESP).

Risk Description	*Risk Rating*	*Mitigation Measures*
National and Operational risk COVID-19 pandemic is a national issue arising from a sanitary and health crisis that has negative socio-economic impacts. This translates into an operational risk for the project. The COVID-19 Pandemic may slow down project implementation. As discussed in section II, the response to COVID-	Moderate L = 4 I = 3	The first point to note is that the Nigeria Centre for Disease Control (NCDC) mentions that most of the infection and deaths related to COVID-19 have taken place in urban and peri-urban areas (**Annex 6**).[56] Since the investments made by the project will take place in rural / off-grid areas, it implies that investments in minigrids under Output 1.1 will directly contribute to COVID-19-proofing local development including job creation, and better access to health care as described in paragraph 25.

[56] https://ncdc.gov.ng/news/276/end-of-year-travel-advisory-on-covid-19 - accessed 10 December 2020.

19 in Nigeria has been strong with mortality rates falling below the world average. However, the pandemic is still evolving and it poses a tangible threat to the continued constrained mobility of persons that can slow down project implementation.		It also means that the implementation of the project will be sheltered by this geographically-differentiated disease dynamics. [57] Nevertheless, most technical assistance provided by the project will take place in urban areas, implying appropriate hygiene and safety precautions will need to be practiced by stakeholders. There is also a higher risk of transmission between urban and rural areas arising from internal movement of people. This can aggravate the rate of infections in rural areas that are known to have weak health infrastructure.[58] The effects of the pandemic, nevertheless, will be attenuated by the fact that movement within the country or overseas is not restricted as long as the precautionary measures of the NCDC are respected. The following project design provide mitigation actions that reduce the need for physical travel: • The biggest threat relates to the movement of international consultants. The project has been designed to make maximum use of local expertise as far as practicable, and to make use of home-based international consultants. In the present case, the budget for national consultancies is marginally higher than that for international consultancies. • A project website will be developed under Output 3.4 that will facilitate data and information sharing, and enable the use of virtual meetings to carry out stakeholder meetings and consultations. For instance, the Inception Workshop can be planned to take place virtually if needed. • Regarding in-person workshops and technical working group meetings, the project will adopt precautionary measures such as social distancing and mandatory sanitary protocols, including wearing of face masks and hand-sanitizing among others. A small budget has been allocated for the purchase of face masks and hand sanitizers. • The AMP Regional Project will also allow for Community of Practice peer-to-peer exchanges to take place virtually in order to minimize the need for in-person meetings and travels.
Organizational The capacity assessment of the Implementing Partner (IP) has revealed the REA to be a 'low risk' IP. Nevertheless, the micro-assessments revealed few weaknesses of which one was: "Procurement system and contract administration: The IP should acquire and operate a computerized procurement system for effective procurement and contract administration. Procurement reports should be prepared and filled as soon as the procurement process is complete. There should also be a staff dedicated to monitoring contract expiration and other risk management instruments. The IP	Moderate L = 3 I = 3	The project has been designed by providing mitigation measures for this risk. • As discussed in Table 1, a new Output 1.2 has been formulated to support the REA establish and operationalize and online platform for receiving bids and tenders from low-carbon minigrid developers in order to enhance transparency of the bidding process.

[57] It is assumed that the risk of contamination is less in rural areas that have lower density populations.
[58] Ibid.

should maintain a database of past performance of contractors."[59]		
Political 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.	Moderate L = 2 I = 4	The project is designed 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). Importantly, Nigeria has one of the most advanced minigrid policy and regulatory framework in Africa, and significant investments have been mobilized by development banks and others based on this. As such, it is unlikely that even a new government would implement any policy reversal.
Economic 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. This may jeopardize the financial viability of solar PV minigrids and/or the electrification of fossil fuel powered post-harvest processing of agricultural commodities.	Moderate L = 3 I = 3	This has been an important problem in the past when energy prices in Nigeria have been very low but since January 2016 energy prices in Nigeria have increased as a result of Government policy to eliminate subsidies on liquid fuels, and it is unlikely that this policy would be reverted. Although this risk falls outside the control of the project, Components 1 and 2 of the project aim precisely at achieving these goals and levelling the playing field for sustainable energy alternatives.
Climate Change (See SESP Risk 8) 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 products and distribution channels. In addition, the projected rise in temperatures will increase the power demand for air conditioning. Also, the impacts of climate change and climate variability on agricultural production are expected to be relatively moderate.[60]	Moderate L = 4 I = 3	The project will put most emphasis on rural electrification using isolated (implying small infrastructure) solar PV minigrids, which are not 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 inception stage, and appropriate measures will be identified for incorporation of adaptation measures in the investment programme. Even if the impacts of climate change on minigrid infrastructure is expected to be manageable, the impacts on agricultural productivity will need to be better understood. This knowledge will allow for better solar PV capacity design and for the potential development of water pumping for irrigation purposes. For this, the development of ESMP and ESIA using the guidance contained in the ESMF (**Annex 10**) will be carried out for pilots under Activity 1.1.4. All risks identified in the SESP (**Annex 6**), including current and future climate impacts on agricultural crops will be carried out. Further, Output 2.3 will include GIS information on the current and future impacts of climate change and climate variability on agricultural productivity in different agro-ecological zones and covering different crops. Likewise, market intelligence under Output 2.3 will also be generated related to the historical and current impacts of climate change in agricultural value chains. The creditworthiness of agricultural end users will also be collected, including their income vulnerabilities due to current and future climate change. In this way, the pipeline of investible assets

[59] UNDP. 2019. Micro Assessment Report for Rural Electrification Agency – Final.

[60] J. Ajetomobi, O. Ajakaiye and A. Gbadegesin. 2015. The Potential Impact of Climate Change on Nigerian Agriculture: AGRODEP Working Paper 0016.

		within the agriculture-energy nexus will be climate-proofed. Financial derisking instruments will be developed and tested under Output 2.2 to climate-proof the financial viability of minigrids against climate impacts in agricultural value chains.
Security 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. Similarly, there are security issues in the North-Eastern States in Nigeria related to the operation of Boko Haram. Abductions and kidnappings are quite frequent.	Moderate L = 2 I = 4	While it is not possible to fully mitigate security risks within the framework of the proposed project, the participation of local communities will be sought in selected project sites as per the ESMF (**Annex 10**). Market intelligence to be carried out under Output 2.3 will provide geographic information regarding security risks. Finally, Nigeria has such a large underserved rural communities that the project can be impactful without having to invest in communities that pose significant security risks that are beyond its control.
Environmental (See SESP Risk 21) SESP has revealed that electronic and electrical waste related to batteries, control electronics and electrical appliances of off-grid RETs at the end of product lifetime will become an increasingly more serious issue as investments in these technologies for enhancing clean rural energy access is catalyzed. This is especially so given the poor institutional arrangements and infrastructure for waste collection, storage and disposal in rural areas.	Moderate L = 3 I = 3	This risk is under the full control of the project and it will be dealt with in two ways, namely: (1) one eligibility criterion for private companies / entrepreneurs to participate in the REF Call for Proposals that will allow them to access grant funding for developing pilot projects will be a product take back clause at the end of product lives; and (2) developing an Environmental and Social Management Plan (ESMP) in collaboration with the Federal Ministry of Environment (and the Federal Environmental Protection Agency) on the environmentally-sound collection, storage and disposal of all electronic and electrical waste, including rechargeable batteries, associated with off-grid RETs. The Plan will also provide the measures required for supporting State and Local Governments in discharging their roles and responsibilities in the sound management of these wastes. All institutional and regulatory frameworks will also be reviewed in the process for formulating the Strategy and Action Plan. An essential element of the ESMP will be to propose technologically and socio-economically viable means for developing a circular economy around off-grid RETs that will generate jobs and economic development in additional to being environmentally sound. This is captured under Output 1.1 of the project.
Social (See SESP Risk 19) Risk on labour opportunity and working conditions, especially related to the electrification of manual labour carried out by women.	Substantial L = 4 I = 4	Event: It may occur that working conditions are not meeting the minimum criteria to satisfy the UNDP's requirements. It may also occur that unskilled/manual labour loses their jobs. Cause: all project stages (i.e. construction, operation…) will require labour, some project activities will displace unskilled/manual labour (especially for women in baseline agricultural value chains that employ manual labour), and the UNDP Universal Human Rights Index informs concerns in this country regarding labour rights, employment rates and/or working conditions for some of the stakeholder groups relevant to this project. Impact: This may lead to the use of child, forces, discriminatory, under-minimum practices and/or occupational health and safety accidents/incidents. The necessary management plan/measures will be put in place as part of ESMP, based on the ESIA and following the guidance contained in the ESMF (Annex 10). This will be carried out under Activity 1.1.4.
Social (See SESP Risk 16) Risk of economic displacement due to loss of income from fuel selling.	Substantial L = 4	Traditional fuels supplied by local providers, including those from the informal/traditional sectors see their market diminished. Cause: Some mini-grid systems and project appliances to be implemented may replace an activity that was fueled with other energy sources like wood

	I = 4	charcoal, paraffin, kerosene, diesel. For example in the households these activities may be cooking and lighting while in the community/commercial scope it may be diesel for the existing mini-grids. Impact: the change on the fuel used (i.e. from charcoal, private diesel mini-grids… to the service the renewable energy mini-grid provides) would lead to the loss of income for fuel suppliers, potentially these are mainly poor women selling in the informal market. The necessary management plan/measures will be put in place as part of ESMP, based on the ESIA and following the guidance contained in the ESMF (Annex 10). This will be carried out under Activity 1.1.4.

69. Stakeholder engagement: **Table 5** lists key project partners required to achieve the desired results of the project at the output level. The description of their participation in the project is directly related to the assumptions in the ToC. Details of partnerships and stakeholder engagement can be found in **Annex 9** (Stakeholder Engagement Plan). This annex also gives a mobilization and communication plan with stakeholders. In addition, the UNDP grievance redress mechanism will be set up in accordance with UNDP procedures. Stakeholder engagement was also carried out during project design and conceptualization and is reflected in **Annex 17** and **Annex 19**. Structured interviews were conducted with minigrid developers and development partners for the derisking study given in **Annex 17**. Also, several stakeholders were engaged during the baseline analysis, and the results are summarised in **Annex 19**. All the stakeholders will be involved in Outputs 3.1 and 3.3.

Table 5. Stakeholder involvement in the implementation of the project.

Stakeholders	Contribution	Relevant Project Outputs
Federal Ministry of Power (FMP)	The Ministry of Power is responsible for providing policy guidance regarding rural energy access in Nigeria. The policy guidance and accompanying regulations then provide the framework for the operation of REA and REF. Consequently, the Ministry will be interested in all the outputs under several outputs of Components 1 and 2, and particularly in the development of the spatial mapping for the electrification of agricultural values chains, which can be grafted in the existing spatial maps of least cost rural energy access technologies. The mandate of the Ministry will also be leveraged to engage other line ministries such as the Ministry of Finance to support innovative financing solutions for the deployment of solar PV minigrids in agricultural value chains. The Ministry has also developed a monitoring system for off-grid technologies that will serve as foundation for the adoption of an augment QAF.	- Output 1.5: Capacity building provided to public officials (regulator, ministries) specifically to design procurement/tender processes that incorporate cost-reduction levers and innovative business models. - Output 1.6: Scaled up support for upstream equipment manufacturers and suppliers. - Output 2.1: Financial advisory committee established and operational. - Output 2.2: Innovative financing solutions for minigrid development are identified and implemented through the REF. - Output 3.6: Renewable Energy and minigrid Development Associations supported and strengthened to promote minigrid development. - Output 3.7: Project Digital Strategy developed/implemented and Quality Assurance Framework augmented for measuring, reporting and verification of the sustainable develop impacts of MGs, including GHG emission reductions.
Rural Electrification Agency (REA)	The REA is the agency of the Federal Government of Nigeria with the mandate of electrifying rural and unserved communities. The mission of the REA is to provide access to reliable electric power supply for rural dwellers irrespective of where they live and what they do, in a way that would allow for reasonable return on investment through appropriate tariff that is	All project outputs

	economically responsive and supportive of the average rural customer. The REA will serve as the Implementing Partner for the project, and it will therefore implement all project activities and outputs under full NIM. The Project Management Unit will be domiciled in the REA and will be responsible for the day-to-day running of Project. Most of the communication activities and engagement with stakeholders will be coordinated by the REA. The REA is also the implementing the Energizing Agriculture Programme (EAP) together with FMARD.	
Federal Ministry of Environment (FME)	The Nigeria Federal Ministry of Environment (FME) was established to ensure that the country's environment is protected, natural resources are conserved, and development is sustainable. The FME is the GEF focal agency for Nigeria, hosting the GEF Political Focal Point (Minister of Environment) and the Operational Focal Point (OFP). The representative of FME in the Project Steering Committee (PSC) will serve as the Chairperson of the PSC. Furthermore, the FME will be responsible for monitoring the project activities and provide the necessary guidance to ensure that the project is implemented in accordance with the Project Document. The FME will also play vital role in communicating the achievements of the project to stakeholders through policy briefing and press releases.	- Output 1.1: Pilots developed, including on productive use/innovative appliances and modular hardware/system design, leading to cost-reduction in mini-grids and sufficient growing demand for minigrid systems. - Output 3.4: Lessons learned captured and disseminated at the national level. - Output 3.7: Project Digital Strategy developed/implemented and Quality Assurance Framework augmented for measuring, reporting and verification of the sustainable develop impacts of MGs, including GHG emission reductions.
Federal Ministry of Agriculture and Rural Development (FMARD)	FMARD is mandated to organize and manage the agriculture sector and facilitate agribusiness for increased food security and employment along commodity value chains and agro-industrial development to earn foreign exchange and contribute to socio-economic development of the country. Agricultural development is central to government programme since it is one of the largest economic sectors in Nigeria, as well as the one generating the most jobs. FMARD is a central player in the Energizing Agriculture Programme (EAP) that is implemented in conjunction with the REA.	- Output 1.1: Pilots developed, including on productive use/innovative appliances and modular hardware/system design, leading to cost-reduction in mini-grids and sufficient growing demand for minigrid systems. - Output 1.6: Scaled up support for upstream equipment manufacturers and suppliers. - Output 2.1: Financial advisory committee established and operational. - Output 2.2: Innovative financing solutions for minigrid development are identified and implemented through the REF. - Output 2.3: General market intelligence study on minigrids prepared and disseminated amongst public officials and finance community. - Output 3.4: Lessons learned captured and disseminated at the national level. - Output 3.5: Replication plan (including investment plan) for scaling up rural energy access developed. - Output 3.7: Project Digital Strategy developed/implemented and Quality Assurance Framework augmented and independent verification process in place for measuring, reporting and verification

		of the sustainable develop impacts of MGs, including GHG emission reductions.
Ministry of Finance, Budget and National Planning (MFBNP) and financial regulator (Central Bank of Nigeria)	The MFBNP and the CBN will be involved in developing financial schemes and mechanisms for supporting the electrification of agricultural value chains (and other productive energy uses) using renewable electricity generated by solar PV minigrids. The Ministry will also be involved in designing and implementing fiscal and economic incentives for equipment used within the energy-agriculture nexus. It is also expected that having the collaboration of the Ministry and the regulator will make it easier to advocate for policy and financial derisking instruments that will be informed by the project's derisking studies. The Ministry and the regulator will also be involved in the process of informing and training financial institutions on alternative financing schemes to promote private investments in the energy-agriculture nexus.	- Output 1.6: Scaled up support for upstream equipment manufacturers and suppliers. - Output 2.1: Financial advisory committee established and operational. - Output 2.2: Innovative financing solutions for minigrid development are identified and implemented through the REF. - Output 2.5: Capacity building provide to minigrid developers and investors on measuring and reporting on impact indicators, building credibility in impact investment as an asset class. - Output 3.5: Replication plan (including investment plan) for scaling up rural energy access developed. - Output 3.7: Project Digital Strategy developed/implemented and Quality Assurance Framework augmented and independent verification process in place for measuring, reporting and verification of the sustainable develop impacts of MGs, including GHG emission reductions.
State Governments	The state government is responsible for developing policies, strategies and action plans in line with national policies for the development of the state. In effect, the Provincial Government carries out actions that promote the economic, social and cultural well-being of the population residing in its jurisdiction. The state governments can help to further reduce the price of electricity by supporting individual projects in their states with grants either in-kind or in-cash to developers. They can also facilitate entry into communities via the local government. Furthermore, developers can rely on the support of state governments to get importation tariff waver for major components of the MG system if they are imported as diplomatic goods.	- Output 1.1: Pilots developed, including on productive use/innovative appliances and modular hardware/system design, leading to cost-reduction in mini-grids and sufficient growing demand for minigrid systems. - Output 2.2: Innovative financing solutions for minigrid development are identified and implemented through the REF. - Output 2.3: General market intelligence study on minigrids prepared and disseminated amongst public officials and finance community. - Output 3.4: Lessons learned captured and disseminated at the national level.
Local Communities / civil society organizations / non-governmental organizations (it is implicit that the productive users will emanate from the local communities)	These are the direct beneficiaries of the project. The local communities will host the minigrid systems and utilized resources for socio-economic development, as well as enhance the primary health care system. The operations of public infrastructure such schools, banks, hotels will be enhanced thereby directly benefiting local communities. Consequently, their needs, interests and perceptions about the technology value chain need to be well understood for the successful implementation of the project.	- Output 1.1: Pilots developed, including on productive use/innovative appliances and modular hardware/system design, leading to cost-reduction in mini-grids and sufficient growing demand for minigrid systems. - Output 2.3: General market intelligence study on minigrids prepared and disseminated amongst public officials and finance community. - Output 3.4: Lessons learned captured and disseminated at the national level.

Private Sector (mini grid developers and actors in agricultural value chains)	The minigrid developers will provide the technical design and financial modeling for the minigrid system. They will also be responsible for the engineering, procurement and commissioning of the power systems. Furthermore, they will have direct contact with local communities, and ensure the smooth operation of the minigrid. The developers will design the method of cost recovery which could be either by direct bank transfer or use of mobile money. In the absence of GSM network, payment could be done manually.	- Output 1.1: Pilots developed, including on productive use/innovative appliances and modular hardware/system design, leading to cost-reduction in mini-grids and sufficient growing demand for minigrid systems. - Output 1.3: Capacity of potential tender bidders (private sector developers) strengthened to consider innovative business models and cost-reduction levers - Output 1.4: Capacity of winning tender bidders (private sector developers) strengthened to develop and implement innovative business models and cost-reduction levers - Output 1.6: Scaled up support for upstream equipment manufacturers and suppliers. - Output 2.2: Innovative financing solutions for minigrid development are identified and implemented through the REF. - Output 2.3: General market intelligence study on minigrids prepared and disseminated amongst public officials and finance community. - Output 2.4: Feasibility study support provided to minigrid developers, creating a pipeline of investible assets. - Output 2.5: Capacity building provide to minigrid developers and investors on measuring and reporting on impact indicators, building credibility in impact investment as an asset. - Output 3.4: Lessons learned captured and disseminated at the national level. - Output 3.5: Replication plan (including investment plan) for scaling up rural energy access developed. - Output 3.6: Renewable Energy and minigrid Development Associations supported and strengthened to promote minigrid development. - Output 3.7: Project Digital Strategy developed/implemented and Quality Assurance Framework augmented and independent verification process in place for measuring, reporting and verification of the sustainable develop impacts of MGs, including GHG emission reductions.
Financial Institutions	Financial institutions will serve as providers of lower cost debt/equity during the project implementation. They could also assist the MG developer to design payment recovery method that will be suitable for the location or region where the MG is located. Since	- Output 2.1: Financial advisory committee established and operational.

	innovative minigrid business models centered on cost reduction levers are not well known to local financial institutions, this group of stakeholders will be direct beneficiaries of the capacity building activities of the project. Financial institutions are also key to the long-term commercial sustainability of solar PV minigrids in Nigeria.	- Output 2.2: Innovative financing solutions for minigrid development are identified and implemented through the REF. - Output 2.5: Capacity building provide to minigrid developers and investors on measuring and reporting on impact indicators, building credibility in impact investment as an asset class. - Output 3.4: Lessons learned captured and disseminated at the national level. - Output 3.5: Replication plan (including investment plan) for scaling up rural energy access developed. - Output 3.7: Project Digital Strategy developed/implemented and Quality Assurance Framework augmented and independent verification process in place for measuring, reporting and verification of the sustainable develop impacts of MGs, including GHG emission reductions.
Media	Several media outlets were engaged at the early stage of project design and conceptualization (Annex 19). There are trained newspaper reports in matters related to climate change and renewable energy, with whom the project will work closely to (i) increase its visibility; and (ii) communicate on its strategic outputs and results to a broad range of stakeholders. In this respect, the media can be seen as a cross-cutting type of stakeholder, therefore, potentially involved in communicating on all aspects of the project. This will happen primarily through Output 3.4.	- Output 3.4: Lessons learned captured and disseminated at the national level.

70. South-South cooperation will take place in a di-directional way between the Nigeria child project and other AMP child projects through the AMP regional project. The AMP regional project will connect countries to knowledge, resources and networks of best practice and will support the rapid deployment of expertise, solutions and tools to support on-the-ground implementation. Components 1, 2 and 3 of the AMP regional project – drawing from regional and international best practices and curating existing knowledge - will squarely support the first three components of the Nigeria project as follows:
    - Thematic working groups (policies, private sector, financing) will be organized and communities of practice (CoP) will be established at the regional level targeting specific stakeholder groups and country needs. The Regional program with support the Nigeria project in the following ways:
        - ✓ Providing tailored, hands-on, technical assistance to support all technical activities, both at the design and implementation stages. Readily-available experts at the regional level will be rapidly-deployable for either short-term or longer-term embedded support to Nigeria. The regional project will help scope the technical assistance and will suggest experts. The regional project will support Nigeria with key decisions and technical reviews at Child Project milestones and provide actionable, strategic recommendations to Child Project to increase adoption of minigrid cost-reduction opportunities and innovative business models
        - ✓ Knowledge tools and good practices around minigrid cost-reduction in a variety of regulatory environments, and research and development tools, such as policy packages, template tender documents, and guidelines on productive use program designs will be made available. The toolkits will support both public sector (e.g. REA, FMP, NERC) and private sector (e.g. mini-grid developers) and the overall minigrid market
        - ✓ Providing standardized methodologies for carrying out market intelligence and augmented QAF

- Further, two global meetings will bring together key partners from all of the participating countries to facilitate the multidirectional flows of experience sharing
- The regional project will support the development of a common monitoring and indicator framework for all child projects, and country lessons learned will be used for sharing through the regional project Community of Practice and its technical cohorts and bilaterally between countries

71. In a reciprocal manner, the results of Component 3 in the Nigeria child project will feed the regional project for onward sharing with other AMP participating countries (Angola, Burkina Faso, Comoros, Djibouti, Ethiopia, Eswatini, Madagascar, Malawi, Somalia, Sudan) through the Community of Practice and its technical cohorts. It is timely to point out here that a budget of USD 150,000 has been earmarked for the participation of Nigerian stakeholders in the regional project CoP and its technical cohorts. There will also be opportunities for these results to be shared directly with other participating countries through corresponding knowledge management activities built into each child project. This will serve better integration between AMP child projects. The Nigeria child project will also draw lessons learned from previous and ongoing GEF-funded project on renewable minigrids in Sub-Saharan Africa,[61] especially countries that share a similar geopolitical, social and environmental context.

72. Gender equality and Women's Empowerment: During the preparatory phase, the project team conducted a gender analysis with limited field consultations because of the ongoing COVID-19 pandemic and the inability of international consultants to carry out in-country missions. Nevertheless, gender-disaggregated socioeconomic data had been collected in prior missions, and corroborated with the Gender department of the REA. A gender action plan (GAP) was developed by integrating measures, indicators, targets and budget in the project activities. The gender analysis and GAP are found in **Annex 11** and highlights the gender dimension in relation to the status in the family and in society, capacity and participation in decision making. The main findings of the gender analysis are:
    - Nigeria exhibits high overall levels of gender inequality, though country-level analysis masks much local and state-level heterogeneity;
    - In spite of many patriarchal systems and norms that can be observed today, Nigeria exhibits strong traditions of both pre- and post-colonial participation by women in public life;
    - A significant amount of gender discrimination in Nigeria is traced back to the colonial era. Though colonialism left an undeniable imprint on gender norms and relations in Nigeria, it did not erase traditions of female empowerment and women's collective advocating for their rights;
    - There is a strong cultural divide between the Muslim-majority Northern States and Christian-majority Southern States that influences gender roles and responsibilities.
    - The incidence of female-headed households is not always a reliable proxy to identify disadvantaged women. On average, 19% of households in Nigeria are female-headed. However, the inter-State variation is relatively high, with only 6% of households female-headed in the North East and 32% are in the South East. Rural poverty is highly correlated with household size and there are many disadvantaged women living in these large households.
    - Typically, women's access to bank accounts, mobile phones, and mobile-enabled financial transactions is lower than men's access, and is also considerably lower in the Northern regions as compared to the Southern ones.
    - When it comes to gender roles related to work and entrepreneurship, there are several pertinent observations that relate directly to the objectives of the project, namely: (i) Nigerian women today are involved in the production of both staple and cash crops, along with animal husbandry, but with gender-differentiated output and productivity gaps; (ii) in the agriculture sector, post-harvest value addition is male-biased implying that if care is not exercised, the substitution of labour intensive agricultural activities (done predominantly by women) with mechanization and the electrification of post-harvest agricultural value chains can be detrimental to women; (iii) women work disproportionately more than men because they also shoulder a majority of care-giving, domestic and reproductive work; and (iv) there

[61] Details are given in Annex E of the Program Framework Document of the 'GEF-7 Africa Minigrids Program'.

is a gender gap in asset ownership, implying that women generally find themselves in a weaker capacity to generate income and/or to access financing for investment in productive assets.

73. Cognizant of these findings, a gender action plan (GAP) has been developed to integrate gender equality and equity in the project design (**Table 6**). The proposed measures aim to ensure that gender disparities are minimized and to enhance women's empowerment. If these proposed measures are not taken, then there is a risk of the project increasing gender disparities. Also, project investments will be carried out using competitive bidding (Output 1.1 above), and this process will determine the geographical location of project sites. Because of this, ongoing and responsive gender analysis throughout the program is necessary and success markers/expectations for gender equitable outcomes will likely have to be tailored to individual project's circumstances. A "gender win" in a very traditional, Muslim-majority village in the North may look very different from one in a predominantly Christian small town in the South, for instance. The implementation and monitoring and evaluation of the GAP will be under the responsibility of the Project Manager. Also, the project will advocate the mainstreaming of gender equality among its staff so that they are conversant with gender-related issues in the project design and attentive to issues gender mainstreaming. Capacity building activities for gender mainstreaming will take into account women's multiple responsibilities and time constraints. The project also will work with UNDP gender experts in order to integrate their knowledge in the development and implementation of GEF-funded projects.

Table 6. Gender Action Plan.

Objective	Gender Action	Indicator and Targets	Responsible / Institutions	Budget (USD)
Component 1: Policy and Regulation				
Output 1.1 **Pilots developed, including on productive use/innovative appliances and modular hardware/system design**	Ensure Calls for Proposals includes the following: - Ensure dedicated financing support to women entrepreneurs in the energy-agriculture value chains through at least 25% of total GEF investments. Women (and consortia including women) will be actively encouraged to bid on projects by tailoring language in Calls for Proposals and also by conducting aggressive outreach through professional networks; - All project proposals mandated to incorporate gender considerations in technical design, [62] PUE and other applications, operations and management, project activities like training; - Provide pre-bid support and guidance to applicants, including detailed pre-submission reviews[63] Ensure integration of women, or women's organizations, within the business delivery models. To the extent possible, include a gender variable overlay on the remote monitoring data.	**Baseline:** 0 **Indicators:** - Number female-led applicant teams and successful bidders - Number of applicant teams and successful bidders with 1/3 or more female team members/partners - % of GEF investments deemed "gender transformative" **Target:** - 40% Female-led applicant teams and 1/3 female-led winners - 40% gender diverse applicant teams and 1/3 gender diverse winners - At least 25% of GEF investments	REA	774,861 (INV) 15,000 (TA)
Output 1.2 **Standardized online REF Calls for Proposals for enhanced**	Conduct a gender review of any online, Odyssey-based (or similar), bidding platform by collecting and analysing user feedback experience from both men and women.[64]	**Baseline:** 0 **Indicators:** - Gender review conducted, Y/N	REA	5,000

[62] For example, this includes: that the hopper heights of mills be either adjustable or low enough to be comfortably filled by most women; that noise levels be reduced to the point where ear protection is not required and women can hear and respond to children; that moving parts (like belts and drive shafts) posing a danger to children being carried or playing nearby be enclosed; that moving parts that could catch on any loose-fitting women's clothing also be enclosed; that machinery can be started and stopped frequently and includes an emergency shut-off; that various sizes of equipment, including options appropriate for home-based production, be eligible for funding; etc.

[63] This helps compensate for women's lower experience with responding to and winning tenders, as well as the fact that they have access to fewer professional networks and contacts within REA to receive tips on properly completing their applications.

[64] For example: ensure male and female applicants have similar internet access, internet reliability, and internet literacy; perform gender-disaggregated A/B testing of features and wording of instructions; canvas applicants to assess whether in the case of difficulties with the application, men and women receive comparable levels of phone/in-person assistance, both formal and informal, etc.

Objective	Gender Action	Indicator and Targets	Responsible / Institutions	Budget (USD)
transparency in developers bidding process	Use insights from the review to iterate and improve on the platform/process design.	- Gender data collection step added for applicants, Y/N - M/F attrition rates by process step (%) **Target:** - Gender review conducted - Gender data collection step added for applicants - Gender parity in attrition rates by process step		
Output 1.3 **Capacity of potential tender bidders (private sector developers) strengthened to consider innovative business models and cost-reduction levers**	Deploy mixed gender pairs of mentors/coaches to assist both male and female sponsors with business plan strengthening, introduction to agricultural value chain actors, and financial facilitation and reporting. Connect female minigrid developers with others in 3rd countries for peer support and collaborative problem-solving exercises. The technical cohorts of the Regional Project Community of Practice can be a starting point to foster South-South cooperation.	**Baseline:** 0 **Indicator:** - Number of female-led companies supported by programme for business plan development and financial reporting - Client/sponsor satisfaction with business development services (sex-disaggregated) - M/F companies successfully securing REF (and/or other) financing **Target:** - 40% of companies receiving services are female-led - At least 80% satisfaction rate for both M/F - No M/F differential in client satisfaction	REA, UNDP	44,144
Output 1.4 **Capacity of winning tender bidders (private sector developers) strengthened**	Minigrid developers linked with women's cooperative enterprises, financing organizations, self-help groups, in order to support electricity uptake in agro-processing.	**Baseline:** 0 **Indicators:** - Number of women's cooperatives, financing organizations, self-help groups, etc. incorporated into minigrid-enabled value chain **Targets:** - Financial/material involvement of at least one women's group per developer supported, e.g., in a leasing scheme or as a key project partner	REA	35,308
Output 1.5	Provide equal opportunity for male and female officials to attend all trainings provided.	**Baseline:** 0 **Indicators:**	REA, UNDP	56,980

Objective	Gender Action	Indicator and Targets	Responsible / Institutions	Budget (USD)
Capacity building provided to public officials specifically to design procurement/tender processes	Conduct gender review of bidding document language and requirements.[65] Provide training on gender issues salient in mini-grids and in agricultural value chains. While conducting the long-term analysis of power markets to ensure on-grid/off-grid equity in tariff structure, also consider the gender aspects of any connection subsidies, including implicit/indirect ones, which could predominantly accrue to male house owners.	- M/F attendance at trainings compared to overall departmental gender diversity - Gender review of bidding documents completed, Y/N - # Staff training on gender issues and % demonstrating competence in skills - Gender review of connection subsidies and pricing complete, Y/N **Targets:** - Training attendance rates identical or better than women's departmental representation - Gender review complete - 100% of staff overseeing bids and tenders (launch, processing and assessing) trained and demonstrating competence on practical exercises - Gender review of connection costs and benefits complete		
Output 1.6 **Scaled up support for upstream renewable energy manufacturers and suppliers**	When promoting local assembly and manufacturing, adapt commercially available, international designs to be gender inclusive and appropriate for a variety of a Nigerian contexts, leveraging feedback form local female users and engaging in a user-centred, co-design process. Include in roadmap development a strategy for bringing more women into the design, manufacture, and uptake of agro-processing equipment.	**Baseline:** 0 **Indicators:** - # of equipment designs deemed to have been gender mainstreaming - Women's involvement in supply and uptake clearly delineated in roadmap, Y/N **Targets:** - At least 2/3 of equipment assessed and subjected to gender-inclusive reconfiguration - Presence of gender mainstreaming section in each technology roadmap	REA	27,952
Component 2: Scaled-up Financing				

[65] For example, to assess if any requirements deter female applicants and could, in fact, be waived without jeopardizing project success. Also to uncover and alter any male-as-norm assumptions or language in the documents themselves.

Objective	Gender Action	Indicator and Targets	Responsible / Institutions	Budget (USD)
Output 2.1 **Financial advisory committee (FAC) established and operational**	Ensure gender balance in the composition and leadership of the Financial Advisory Committee.	**Baseline:** 0 **Indicators:** - # M/F in committee - Gender of chair and co-chair **Targets:** - 50% women on committee - Chair and co-chair are opposite gender	REA, UNDP	No additional budget
Output 2.2 **Innovative financing solutions for minigrid development are identified and implemented through the REF**	Design financing solutions with female minigrid sponsors and agricultural users in mind,[66] and design of financing activities to be paired with cultivation of agency/empowerment mindsets among women.[67] Aggressive outreach to and recruitment of female potential borrowers/investees utilizing professional and social networks.	**Baseline:** 0 **Indicators:** - % Financing mechanisms/proposals screened for unintentional bias and in which gender considerations have been mainstreamed. - M/F recipients of piloted financing - Value of piloted financing flowing to M/F recipients **Targets:** - 75% of financing mechanisms/proposals gender mainstreamed - 40% at least of recipients are female - 40% at least of financing value goes to female recipients	REA	28,240
Output 2.3 **General market intelligence study on minigrids prepared and disseminated amongst public officials and finance community**	Append available gender data to agro-ecological, energy needs, and demographic GIS sets.[68]	**Baseline:** 0 **Indicator:** - # of gender variables cross-indexed with GIS data sets and made available to developers **Target:** - At least three relevant, granular-level gender variables included in market intelligence materials	REA	33,560

[66] For example: use of collective/social capital lending methodologies; replacement of deposit or real property collateral requirements with life insurance products or partial credit guarantees; adoption of flexible payment modalities/forbearance options appropriate for when women must pause then resume business activities due to childbirth or unforeseen care-giving obligations; simplified application procedures; relaxed equity requirements; etc.

[67] I.e., helping women connect with one another to build confidence, refine their personal visions, confront internalized discrimination, and build back missing soft skills.

[68] For example, add a census layer about M/F household composition to mapped assets, cross-reference presence of women's agricultural cooperatives, include what is known about M/F participation in certain crop cultivation and processing to allow REA to estimate the likely gender benefit incidence of its minigrid portfolio.

Objective	Gender Action	Indicator and Targets	Responsible / Institutions	Budget (USD)
Output 2.4 **Feasibility study support provided to minigrid developers, creating a pipeline of investible assets**	Site-specific feasibility support should carefully account for both male- and female- energy needs and potential uses, including potentially efficient electric cooking (induction or pressure) and community uses in addition to agricultural uses. Support should benefit both male- and female-led developer companies.	**Baseline:** 0 **Indicators:** - # of feasibility studies that include detailed M/F customer segmentation - # M/F-led companies benefitting from the provision of feasibility study support **Targets:** - 100% of feasibility studies include meaningful M/F customer segmentation - 1/3 of studies benefit female-led development companies	REA	127,872
Output 2.5 **Capacity building provided to minigrid developers and investors on measuring and reporting on impact indicators, building credibility in impact investment as an asset class**	Insist that financial institutions nominate equal numbers of men and women to attend any trainings. Foster dialog and experience sharing[69] between meso-level commercial lenders/investors and micro-financiers when both will be participating in complementary transactions within a single energy-agricultural value chain.	**Baseline:** 0 **Indicators:** - # of M/F from financial institutions attending training sessions - # M/F attendees at dialog/experience sharing events **Targets:** - 50-50 gender balance at training sessions - At least 50 attendees at dialog events, or 50 program-relevant introductions brokered between individuals operating at different levels of the financial services industry	REA	20,402
Component 3: Digital, Knowledge Management, monitoring and evaluation and Scale up Strategy				
All Outputs **3.1: Inception workshop** **3.2: Project monitoring** **3.3: Project evaluations**	Continue to mainstream gender in all project management activities; use gender indicators listed above in this table for adaptive program management; develop, capture and disseminate gender insights from sector; continue to innovate and adapt processes and offerings to include	**Baseline:** 0 **Indicators:** - # program management documents that include at least some discussion of gender issues	REA, UNDP	(15% of the total budget for Outcome 3) 134,635

[69] The goal is for meso-lenders/investors to gain confidence in the strength of micro-level transactions that may ultimately underpin their underwriting; to appreciate the financial value of MFI's "non-financial" empowerment activities; to appreciate the social impact metrics and reporting conventions common to many MFIs; and for both sides to develop "hand-off" strategies for clients graduating from one level to the next.

Objective	Gender Action	Indicator and Targets	Responsible / Institutions	Budget (USD)
3.4: Lessons learned captured and disseminated at the national level **3.5: Replication plan (including investment plan) for scaling up rural energy access developed** **3.6: Renewable Energy and minigrid Development Associations supported and strengthened to promote minigrid development** **3.7: Project Digital Strategy developed/implemented and Quality Assurance Framework augmented and independent verification process in place for measuring, reporting and verification of the sustainable develop impacts of minigrids, including GHG emission reductions**	more women in all aspects of energy supply, demand and enabling environments; select the most meaningful gender indicators[70] and actively work to narrow identified gender gaps; conduct regular open-ended discussions with female stakeholders to capture and record unanticipated barriers and outcomes.	- # of project indicators which are sex-disaggregated - # of project indicators which directly seek to measure gender outcomes (beyond simple disaggregation)[71] - # knowledge products and scale-up strategies including gender analysis - # knowledge products and scale-up strategies having gender as a main theme **<u>Targets:</u>** - 80% of program documents include at least some discussion of gender dynamics and program responses - Gender disaggregation of indicators as far as practicable - Tracking and reporting on at least 2 gender-specific indicators, one on the demand side and one on the supply side - 80% of knowledge products and replication strategies include gender analyses - At least one knowledge product or replication strategy with gender as a main theme		

[70] Most likely, women heading up or employed by agro-processors and women heading up or employed by minigrid development companies.
[71] For example, this could include surveys that attempt to qualify the degree of attitudinal change among men and women pre- and post-intervention.

74. Innovativeness: The project's primary innovation is its extensive focus on cost-reduction and business model innovation to reduce minigrid cost, with the overall aim to increase the affordability of renewable electricity to off-grid markets. Since off-grid market development cannot be met solely through public investments and development aid, a more sustainable approach is to involve private sector participation in off-grid electrification using solar PV minigrids. Reductions in financing costs is underlined by the Theory of Change (Annex 1) that proposes to reduce, eliminate or transfer the investor's risks using appropriate derisking instruments, thereby reducing the investor's cost of capital (equity and debt). Further, as shown in **Figure 3** increased capacity utilization resulting from more predictable loads from productive uses, especially in agricultural value chains will reduce the levelized cost of electricity. This cost reduction can be translated in reductions in hardware costs per unit of renewable electricity generated. The project will invest in pilots to test the ToC within the energy-agriculture nexus to then propose commercially-viable business models for solar PV minigrids that will then be subject to scaling up discussed below. Another feature of innovation is to increase the capacity to pay of end-users by providing economic opportunities in the form of income-generating activities for local communities. The combined effects of decreasing electricity costs and improved economic conditions will be the increased affordability and capacity to pay for renewable electricity by end users. In a derisked investment environment, the increasing demand driven by low cost of electricity will catalyze further investments in renewable minigrids thereby creating a virtuous circle for scaling up investments and contributing to higher levels of rural electrification (**Figure 3**).

75. Sustainability: The sustainability of deploying solar PV minigrids in agricultural value chains beyond the project lifetime is discussed from three vantage points, namely: (1) technical viability, (2) financial viability, (3) socio-economic viability, and (4) environmental viability.
    - Technical viability: From a technical point of view, the viability of low-carbon minigrids for rural electrification has been demonstrated in Nigeria. It will be enhanced by supporting the adoption of a QAF for solar PV-battery minigrids (Output 3.7). Also, the barriers to technology transfer and diffusion will be reduced or eliminated by proposing a country-specific strategic plan for the local assembly and manufacturing of equipment used in the energy-agriculture nexus (Output 1.6). The project will also support technology development through a market-based approach - developing national capabilities and disseminating information through knowledge management (Outcome 3). These efforts should ensure the increased long-term technical viability of minigrids for rural electrification in Nigeria.
    - Financial viability: As discussed at paragraph 64, one of the innovative elements of the project is its focus on cost reduction (hardware, non-hardware, and financing costs) in order to increase the affordability of renewable electricity to rural communities. To achieve this objective, the project will implement policy and financial de-risking measures designed to reduce the costs of hardware, non-hardware (site-selection, system design, customer acquisition, operations and maintenance, etc.) and finance (debt and equity). An interlocking element is promoting the use of renewable electricity for productive uses (predominantly agriculture) in order to support the socio-economic development of targeted communities. A by-product of this development will be the increased capacity of local communities to pay for electricity, which will ensure the financial viability of proposed minigrids. This will be achieved by providing targeted support to rural households and/or associations willing to engage in income-generating activities using electricity simultaneously building the capacity of technical staff. Further, the project will operationalize the most optimum business model for the design, implementation, operation, maintenance and management of solar PV minigrids taking into account local conditions to minimize both transaction and operational costs in minigrid development and management (Output 1.1). Innovative business models for commercially viable solar PV minigrids would be inimical to financial viability.

      With regard to the financial support given to project developers, the key to sustainability is to ensure that low-carbon minigrids are viable investments. For this, the project adopts a value chain approach by embedding solar PV minigrids in the agricultural value chains, and by targeting technical assistance to the different stakeholders in the value chains. The project will support identification and implement financial instruments (Output 2.2) in order to ensure the financial viability of investments. In addition to integrating financial instruments in business plans centred on cost reduction levers (Output 1.3, Output 1.4, Output 2.4), the project will work with financial institutions (Output 2.5) to make them aware of investment opportunities in minigrids and low-carbon technologies, and educating them about the particularities of

investments in the off-grid sector, as well as strengthening the role of government and development partners as facilitators (Output 1.1). Public stakeholders will also be capacitated to design procurement and tender processes that incorporate cost reduction levers and innovative business models (also including strong gender transformative potential) to increase the financial viability of solar PV minigrids in Nigeria (Output 1.5).

- Socio-economic sustainability: The project will fully support the human rights-based approach and will not have any negative impact on the enjoyment of human rights (civil, political, economic, environmental, social or cultural) of key potential stakeholders, targeted communities or the population as a whole. In particular, a gender-transformative approach will be used (as described in Gender Equality and Women's Empowerment and **Annex 11**), and it will avoid any community relocation as far as practicable. If relocation is unavoidable, appropriate relocation action plans and grievance mechanisms will be developed within a robust Environmental and Social Management Framework (ESMF) that is provided **Annex 10**.

  The project will focus on providing modern and sustainable electricity services to the rural population and, in the process, demonstrate the benefits that sustainable technology can bring to improved livelihoods in rural areas. As discussed in the ToC (**Annex 1**) and on the innovative and financial viability aspects of the project, enhancing local economic opportunities within the energy-agriculture nexus is central to project success. One of the key levers of long-term sustainability of solar PV minigrids in isolated communities is the positive feedback loop that is created between local socio-economic development and increased demand for renewable electricity as shown in **Figure 3**. In summary, social and economic benefits will accrue to local communities in terms of a healthier environment for the rural population, opportunities for income-generating activities and improved management of natural resources related to productive energy uses. Particular attention will be given to strengthening the role of women as actors and entrepreneurs in the energy-agriculture nexus rather than being passive beneficiaries. Women entrepreneurs will be encouraged to manage facilities. Those engaged in the processing and packaging of agricultural products will be at the core of promoting renewable electricity for productive purposes. In addition, on-the-job capacity building - especially for installation and maintenance of minigrids and participating in the mechanization of agricultural activities will be gender-sensitive (**Table 6**). These combined activities will help reduce the gender gaps that traditionally exist in the energy-agriculture value chains.

- Environmental sustainability: The project will result in an estimated direct GHG emission reduction of 74.2 $ktCO_2e$ and 4.2 $MtCO_2e$ in indirect emission reductions. Consequently, the project will support Nigeria in either implementing its NDC through deployment of solar PV minigrids or in updating NDCs to cover off-grid electrification using sustainable delivery models for solar PV minigrids. This will facilitate decision-making on energy infrastructure and service delivery options to account for the uncertainty associated with climate change predictions and to assess the climate resilience of different options. The project will also promote the uptake of energy efficient appliances for residential and productive purposes, thereby further supporting environmental sustainability. Also, the environmental sustainability is underpinned by application of UNDP's Social and Environmental Screening Procedure as shown in **Annex 6**. One of the key environmental risks relate to the environmentally sound disposal of batteries used for storage in solar PV minigrids. A dedicated activity has been included in Output 1.1 to reinforce the mechanism for the collection and safe disposal of batteries at end-of-life.

76. Potential for Scaling-up: The replication and scaling of the project's impact is embedded within its. The project will develop a replication plan - including investment plans, for scaling-up investments in solar PV minigrids (Output 3.5). The replication plan will be based on lessons learned in Nigeria and across all child projects, and from GEF-funded minigrid projects worldwide. Importantly, scaling up investments in solar PV minigrids will be premised on ground-truthing of innovative business models centred on cost reduction levers and optimized capacity utilization, coupled with increased affordability of electricity to end users. The derisking approach supported by the project will lay the foundation for better development partner coordination around the choice and implementation of an optimum basket of policy and financial derisking instruments. So the GEF-financed project proposes innovative tools and approaches for incremental reasoning and complementarity of

interventions vis-à-vis parallel initiatives. A notable initiative that will also ensure scaling up of the project results and outcomes is the Energizing Agriculture Programme (EAP), of which the GEF-financed project is the first child project. Hence, the project results will directly impact the further implementation of the EAP, while noting that agriculture is the mainstay of the Nigeria economy both from an economic and job creation perspective. The project's comprehensive approach to reduce financing, hardware and soft costs will create the enabling environment to attract public and private investments. This coupled with sound knowledge management underpinned by a robust theory of change is expected to catalyze markets.

V. PROJECT RESULTS FRAMEWORK

Table 7. Project Results Framework.

This project will contribute to the following Sustainable Development Goal (s):

- SDG7: Ensure access to affordable, reliable, sustainable and modern energy for all (SDG 7.1 By 2030, ensure universal access to affordable, reliable and modern energy services; SDG 7.2 By 2030, increase substantially the share of renewable energy in the global energy mix)
- SDG13: Take urgent action to combat climate change and its impacts;
- SDG5: Achieve gender equality and empower all women and girls

This project will contribute to the following country outcome (UNDAF/CPD, RPD, GPD): *By 2022, Nigeria achieves environmental sustainability, climate resilience and food security through efficient management of its cultural and natural resources.*
Indicator 9.1: CO_2 emission per unit of value added; baseline: No baseline; target: No target

	Objective and Outcome Indicators	Baseline[72]	Mid-term Target[73]	End of Project Target
Project Objective: Supporting access to clean energy by increasing the financial viability and promoting scaled-up commercial investment in solar PV minigrids in Nigeria.	*Mandatory GEF Core Indicator 1:* Greenhouse gas emissions mitigated (cumulative metric tons of carbon dioxide equivalent (tCO2e))	*0*	*Direct: 17,815 tCO2e* *Indirect: 0 tCO2e*	*Direct: 74,228 tCO2e* *Indirect: 4,170,960 tCO2e*
	Mandatory GEF Core Indicator 2: Number of direct beneficiaries benefitting from energy access via minigrids, disaggregated by gender and by customer segment (Residential (number of people); commercial, social (number of connections))	*0 people (residential)* *0 connections (productive)* *0 connections (social)*	*16,815 people (49.3% women)[74] (residential)* *144 connections (productive)* *90 connections (social)*	*70,063 people (49.3% women) (residential)* *600 connections (productive)* *375 connections(social)*
	GEF Core Indicator 3: Increase in installed solar PV capacity (MegaWatt peak (MWp)) and battery storage (MWh)	*0 (solar PV)* *0 (battery storage)*	*0.7254 MWp* *1.80 MWh*	*3.0225 MWp* *7.51 MWh*
	Objective Level Indicator 4: Number of direct formal and informal primary jobs created in the minigrid sector, disaggregated by gender, for mini-grid development, operation and productive use. (number of jobs)	*0 (direct formal jobs)* *0 (direct informal jobs)*	*303 (20% women)* *140 (20% women)*	*1,263 (40 % women)* *583 (40% women)*
Project Component 1	Business Model Innovation with Private Sector			
Outcome 1 *Innovative business models based on cost reduction*	*Indicator 5:* Minigrid pilots implemented that demonstrate a delivery model, cost-reduction measure(s) and/or productive use of electricity (*binary (1/0)*)	*0*	*The project's detailed design plan (the 'Minigrid Pilot Plan') for advancing the minigrid pilots is*	*100% of the planned minigrid pilots, as identified in the project's Minigrid Pilot Plan, are commissioned. (1)*

[72] *Baseline, mid-term and end of project target levels must be expressed in the same neutral unit of analysis as the corresponding indicator. Baseline is the current/original status or condition and needs to be quantified. The baseline can be zero when appropriate given the project has not started. The baseline must be established before the project document is submitted to the GEF for final approval. The baseline values will be used to measure the success of the project through implementation monitoring and evaluation.*
[73] *Target is the change in the baseline value that will be achieved by the mid-term review and then again by the terminal evaluation.*
[74] Please see gender analysis given in Annex 11; World Development Indicators (2019); National Bureau of Statistics (2016) Nigeria - General Household Survey-Panel Wave 3.

operationalized to support and strengthen private participation in low-carbon minigrid development.			*developed, and cleared by UNDP. (1)* *Any project tendering process, as applicable, for minigrid pilots is launched. (1)*	
	Indicator 6: ***(a) Number*** of private sector minigrid developers and/or operators with enhanced ability, and (b) their level of capacity to participate in sector-wide tendering processes led by REA-REF to develop and/or operate minigrids based on innovative business models	*(a) 0* *(b) 0%*	*(a) 6 (20% women)* *(b) 75% (at least)*	*(a) 30 (40% women)* *(b) 95% (at least)*
	Indicator 7: ***(a) Percentage of REA-REF staff receiving training to enhance capacity, and (b) level of enhanced capacity for carrying out transparent bidding processes centred on innovative business models, including cost-reduction levers and gender-transformation***	*(a) 0 %* *(b) 0%*	*(a) 40%* *(b) 75 % (at least)*	*(a) 100%* *(b) 95 % (at least)*
Outputs to achieve Outcome 1	*Output 1.1: Pilots developed, including on productive use/innovative appliances and modular hardware/system design, leading to cost-reduction in mini-grids and sufficient growing demand for minigrid systems* *Output 1.2: Standardized online REF Calls for Proposals for enhanced transparency in developers bidding process* *Output 1.3: Capacity of potential tender bidders (private sector developers) strengthened to consider innovative business models and cost-reduction levers* *Output 1.4: Capacity building provided to public officials (regulator, ministries) specifically to design procurement/tender processes that incorporate cost-reduction levers and innovative business models* *Output 1.5: Capacity of winning tender bidders (private sector developers) strengthened to develop and implement innovative business models and cost-reduction levers* *Output 1.6: Scaled up support for upstream equipment manufacturers and suppliers*			
Project Component 2	Scaled-up Financing			
Outcome 2 *Financing mechanism and accompanying financial instruments in place to incentivize investments in the development of low-carbon minigrids*.	Indicator 8: ***(a) Number of*** financial institutions with enhanced capacity, and (b) level of capacity enhancement through training, knowledge sharing, and/or awareness raising events aimed at increasing the financial sector's capacity to evaluate investments in MG	*(a) 0* *(b) 0%*	*(a) 5* *(b) 75 % (at least)*	*(a) 15* *(b) 95% (at least)*
	Indicator 9: Number of government or impact investor-supported financing mechanisms offering concessional finance for low-carbon minigrids are designed and operational (number of funding instruments)	*0*	*2 funding instruments*	*4 funding instruments*

	Indicator 10: ***Size of investible solar PV assets (MW) developed based on project-supported market intelligence and feasibility studies***	*0 MW*	*4 MW (at least)*	*10 MW (at least)*
Outputs to achieve Outcome 2	*Output 2.1: Financial advisory committee established and operational* *Output 2.2: Innovative financing solutions for minigrid development are identified and implemented through the REF* *Output 2.3: General market intelligence study on minigrids prepared and disseminated amongst public officials and finance community* *Output 2.4: Feasibility study support provided to minigrid developers, creating a pipeline of investible assets* *Output 2.5: Capacity building provide to minigrid developers and investors on measuring and reporting on impact indicators, building credibility in impact investment as an asset class*			
Project Component 3	Digital, knowledge management, monitoring and evaluation, and scale-up strategy			
Outcome 3 ***Increased awareness and network opportunities in the minigrid market and among stakeholders, and lessons learned for scaling up rural electrification using low-carbon minigrids***.	*Indicator 11*: ***A digital strategy for the project is prepared and implemented by the PMU to contribute to project implementation and local minigrid market development*** (*binary (1/0)*)	*0*	*The project digital strategy is developed and being implemented. (1)*	*The project digital strategy is implemented. (1)* *Recommendations for rolling out digital solutions for minigrids at national level have been shared with key national stakeholders. (1)*
	Indicator 12: ***Percentage of minigrid pilots sharing data on minigrid performance with the regional project and other stakeholders following best practices and guidance provided by the AMP Regional Project***	*0*	*50% of the planned minigrid pilots, as identified in the project's Minigrid Pilot Plan, are collecting and sharing data with the project's digital platform*	*100% of the planned minigrid pilots, as identified in the project's Minigrid Pilot Plan, are collecting and sharing data with the project's digital platform*
	Indicator 13: ***Number of replication plan, including detailed budget, for scaling up the deployment of solar PV minigrids for energizing agriculture in Nigeria based on national and regional lessons learned*** *(number of plans)*	*0*	*0*	*1*
Outputs to achieve Outcome 3	*Output 3.1: Inception workshop* *Output 3.2: Project monitoring* *Output 3.3: Project evaluations* *Output 3.4: Lessons learned captured and disseminated at the national level* *Output 3.5: Replication plan (including investment plan) for scaling up rural energy access developed* *Output 3.6: Renewable Energy and minigrid Development Associations supported and strengthened to promote minigrid development* *Output 3.7: Project Digital Strategy developed/implemented and Quality Assurance Framework augmented and independent verification process in place for measuring, reporting and verification of the sustainable develop impacts of minigrids, including GHG emission reductions*			

VI. MONITORING AND EVALUATION (M&E) PLAN

73. The project results, corresponding indicators and mid-term and end-of-project targets in the project results framework will be monitored annually and evaluated periodically during project implementation. If baseline data for some of the results indicators is not yet available, it will be collected during the first year of project implementation. The Monitoring Plan included in **Annex 5** details the roles, responsibilities, and frequency of monitoring project results.

74. Project-level monitoring and evaluation will be undertaken in compliance with UNDP requirements as outlined in the UNDP POPP and UNDP Evaluation Policy. The UNDP Country Office is responsible for ensuring full compliance with all UNDP project monitoring, quality assurance, risk management, and evaluation requirements.

75. Additional mandatory GEF-specific M&E requirements will be undertaken in accordance with the GEF Monitoring Policy and the GEF Evaluation Policy and other relevant GEF policies[75]. The costed M&E plan included below, and the Monitoring plan in Annex, will guide the GEF-specific M&E activities to be undertaken by this project.

76. In addition to these mandatory UNDP and GEF M&E requirements, other M&E activities deemed necessary to support project-level adaptive management will be agreed during the Project Inception Workshop and will be detailed in the Inception Report.

Additional GEF monitoring and reporting requirements:

77. Inception Workshop and Report: A project inception workshop will be held within 60 days of project CEO endorsement, with the aim to:
    a. Familiarize key stakeholders with the detailed project strategy and discuss any changes that may have taken place in the overall context since the project idea was initially conceptualized that may influence its strategy and implementation.
    b. Discuss the roles and responsibilities of the project team, including reporting lines, stakeholder engagement strategies and conflict resolution mechanisms.
    c. Review the results framework and monitoring plan.
    d. Discuss reporting, monitoring and evaluation roles and responsibilities and finalize the M&E budget; identify national/regional institutes to be involved in project-level M&E; discuss the role of the GEF OFP and other stakeholders in project-level M&E.
    e. Update and review responsibilities for monitoring project strategies, including the risk log; SESP report, Social and Environmental Management Framework and other safeguard requirements; project grievance mechanisms; gender strategy; knowledge management strategy, and other relevant management strategies.
    f. Review financial reporting procedures and budget monitoring and other mandatory requirements and agree on the arrangements for the annual audit.
    g. Plan and schedule Project Board meetings and finalize the first-year annual work plan.
    h. Formally launch the Project.

78. GEF Project Implementation Report (PIR): The annual GEF PIR covering the reporting period July (previous year) to June (current year) will be completed for each year of project implementation. Any environmental and social risks and related management plans will be monitored regularly, and progress will be reported in the PIR. The PIR submitted to the GEF will be shared with the Project Board. The quality rating of the previous year's PIR will be used to inform the preparation of the subsequent PIR.

79. GEF Core Indicators: The Core indicators included as Annex 15 will be used to monitor global environmental benefits and will be updated for reporting to the GEF prior to MTR and TE. Note that the project team is responsible for updating the indicator status. The updated monitoring data should be shared with MTR/TE

[75] See https://www.thegef.org/gef/policies_guidelines

consultants prior to required evaluation missions, so these can be used for subsequent groundtruthing. The methodologies to be used in data collection have been defined by the GEF and are available on the GEF website.

80. Independent Mid-term Review (MTR): The terms of reference, the review process and the final MTR report will follow the standard templates and guidance for GEF-financed projects available on the UNDP Evaluation Resource Center (ERC).
81. The evaluation will be 'independent, impartial and rigorous'. The evaluators that will be hired to undertake the assignment will be independent from organizations that were involved in designing, executing or advising on the project to be evaluated. Equally, the evaluators should not be in a position where there may be the possibility of future contracts regarding the project under review.
82. The GEF Operational Focal Point and other stakeholders will be actively involved and consulted during the evaluation process. Additional quality assurance support is available from the BPPS/GEF Directorate.
83. The final MTR report and MTR TOR will be publicly available in English and will be posted on the UNDP ERC by 01 February 2024. A management response to MTR recommendations will be posted in the ERC within six weeks of the MTR report's completion.
84. Terminal Evaluation (TE): An independent terminal evaluation (TE) will take place upon completion of all major project outputs and activities. The terms of reference, the evaluation process and the final TE report will follow the standard templates and guidance for GEF-financed projects available on the UNDP Evaluation Resource Center.
85. The evaluation will be 'independent, impartial and rigorous'. The evaluators that will be hired to undertake the assignment will be independent from organizations that were involved in designing, executing or advising on the project to be evaluated. Equally, the evaluators should not be in a position where there may be the possibility of future contracts regarding the project being evaluated.
86. The GEF Operational Focal Point and other stakeholders will be actively involved and consulted during the terminal evaluation process. Additional quality assurance support is available from the BPPS/GEF Directorate.
87. The final TE report and TE TOR will be publicly available in English and posted on the UNDP ERC by 01 June 2025. A management response to the TE recommendations will be posted to the ERC within six weeks of the TE report's completion.
88. Final Report: The project's terminal GEF PIR along with the terminal evaluation (TE) report and corresponding management response will serve as the final project report package. The final project report package shall be discussed with the Project Board during an end-of-project review meeting to discuss lesson learned and opportunities for scaling up.
89. Agreement on intellectual property rights and use of logo on the project's deliverables and disclosure of information**:** To accord proper acknowledgement to the GEF for providing grant funding, the GEF logo will appear together with the UNDP logo on all promotional materials, other written materials like publications developed by the project, and project hardware. Any citation on publications regarding projects funded by the GEF will also accord proper acknowledgement to the GEF. Information will be disclosed in accordance with relevant policies notably the UNDP Disclosure Policy[76] and the GEF policy on public involvement[77].
90. Linkages to the AMP Regional Project: In addition, the project will establish M&E linkages with the AMP Regional project in the manner described in Box 3:

[76] See http://www.undp.org/content/undp/en/home/operations/transparency/information_disclosurepolicy/
[77] See https://www.thegef.org/gef/policies_guidelines

Box 3: Linkages to the AMP Regional Project - M&E

The project will share M&E information with the AMP Regional Project as follows:

- The project will provide on an annual basis (and to the extent feasible if requested on an ad-hoc basis) the following M&E information to the AMP regional project staff: (a) Standard reporting on all indicators in the results framework for aggregation and reporting to GEF (by the regional project) on the impacts of all participating national projects for the program as a whole; and (b) Reporting on any and all additional Key Performance Indicators (KPIs) adopted by the project under the common M&E framework.

The project will receive support and guidance from the AMP Regional Project for conducting M&E activities as follows:

- **Inception workshop**. The AMP Regional Project PMU will:
    a. Provide support to the project PMU to develop content and materials to facilitate project planning activities to be completed during and after the Inception Workshop. This includes but is not limited to support for the PMU to prepare and/or update 'key project planning instruments' such as the Total Budget and Work Plan, multi-year work plan, Annual Work Plan (AWP), Monitoring Plan, Risks Matrix, and Procurement Plan, among others.
    b. Participate either remotely or in-person in the Inception Workshop.
    c. Review and provide inputs to the Inception Report prior to submitting to UNDP.
- **Ongoing project monitoring**. The AMP Regional Project PMU will:
    a. Develop a 'common monitoring and evaluation (M&E) framework' against which GHG emission reductions and broader SDG impacts and program objectives can be measured, and work closely with national child projects to ensure operationalization and harmonization.
    b. Provide support to the project PMU for updating 'key project planning instruments' at least on an annual basis as required to comply with UNDP project monitoring, quality assurance, and risk management requirements, and ensure adequate project planning and adaptive management. This may entail developing common templates for 'key project planning instruments'.
    c. Review and provide feedback on reports submitted by the project PMU seeking to continuously improve the quality and ease of reporting by national projects.
    d. Aggregate M&E data from all national projects, including Results Framework and all additional Key Performance Indicators (KPIs) adopted by the project under the common M&E framework, and report back to GEF at the program level.
- **Evaluations (MTR and TE)**. The AMP Regional Project PMU will:
    a. Make available to national projects standardized terms of reference for MTR and TE as well as a roster of vetted evaluation consultants.
    b. Review and provide feedback on terms of reference and draft evaluation reports shared by the project PMU to ensure project-level evaluation will be undertaken in compliance with UNDP requirements.
    c. Make themselves available for interviews and consultation in the context of national project mid-term and terminal evaluations.

Table 8. Monitoring and evaluation plan and budget.

Monitoring and Evaluation Plan and Budget: This M&E plan and budget provides a breakdown of costs for M&E activities to be led by the Project Management Unit during project implementation. These costs are included in Component 3 of the Results Framework and TBWP. For ease of reporting M&E costs, please include all costs reported in the M&E plan under the one technical component. The oversight and participation of the UNDP Country Office/Regional technical advisors/HQ Units are not included as these are covered by the GEF Fee.		
GEF M&E requirements	**Indicative costs (US$)**	**Time frame**
Inception Workshop	*5,000*	Within 60 days of CEO endorsement of this project.
Inception Report	None	Within 90 days of CEO endorsement of this project.
M&E of GEF core indicators and project results framework	*21,000*	Annually and at mid-point and closure..
GEF Project Implementation Report (PIR)	*None* *[Covered by the salary of the Project Manager]*	Annually typically between June-August
Monitoring of *SES, gender action plan, and stakeholder engagement plan (project risks)*	*49,000*	On-going.
Supervision missions	None	Annually

Monitoring and Evaluation Plan and Budget: This M&E plan and budget provides a breakdown of costs for M&E activities to be led by the Project Management Unit during project implementation. These costs are included in Component 3 of the Results Framework and TBWP. For ease of reporting M&E costs, please include all costs reported in the M&E plan under the one technical component. The oversight and participation of the UNDP Country Office/Regional technical advisors/HQ Units are not included as these are covered by the GEF Fee.		
GEF M&E requirements	**Indicative costs (US$)**	**Time frame**
Independent Mid-term Review (MTR)	*42,160*	*01 February 2024*
Independent Terminal Evaluation (TE)	*57,370*	*01 November 2025*
TOTAL indicative COST **(2.96% of GEF grant)**	**174,530**	

VII. GOVERNANCE AND MANAGEMENT ARRANGEMENTS

Roles and responsibilities of the project's governance mechanism:

90. Implementing Partner: The Implementing Partner for this project is the Rural Electrification Agency. The Implementing Partner is the entity to which the UNDP Administrator has entrusted the implementation of UNDP assistance specified in this signed project document along with the assumption of full responsibility and accountability for the effective use of UNDP resources and the delivery of outputs, as set forth in this document.

91. The Implementing Partner is responsible for executing this project. Specific tasks include:
    - Project planning, coordination, management, monitoring, evaluation and reporting. This includes providing all required information and data necessary for timely, comprehensive and evidence-based project reporting, including results and financial data, as necessary. The Implementing Partner will strive to ensure project-level M&E is undertaken by national institutes and is aligned with national systems so that the data used and generated by the project supports national systems.
    - Risk management as outlined in this Project Document;
    - Procurement of goods and services, including human resources;
    - Financial management, including overseeing financial expenditures against project budgets;
    - Approving and signing the multiyear workplan;
    - Approving and signing the combined delivery report at the end of the year; and,
    - Signing the financial report or the funding authorization and certificate of expenditures.

92. Project stakeholders and target groups: The project stakeholders and target groups are identified in **Table 5** (Section IV) above with more details given in Annex 9 – Stakeholder Engagement Plan. The involvement of the key stakeholders in project management is shown below in project organization structure shown below.

93. UNDP: UNDP is accountable to the GEF for the implementation of this project. This includes oversight of project execution to ensure that the project is being carried out in accordance with agreed standards and provisions. UNDP is responsible for delivering GEF project cycle management services comprising project approval and start-up, project supervision and oversight, and project completion and evaluation. UNDP is also responsible for the Project Assurance role of the Project Board/Steering Committee.

Project organisation structure:

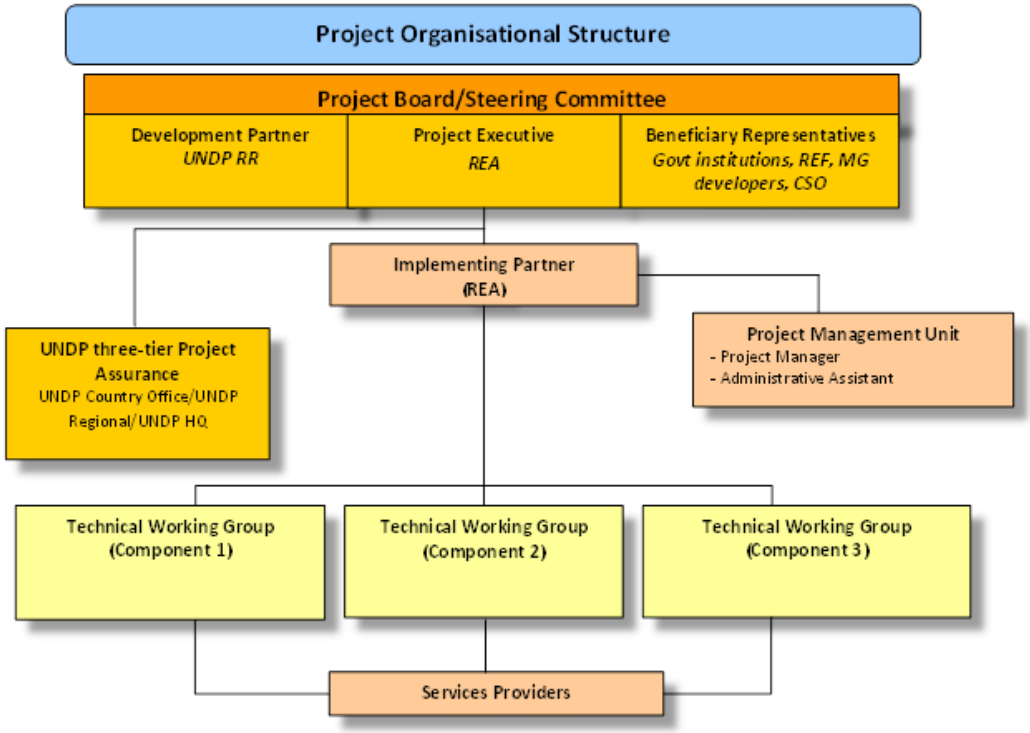


Figure 7. Project organisational structure.

94. The Project Board (also called Project Steering Committee) is responsible for taking corrective action as needed to ensure the project achieves the desired results. In order to ensure UNDP's ultimate accountability, Project Board decisions should be made in accordance with standards that shall ensure management for development results, best value money, fairness, integrity, transparency and effective international competition.

95. In case consensus cannot be reached within the Board, the UNDP Resident Representative (or their designate) will mediate to find consensus and, if this cannot be found, will take the final decision to ensure project implementation is not unduly delayed.

96. Specific responsibilities of the Project Board include:
    - Provide overall guidance and direction to the project, ensuring it remains within any specified constraints;
    - Address project issues as raised by the project manager;
    - Provide guidance on new project risks, and agree on possible mitigation and management actions to address specific risks;
    - Agree on project manager's tolerances as required, within the parameters set by UNDP-GEF, and provide direction and advice for exceptional situations when the project manager's tolerances are exceeded;
    - Advise on major and minor amendments to the project within the parameters set by UNDP-GEF;
    - Ensure coordination between various donor and government-funded projects and programmes;
    - Ensure coordination with various government agencies and their participation in project activities;
    - Track and monitor co-financing for this project;
    - Review the project progress, assess performance, and appraise the Annual Work Plan for the following year;
    - Appraise the annual project implementation report, including the quality assessment rating report;
    - Ensure commitment of human resources to support project implementation, arbitrating any issues within the project;
    - Review combined delivery reports prior to certification by the implementing partner;
    - Provide direction and recommendations to ensure that the agreed deliverables are produced satisfactorily according to plans;
    - Address project-level grievances;

- Approve the project Inception Report, Mid-term Review and Terminal Evaluation reports and corresponding management responses;
- Review the final project report package during an end-of-project review meeting to discuss lesson learned and opportunities for scaling up.
- Ensure highest levels of transparency and take all measures to avoid any real or perceived conflicts of interest.
- Designate the 'beneficiary representative' of the project on the AMP Regional Project's Steering Committee/Project Board

97. The composition of the Project Board must include the following roles:
   a. Project Executive: Is an individual who represents ownership of the project and chairs the Project Board. The Executive is normally the national counterpart for nationally implemented projects. The Project Executive will be a representative of the REA.
   b. Beneficiary Representative(s): Individuals or groups representing the interests of those who will ultimately benefit from the project. Their primary function within the board is to ensure the realization of project results from the perspective of project beneficiaries. Often civil society representative(s) can fulfil this role. The Beneficiary representative (s) is/are: The Beneficiary representative (s) are: line ministries and public institutions (e.g. Federal Ministry of Power, Federal Ministry of Agriculture and Rural Development, Federal Ministry of Environment, Federal Ministry of Industry, Trade and Investment, Energy Commission of Nigeria), private sector RE and minigrids associations, NGOs and civil society organizations (CSOs).
   c. Development Partner(s): The Development Partner is the UNDP Resident Representative (RR). There are other implementing partners such as the World Bank and the African Development Bank that are supporting the electrification of productive energy uses by supporting isolated minigrids under the NEP. All NEP support is coordinated under the aegis of the REA that is also the Implementing Partner. REA will decide on a needs basis to invite any other (i.e. in addition to UNDP) development partners to PSC meetings on a needs basis.
   d. Project Assurance: UNDP performs the quality assurance and supports the Project Board and Project Management Unit by carrying out objective and independent project oversight and monitoring functions. This role ensures appropriate project management milestones are managed and completed, and conflict of interest issues are monitored and addressed. The Project Board cannot delegate any of its quality assurance responsibilities to the Project Manager. UNDP provides a three – tier oversight services involving the UNDP Country Offices and UNDP at regional and headquarters levels. Project assurance is totally independent of project execution.
98. **Project extensions:** The UNDP Resident Representative and the UNDP-GEF Executive Coordinator must approve all project extension requests. Note that all extensions incur costs and the GEF project budget cannot be increased. A single extension may be granted on an exceptional basis and only if the following conditions are met: one extension only for a project for a maximum of six months; the project management costs during the extension period must remain within the originally approved amount, and any increase in PMC costs will be covered by non-GEF resources; the UNDP Country Office oversight costs in excess of the CO's Agency fee specified in the DOA during the extension period must be covered by non-GEF resources.
99. **Representation on the AMP Regional Project's board:** A representative of the project will sit on the project board/steering committee of the AMP Regional Project in a role as 'beneficiary representative.' It is expected that all AMP Regional Project board meetings will be held virtually (i.e. not in-person) and that beneficiary representatives will participate in project board meetings via video-conference. The representative of the project on the AMP Regional Project board will be from the Implementing Partner (Rural Electrification Agency)[78]**.** It is expected that the AMP Regional Project board will meet a maximum of twice per year.

[78] This role will be additional to any role in the national project steering committee. It is recommended this role will be played by either the representative of the IP on the national project steering committee or the project manager/project coordinator of the project.

VIII. FINANCIAL PLANNING AND MANAGEMENT

100. The total cost of the project is *USD 105,655,046.* This is financed through a GEF grant of *USD* 5,905,406 administered by UNDP, and additional support of *USD 99,750,000* in the form of parallel financing. UNDP, as the GEF Implementing Agency, is responsible for the oversight of the GEF resources and the cash co-financing transferred to UNDP bank account only.

101. Confirmed Co-financing: The actual realization of project co-financing will be monitored during the *mid-term review* and terminal evaluation process and will be reported to the GEF. Note that all project activities included in the project results framework that will be delivered by co-financing partners (even if the funds do not pass through UNDP accounts) must comply with UNDP's social and environmental standards. Co-financing will be used for the following project activities/outputs:

Table 9. Allocation of co-financing and risk mitigation measures.

Co-financing source	Co-financing type	Co-financing amount (USD)	Planned Co-financing Activities/Outputs	Risks	Risk Mitigation Measures
Government / REA	Cash	10,000,000	All project outputs	The risk is low since the source of co-financing is from capital expenditure budget for supporting off-grid electrification. This budget has been stable over the years, especially given the strong interest by the FGN to spur rural development through off-grid electrification.	The Project Manager will track the flows of co-financing. In the unlikely case that the REA would witness cuts in capital expenditure budget, the project will seek additional co-financing from other development partners active in the minigrids space.
Government / REA	In-kind	625,000	All project outputs	The risk is low since the in-kind contribution is related to the time contribution of REA and REF staff. The salaries of staff are covered through recurrent budget.	No mitigation measure is in place for this co-financing.
GEF Agency – African Development Bank (through the African Development Fund window and the Africa Growing Together Fund)	Cash (loan)	64,285,714	Parallel investments in renewable off-grid energy technologies;	The risk is low since as per the loan was already contracted between the AfDB and the FGN as from 2019. The total loan (combining	The sovereign loan is guaranteed by the FGN and no risk mitigation measure is in place.

				AfDB loan and a loan from the Africa Growing Together Fund) is USD 208 million for the period 2018-2024, of which USD 150 million is attributable to AfDB.	
GEF Agency – African Development Bank (through the Sustainable Energy Fund for Africa)	Cash (grant)	125,000	Technical assistance – capacity building of stakeholders; knowledge management	The grant is a package of USD 500,000 that was already allocated in 2019 covering the period to 2022. Hence, the risk is low.	No mitigation measure is in place for this co-financing.

102. Budget Revision and Tolerance: As per UNDP requirements outlined in the UNDP POPP, the project board will agree on a budget tolerance level for each plan under the overall annual work plan allowing the project manager to expend up to the tolerance level beyond the approved project budget amount for the year without requiring a revision from the Project Board.

103. Should the following deviations occur, the Project Manager/CTA and UNDP Country Office will seek the approval of the BPPS/GEF team to ensure accurate reporting to the GEF:
   a) Budget re-allocations among components in the project budget with amounts involving 10% of the total project grant or more;
   b) Introduction of new budget items that exceed 5% of original GEF allocation.

104. Any over expenditure incurred beyond the available GEF grant amount will be absorbed by non-GEF resources (e.g. UNDP TRAC or cash co-financing).

105. Audit: The project will be audited as per UNDP Financial Regulations and Rules and applicable audit policies. Audit cycle and process must be discussed during the Inception workshop. If the Implementing Partner is an UN Agency, the project will be audited according to that Agencies applicable audit policies.

106. Project Closure: Project closure will be conducted as per UNDP requirements outlined in the UNDP POPP. All costs incurred to close the project must be included in the project closure budget and reported as final project commitments presented to the Project Board during the final project review. The only costs a project may incur following the final project review are those included in the project closure budget.

107. Operational completion: The project will be operationally completed when the last UNDP-financed inputs have been provided and the related activities have been completed. This includes the final clearance of the Terminal Evaluation Report (that will be available in English) and the corresponding management response, and the end-of-project review Project Board meeting. **Operational closure must happen with 3 months after posting the TE report to the UNDP ERC**. The Implementing Partner through a Project Board decision will notify the UNDP Country Office when operational closure has been completed. At this time, the relevant parties will have already agreed and confirmed in writing on the arrangements for the disposal of any equipment that is still the property of UNDP.

108. Transfer or disposal of assets: In consultation with the Implementing Partner and other parties of the project, UNDP is responsible for deciding on the transfer or other disposal of assets. Transfer or disposal of assets is recommended to be reviewed and endorsed by the project board following UNDP rules and regulations. Assets may be transferred to the government for project activities managed by a national institution at any time during

the life of a project. In all cases of transfer, a transfer document must be prepared and kept on file[79]. The transfer should be done before Project Management Unit complete their assignments.

109. Financial completion (closure): The project will be financially closed when the following conditions have been met: a) the project is operationally completed or has been cancelled; b) the Implementing Partner has reported all financial transactions to UNDP; c) UNDP has closed the accounts for the project; d) UNDP and the Implementing Partner have certified a final Combined Delivery Report (which serves as final budget revision).

110. The project will be financially completed **within 6 months of operational closure or after the date of cancellation**. Between operational and financial closure, the implementing partner will identify and settle all financial obligations and prepare a final expenditure report. The UNDP Country Office will send the final signed closure documents including confirmation of final cumulative expenditure and unspent balance to the BPPS/GEF Unit for confirmation before the project will be financially closed in Atlas by the UNDP Country Office.

111. Refund to GEF: Should a refund of unspent funds to the GEF be necessary, this will be managed directly by the BPPS/GEF Directorate in New York. No action is required by the UNDP Country Office on the actual refund from UNDP project to the GEF Trustee.

79 See https://popp.undp.org/_layouts/15/WopiFrame.aspx?sourcedoc=/UNDP_POPP_DOCUMENT_LIBRARY/Public/PPM_Project%20Management_Closing.docx&action=default.

IX. TOTAL BUDGET AND WORK PLAN

Total Budget and Work Plan			
Atlas Award ID:	00135668	Atlas Output Project ID:	00126833
Atlas Proposal or Award Title:	PIMS 6339. NGA_African Minigrid Programme		
Atlas Business Unit	NGA10		
Atlas Primary Output Project Title	NGA_African Minigrid Programme		
UNDP-GEF PIMS No.	6339		
Implementing Partner	*Rural Electrification Agency*		

GEF Outcome/Atlas Activity	Responsible Party/ Implementing Agent	Fund ID	Donor Name	Atlas Budgetary Account Code	ATLAS Budget Description	Amount Year 1 (USD)	Amount Year 2 (USD)	Amount Year 3 (USD)	Amount Year 4 (USD)	Total (USD)	Budget notes
OUTCOME 1: Innovative business models based on cost reduction operationalized to support and strengthen private participation in low-carbon minigrid development.	REA	**62000**	**GEF**	71200	International Consultants	71,100	74,700	90,900	36,000	272,700	1
				71300	Local Consultants	50,000	49,000	54,000	27,500	180,500	2
				71600	Travel	19,570	26,260	24,340	15,000	85,170	3
				74200	Audio Visual & Print Prod Costs	6,233	4,030	5,383	4,783	20,429	4
				75700	Workshops and Meetings	2,000	5,000	6,000	2,500	15,500	5
				72100	Contractual Services - Companies	742,482	2,356,965	0	0	3,099,447	6
					sub-total GEF	**891,385**	**2,515,955**	**180,623**	**85,783**	**3,673,746**	
					sub-total Outcome 1	**891,385**	**2,515,955**	**180,623**	**85,783**	**3,673,746**	
OUTCOME 2: Financing mechanism and accompanying financial instruments in place to incentivize investments in the	REA	**62000**	**GEF**	71200	International Consultants	130,500	123,300	91,800	91,800	437,400	7
				71300	Local Consultants	89,000	109,500	122,000	124,500	445,000	8
				71600	Travel	28,930	30,630	27,560	28,500	115,620	9
				74200	Audio Visual & Print Prod Costs	6,400	8,400	9,300	9,221	33,321	10

development of low-carbon minigrids.				75700	Workshops and Meetings	8,000	5,000	6,000	6,000	25,000	11
					sub-total GEF	**262,830**	**276,830**	**256,660**	**260,021**	**1,056,341**	
					sub-total Outcome 2	**262,830**	**276,830**	**256,660**	**260,021**	**1,056,341**	
OUTCOME 3: Increased awareness and network opportunities in the minigrid market and among stakeholders, and lessons learned for scaling up rural electrification using low-carbon minigrids.	REA	**62000**	**GEF**	71200	International Consultants	52,200	22,500	0	94,500	169,200	12
				71300	Local Consultants	70,000	82,500	50,000	95,000	297,500	13
				71600	Travel	54,040	64,700	56,010	26,700	201,450	14
				74200	Audio Visual & Print Prod Costs	2,425	3,262	3,050	3,850	12,587	15
				75700	Workshops and Meetings	11,000	8,000	5,500	14,000	38,500	16
					sub-total GEF	**189,665**	**180,962**	**114,560**	**234,050**	**719,237**	
OUTCOME 3: Monitoring and Evaluation	REA	**62000**	**GEF**	71200	International Consultants	0	31,500	0	45,000	76,500	17
				71300	Local Consultants	17,500	17,500	17,500	17,500	70,000	18
				71600	Travel	0	7,660	0	8,870	16,530	19
				75700	Workshops and Meetings	5,000	3,000	0	3,500	11,500	20
					sub-total GEF (M&E)	**22,500**	**59,660**	**17,500**	**74,870**	**174,530**	
					sub-total Outcome 3	**212,165**	**240,622**	**132,060**	**308,920**	**893,767**	
PROJECT MANAGEMENT UNIT	REA	**62000**	**GEF**	71800	Contractual Services-Imp Partner	64,572	64,572	64,572	64,572	258,288	21
				72800	Information Technology Equipmt	5,000	0	0	0	5,000	22
				74100	Audit (Professional Servcies)	4,001	4,001	4,001	4,001	16,004	23
				72500	Office supplies	500	500	450	450	1,900	24
					sub-total GEF	**74,073**	**69,073**	**69,023**	**69,023**	**281,192**	
					sub-total PMU	**74,073**	**69,073**	**69,023**	**69,023**	**281,192**	
					PROJECT TOTAL (GEF)	**1,440,453**	**3,102,480**	**638,366**	**723,747**	**5,905,046**	

Summary of Funds:

	Amount Year 1 (USD)	Amount Year 2 (USD)	Amount Year 3 (USD)	Amount Year 4 (USD)	Total (USD)
GEF grant administered by UNDP	1,440,453	3,102,480	638,366	723,747	5,905,046
Rural Electrification Agency (cash)	2,500,000	2,500,000	2,500,000	2,500,000	10,000,000
Rural Electrification Agency (in-kind)	156,250	156,250	156,250	156,250	625,000
African Development Bank (loan)	28,892,456	21,669,342	13,723,916	-	64,285,714
African Development Bank (grant)	125,000	-	-	-	125,000
TOTAL	**33,114,159**	**27,428,072**	**17,018,532**	**3,379,997**	**80,940,760**

OUTCOME 1	
1	International expertise will be required for implementing activities for all outputs except for Output 1.2. The outcome deals with innovative business models based on cost-reduction levers, and hence is novel in Nigeria. Hence, there is need for more international expertise and knowledge transfer. The annual breakdown of international consultancy budget is as follows: Year 1 (USD 71,100): USD 18,000 (Act. 1.3.1); USD 21,600 (Act. 1.4.2); USD 13,500 (Act. 1.5.1); USD 18,000 (Act. 1.5.2). Year 2 (USD 74,700): USD 13,500 (Act. 1.3.1); USD 9,000 (Act. 1.3.2); USD 9,000 (Act. 1.5.2); USD 9,000 (Act. 1.5.3); USD 34,200 (Act. 1.6.1). Year 3 (USD 90,900): USD 13,500 (Act. 1.1.2); USD 13,500 (Act. 1.5.1); USD 7,200 (Act. 1.5.3); USD 13,500 (Act. 1.5.4); USD 21,600 (Act. 1.6.1); USD 21,600 (Act. 1.6.2). Year 4 (USD 36,000): USD 13,500 (Act. 1.1.2); USD 9,000 (Act. 1.5.1); USD 13,500 (Act. 1.5.4). A daily fee of USD 900 has been used for estimating the cost of international consultants (same as for Outcomes 2 and 3). Hence, dividing the above activity-related budgets will give the number of days for consultancies as given in Annex 8.
2	National consultants are used to support the work on international consultants at note 1, as well as to implement activities under Output 1.2. The annual breakdown of national consultancy budget is as follows: Year 1 (USD 50,000): USD 12,500 (Act. 1.4.1); USD 10,000 (Act. 1.2.1); USD 5,000 (Act. 1.2.2); USD 7,500 (Act. 1.3.1); USD 7,500 (Act. 1.4.1); USD 7,500 (Act. 1.4.2). Year 2 (USD 49,000): USD 9,000 (Act. 1.2.2); USD 7,500 (Act. 1.3.1); USD 5,000 (Act. 1.3.2); USD 12,500 (Act. 1.4.1); USD 15,000 (Act. 1.6.1). Year 3 (USD 54,000): USD 9,000 (Act. 1.2.2); USD 10,000 (Act. 1.3.1); USD 5,000 (Act. 1.3.2); USD 12,500 (Act. 1.4.1); USD 10,000 (Act. 1.6.1); USD 7,500 (Act. 1.6.2). Year 4 (USD 27,500): USD 10,000 (Act. 1.3.1); USD 5,000 (Act. 1.3.2); USD 12,500 (Act. 1.4.1).

	A daily fee of USD 500 has been used for estimating the cost of national consultants (same as for Outcomes 2 and 3). Hence, dividing the above activity-related budgets will give the number of days for consultancies as given in Annex 8.
3	The travel budget for Outcome 1 covers the costs of travel and accommodation of national and international consultants that increase over the first three years related to increasing project activities commensurate with increasing investments in solar PV-battery minigrids in agricultural value chains. The annual breakdown across the activities planned under Outcome 1 are: Year 1 (USD 19,570): USD 5,740 (Act. 1.3.1); USD 1,410 (Act. 1.4.1); USD 4,300 (Act. 1.4.2); USD 3,340 (Act. 1.5.1); USD 4,780 (Act. 1.5.2). Year 2 (USD 26,260): USD 5,740 (Act. 1.3.1); USD 2,820 (Act. 1.4.1); USD 3,340 (Act. 1.5.2); USD 4,300 (Act. 1.5.3); USD 10,060 (Act. 1.6.1). Year 3 (USD 24,340): USD 3,820 (Act. 1.1.2); USD 1,440 (Act. 1.3.1); USD 2,820 (Act. 1.4.1); USD 3,340 (Act. 1.5.2); USD 3,820 (Act. 1.5.4); USD 9,100 (Act. 1.6.1). Year 4 (USD 15,000): USD 3,820 (Act. 1.1.2); USD 1,440 (Act. 1.3.1); USD 2,820 (Act. 1.4.1); USD 3,100 (Act. 1.5.1); USD 3,820 (Act. 1.5.4). For estimating the travel budget, four parameters were used: (1) International return airfare (Abuja / Lagos): USD 1,900; (ii) per diem for international consultant: USD 240 per day; (iii) per diem for national consultant (USD 110 per day); and (iv) local air travel: USD 250 per person per return trip / one day field trip. The details of the calculations are given in the Excel file accompanying the ProDoc (Annex 18) [PIMS – AMP Nigeria Child project – Budget.xlsx].
4	The printing and publication costs are budgeted for Act. 1.1.5 (USD 6,233 in year 1, USD 4,030 in year 2, USD 4,783 in year 3 and USD 4,783 in year 4) and Act. 1.6.2 (USD 600 in year 3).
5	Working meetings or workshops are planned during project lifetime to carry out stakeholder coordination related activities of Outputs 1.3, 1.5 and 1.6 only. Allocations are as such: Year 1 (USD 2,000) - USD 1,000 (Act. 1.3.1); USD 1,000 (Act. 1.5.1). Year 2 (USD 5,000) - USD 1,000 (Act. 1.3.1); USD 1,500 (Act. 1.3.2); USD 500 (Act. 1.5.3); USD 2,000 (Act. 1.6.1). Year 3 (USD 6,000) - USD 1,500 (Act. 1.5.1); USD 2,000 (Act. 1.6.1); USD 2,500 (Act. 1.6.2). Year 4 (USD 2,500) - USD 2,500 (Act. 1.5.1). The workshops are accounted for in two forms, namely: (i) working sessions that can last up to half a day and regrouping between 15-20 persons; and (ii) a one-day national workshop for around 40-50 persons. Each work session is estimated to cost USD 500, while the national workshop is estimated to cost USD 2,500. For example, a budget of USD 1,500 for Act. 1.5.1 in year 3 consists of 3 work sessions, and that for Act. 1.6.2 represents a 1-day national workshop. The same logic applies to workshops and meetings budgeted under Outcomes 2 and 3.
6	The investment part of GEF will be used to provide payments to solar PV-battery minigrid developers/operators for energy services. The payments will be disbursed to winning bidders under Output 1.1 through transparent Calls for Proposals that will be launched by the Rural Electrification Fund (REF). The level of payment will be based on LCOE parity with baseline diesel generation as detailed in Annex 18. As discussed in Section IV, a staged approach will be adopted based on learning-by-doing, implying that GEF investments (USD 3,099,447) will be deployed in two tranches covering the installation of 6 (see Output 1.1 for pilots) and 19 solar PV-battery minigrids in starting in year 1 (USD 742,482) and year 2 (USD 2,356,965), respectively.
OUTCOME 2	
7	International expertise will be required for implementing activities for all outputs except for Output 2.1. The allocation follows a different trajectory as that for national consultants. This approach of front-loading international consultancies is to ensure local capacity building so that trained national consultants and institutional capacity building become more significant in the second half of the project. The annual breakdown of international consultancy budget is as follows: Year 1 (USD 130,500): USD 28,800 (Act. 2.2.1); USD 36,000 (Act. 2.3.1); USD 17,100 (Act. 2.3.2); USD 21,600 (Act. 2.4.2); USD 27,000 (Act. 2.5.1). Year 2 (USD 123,300): USD 18,000 (Act. 2.2.1); USD 13,500 (Act. 2.2.2); USD 36,000 (Act. 2.3.1); USD 38,700 (Act. 2.3.2); USD 36,000 (Act. 2.4.2).

	Year 3 and year 4 each (USD 91,800): USD 36,000 (Act. 2.3.1); USD 17,100 (Act. 2.3.2); USD 38,700 (Act. 2.4.2).
8	As mentioned at note 8, national consultants are used to support international consultants and responsible for implementing the activities under Output 2.1. The annual breakdown for national consultancy budget is as follows: Year 1 (USD 89,000): USD 7,000; (Act. 2.1.1); USD 5,000 (Act. 2.1.2); USD 10,000 (Act. 2.3.1); USD 10,100 (Act. 2.3.2); USD 30,000 (Act. 2.4.1); USD 7,000 (Act. 2.4.2); USD 10,000 (Act. 2.5.1); USD 10,000 (Act. 2.5.2). Year 2 (USD 109,500): USD 5,000 (Act. 2.1.2); USD 10,000 (Act. 2.3.1); USD 10,100 (Act. 2.3.2); USD 50,000 (Act. 2.4.1); USD 12,000 (Act. 2.4.2); USD 12,500 (Act. 2.5.1); USD 10,000 (Act. 2.5.2). Year 3 (USD 122,000): USD 10,000 (Act. 2.3.1); USD 10,100 (Act. 2.3.2); USD 55,000 (Act. 2.4.1); USD 12,000 (Act. 2.4.2); USD 15,000 (Act. 2.5.1); USD 20,000 (Act. 2.5.2). Year 4 (USD 124,500): USD 10,000 (Act. 2.3.1); USD 10,100 (Act. 2.3.2); USD 55,000 (Act. 2.4.1); USD 12,000 (Act. 2.4.2); USD 17,5 00 (Act. 2.5.1); USD 20,000 (Act. 2.5.2).
9	The travel budget for Outcome 2 covers the costs of travel and accommodation of national and international consultants that is fairly equitably allocated over the project lifetime. The annual breakdown across the activities planned under Outcome 2 are: Year 1 (USD 28,930): USD 4,300 (Act. 2.2.1); USD 8,300 (Act. 2.3.2); USD 6,120 (Act. 2.4.1); USD 7,860 (Act. 2.5.1); USD 2,350 (Act. 2.5.2). Year 2 (USD 30,630): USD 3,100 (Act. 2.2.1); USD 2,900 (Act. 2.2.2); USD 8,300 (Act. 2.3.2); USD 12,240 (Act. 2.4.1); USD 1,740 (Act. 2.5.1); USD 2,350 (Act. 2.5.2). Year 3 (USD 27,560): USD 8,300 (Act. 2.3.2); USD 12,240 (Act. 2.4.1); USD 2,320 (Act. 2.5.1); USD 4,700 (Act. 2.5.2). Year 4 (USD 28,500): USD 8,300 (Act. 2.3.2); USD 12,240 (Act. 2.4.1); USD 2,320 (Act. 2.5.1); USD 5,640 (Act. 2.5.2).
10	The printing and publication costs are budgeted for discharging the work of different groups of stakeholders who are coordinated under Outcome 2, as well as for printing the GIS mapping of agriculture value chains (Act. 2.3.1). The annual breakdown by activity is as follows: Year 1 (USD 6,400) - USD 400 (Act. 2.1.1); USD 2,000 (Act. 2.3.1); USD 500 (Act. 2.3.2); USD 1,000 (Act. 2.4.1); USD 1,500 (Act. 2.4.2); USD 500 (Act. 2.5.1); USD 500 (Act. 2.5.2). Year 2 (USD 8,400) - USD 1,000 (Act. 2.1.2); USD 2,000 (Act. 2.3.1); USD 500 (Act. 2.3.2); USD 1,200 (Act. 2.4.1); USD 2,000 (Act. 2.4.2); USD 850 (Act. 2.5.1); USD 850 (Act. 2.5.2). Year 3 (USD 9,300) - USD 1,000 (Act. 2.1.2); USD 2,000 (Act. 2.3.1); USD 500 (Act. 2.3.2); USD 1,500 (Act. 2.4.1); USD 2,000 (Act. 2.4.2); USD 1,150 (Act. 2.5.1); USD 1,150 (Act. 2.5.2). Year 4 (USD 9,221) - USD 1,000 (Act. 2.1.2); USD 2,000 (Act. 2.3.1); USD 500 (Act. 2.3.2); USD 1,500 (Act. 2.4.1); USD 2,000 (Act. 2.4.2); USD 1,110 (Act. 2.5.1); USD 1,111 (Act. 2.5.2).
11	Working meetings or workshops are planned during project lifetime to carry out stakeholder coordination related to the activities for Outputs 2.1, 2.2 and 2.5 only. Allocations are as such: USD 8,000 (1 year); USD 5,000 (year 2); USD 6,000 (year 3); USD 6,000 (year 4). Year 1 - USD 1,000 (Act. 2.2.1); USD 2,000 (Act. 2.2.2); USD 2,500 (Act. 2.5.1); USD 2,500 (Act. 2.5.2). Year 2 - USD 2,000 (Act. 2.2.2); USD 1,000 (Act. 2.5.1); USD 2,000 (Act. 2.5.2). Year 3 and year 4 budget allocations are similar: USD 2,000 (Act. 2.2.2); USD 1,500 (Act. 2.5.1); USD 2,500 (Act. 2.5.2).
OUTCOME 3	

12	International expertise will be required for implementing activities for Outputs 3.5 and 3.7. More specifically: - In year 1: USD 52,200 distributed as follows: USD 18,000 (Act. 3.7.1), USD 18,000 (Act. 3.7.2) and USD 16,200 (Act. 3.7.3). - In year 2: USD 22,500 for the DREI analysis (Act. 3.5.1). - In year 4: USD 94,500 distributed as follows: USD 36,000 for the updated DREI analysis (Act. 3.5.1) and USD 58,500 for the replication plan (Act. 3.5.2)
13	National expertise will be required to support of international consultants and to implement activities under all outputs except Output 3.3. The annual budget for national consultants for Outcome 3 is as follows: Year 1 (USD 70,000) –USD 19,750 (Act. 3.4.1); USD 13,750 (Act. 3.4.2); USD 1,750 (Act. 3.4.3); USD 12,500 (Act. 3.6.1); USD 1,750 (Act. 3.6.2); USD 20,500 (Act. 3.7.1). Year 2 (USD 82,500) – USD 11,750 (Act. 3.4.1); USD 26,750 (Act. 3.4.2); USD 1,750 (Act. 3.4.3); USD 10,000 (Act. 3.5.1), USD 10,000 (Act. 3.6.1); USD 1,750 (Act. 3.6.2); USD 20,500 (Act. 3.7.1). Year 3 (USD 50,000) – USD 16,000 (Act. 3.4.1); USD 23,500 (Act. 3.4.2); USD 1,750 (Act. 3.4.3); USD 1,750 (Act. 3.6.2); USD 7,000 (Act. 3.7.1). Year 4 (USD 95,000) - USD 18,500 (Act. 3.4.1); USD 31,000 (Act. 3.4.2); USD 1,750 (Act. 3.4.3); USD 12,500 (Act. 3.5.1), USD 22,500 (Act. 3.5.2); USD 1,750 (Act. 3.6.2); USD 7,000 (Act. 3.7.1).
14	The travel budget for Outcome 3 is higher than the combined travel budgets of Outcomes 1 and 2. Whereas the travel budgets for Outcomes 1 and 2 cover the costs of travel and accommodation of national and international consultants, the travel budget for Outcome 3 contains a significant amount (USD 150,000) dedicated for supporting the travel and accommodation expenses of local stakeholders to participate in the events of the regional AMP project Community of Practice and its technical cohorts under Act. 3.6.3. Given the staggered implementation of the regional project and the Nigeria child project, this budget is allocation in the first three years only, and as follows: year 1 – USD 37,500; year 2 – USD 60,000; year 3 – 52,500. The difference of USD 51,450 (i.e. USD 201,450 – USD 150,000) is for covering the travel expenses of international and national consultants in Outcome 3 (except for M&E related travel). In this case, the annual travel budgets are: USD 16,540 (year 1); USD 4,700 (year 2); USD 3,510 (year 3); USD 26,700 (year 4), distributed as follows: Act 3.4.2: USD 13,380 (USD 1,410 in year 1, USD 3,760 in year 2, USD 3,510 in year 3, USD 4,700 in year 4). Act 3.5.1: USD 7,640 in year 4; Act 3.5.2: USD 14,360 in year 4; Act 3.6.1: USD 2,820 (USD 1,880 in year 1, USD 940 in year 2); Act 3.7.1: USD 7,050 in year 1 Act 3.7.2: USD 6,200 in year 1.
15	The printing and publication costs are budgeted for the publication and dissemination of reports (Act. 3.4.3) and for outreach activities (Act. 3.6.1), and are as follows: USD 2,420 (year 1); USD 3,262 (year 2); USD 3,050 (year 3); USD 3,850 (year 4). The relatively higher values in year 2 and year 4 relate to the publication and dissemination of the mid-term review and terminal evaluation reports, respectively.
16	Working meetings or workshops are planned during project lifetime to carry out stakeholder coordination related to knowledge management and learning. Allocations are as such: USD 11,000 (1 year); USD 8,000 (year 2); USD 5,500 (year 3); USD 14,000 (year 4). Year 1: USD 1,500 (Act 3.4.3); USD 1,500 (Act. 3.6.1); USD 3,000 (Act. 3.6.2); USD 4,000 (Act. 3.7.1); USD 1,000 (Act. 3.7.2). Year 2: USD 2,000 (Act. 3.4.3); USD 1,000 (Act. 3.5.1); USD 1,000 (Act. 3.6.1); USD 3,000 (Act. 3.6.2); USD 1,000 (Act. 3.7.1). Year 3: USD 2,500 (Act. 3.4.3) and USD 3,000 (Act. 3.6.2). Year 4: USD 2,500 (Act. 3.4.2); USD 2,500 (Act. 3.4.3); USD 2,500 (Act. 3.5.1); USD 3,500 (Act. 3.5.2); USD 3,000 (Act. 3.6.2).

17	For Output 3.3, independent evaluators will be needed for the mid-term review (USD 31,500 – year 2) and terminal evaluation (USD 45,000 – year 4).
18	National expertise will be required to support of international consultants and to implement activities under all outputs except Output 3.3. The annual budget for national consultants for Outcome 3 is as follows: Year 1 (USD 17,500) – USD 5,250 (Act. 3.2.1); USD 5,250 (Act. 3.2.2); USD 7,000 (Act. 3.2.3). Year 2 (USD 17,500) – USD 5,250 (Act. 3.2.1); USD 5,250 (Act. 3.2.2); USD 7,000 (Act. 3.2.3). Year 3 (USD 17,500) – USD 5,250 (Act. 3.2.1); USD 5,250 (Act. 3.2.2); USD 7,000 (Act. 3.2.3). Year 4 (USD 17,500) - USD 5,250 (Act. 3.2.1); USD 5,250 (Act. 3.2.2); USD 7,000 (Act. 3.2.3).
19	The travel budget for the mid-term review in year 2 is USD 7,660, and it is USD 8,870 for the terminal evaluation in year 4.
20	In year 1, the Inception Workshop (Act. 3.1.1) is budgeted at USD 5,000. Year 2 distribution of budget is: USD 3,000 (Act. 3.3.1 – mid-term review stakeholder coordination). Year 4 budget allocation is: USD 3,500 (Act. 3.3.2 – terminal evaluation stakeholder coordination).
PROJECT MANAGEMENT COST (PMC)	
21	The PMC covers the entire salary of the Project Manager and the Administrative Assistant to the tune of USD 39,204 (i.e. USD 3,267 per month) and USD 25,368 per year (i.e. USD 2,114 per month). The two salaries add up to USD 64,572 per year.
22	The Project Management Unit comprises two staff. For project management, each staff will be provided with a computer costing USD 1,900 each (i.e. total of USD 3,800). Also, the PMU will be provided with a printer costing USD 1,200. Hence, the total is USD 5,000 in Year 1 and 5. It is assumed that all IT equipment will last for the project duration.
23	An independent financial audit of the project will take place for USD 4,001 per year.
24	In order to support the successful implementation of the activities, the PMU will have an annual budget for operating the project secretariat. In this case, annual estimates are: USD 500 for each of year 1 and year 2; and USD 450 for each of year 3 and year 4.

X. LEGAL CONTEXT

Option a. Where the country has signed the Standard Basic Assistance Agreement (SBAA)

112. This project document shall be the instrument referred to as such in Article 1 of the Standard Basic Assistance Agreement between the Federal Government of Nigeria and UNDP, signed on 12 April 1988. All references in the SBAA to "Executing Agency" shall be deemed to refer to "Implementing Partner."

113. This project will be implemented by Rural Electrification Agency ("Implementing Partner") in accordance with its financial regulations, rules, practices and procedures only to the extent that they do not contravene the principles of the Financial Regulations and Rules of UNDP. Where the financial governance of an Implementing Partner does not provide the required guidance to ensure best value for money, fairness, integrity, transparency, and effective international competition, the financial governance of UNDP shall apply.

114. The designations employed and the presentation of material on this map do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations or UNDP concerning the legal status of any country, territory, city or area or its authorities, or concerning the delimitation of its frontiers or boundaries.

XI. RISK MANAGEMENT

Option a. Implementing Partner is a Government Entity (NIM)

114. Consistent with the Article III of the SBAA, the responsibility for the safety and security of the Implementing Partner and its personnel and property, and of UNDP's property in the Implementing Partner's custody, rests with the Implementing Partner. To this end, the Implementing Partner shall:

a) put in place an appropriate security plan and maintain the security plan, taking into account the security situation in the country where the project is being carried;

b) assume all risks and liabilities related to the Implementing Partner's security, and the full implementation of the security plan.

115. UNDP reserves the right to verify whether such a plan is in place, and to suggest modifications to the plan when necessary. Failure to maintain and implement an appropriate security plan as required hereunder shall be deemed a breach of the Implementing Partner's obligations under this Project Document.

116. The Implementing Partner agrees to undertake all reasonable efforts to ensure that no UNDP funds received pursuant to the Project Document are used to provide support to individuals or entities associated with terrorism and that the recipients of any amounts provided by UNDP hereunder do not appear on the list maintained by the Security Council Committee established pursuant to resolution 1267 (1999). The list can be accessed via http://www.un.org/sc/committees/1267/aq_sanctions_list.shtml.

117. The Implementing Partner acknowledges and agrees that UNDP will not tolerate sexual harassment and sexual exploitation and abuse of anyone by the Implementing Partner, and each of its responsible parties, their respective sub-recipients and other entities involved in Project implementation, either as contractors or subcontractors and their personnel, and any individuals performing services for them under the Project Document.

(a) In the implementation of the activities under this Project Document, the Implementing Partner, and each of its sub-parties referred to above, shall comply with the standards of conduct set forth in the Secretary General's Bulletin ST/SGB/2003/13 of 9 October 2003, concerning "Special measures for protection from sexual exploitation and sexual abuse" ("SEA").

(b) Moreover, and without limitation to the application of other regulations, rules, policies and procedures bearing upon the performance of the activities under this Project Document, in the implementation of

activities, the Implementing Partner, and each of its sub-parties referred to above, shall not engage in any form of sexual harassment ("SH"). SH is defined as any unwelcome conduct of a sexual nature that might reasonably be expected or be perceived to cause offense or humiliation, when such conduct interferes with work, is made a condition of employment or creates an intimidating, hostile or offensive work environment.

118.a) In the performance of the activities under this Project Document, the Implementing Partner shall (with respect to its own activities), and shall require from its sub-parties referred to in paragraph 4 (with respect to their activities) that they, have minimum standards and procedures in place, or a plan to develop and/or improve such standards and procedures in order to be able to take effective preventive and investigative action. These should include: policies on sexual harassment and sexual exploitation and abuse; policies on whistleblowing/protection against retaliation; and complaints, disciplinary and investigative mechanisms. In line with this, the Implementing Partner will and will require that such sub-parties will take all appropriate measures to:

i. Prevent its employees, agents or any other persons engaged to perform any services under this Project Document, from engaging in SH or SEA;

ii. Offer employees and associated personnel training on prevention and response to SH and SEA, where the Implementing Partner and its sub-parties referred to in paragraph 4 have not put in place its own training regarding the prevention of SH and SEA, the Implementing Partner and its sub-parties may use the training material available at UNDP;

iii. Report and monitor allegations of SH and SEA of which the Implementing Partner and its sub-parties referred to in paragraph 4 have been informed or have otherwise become aware, and status thereof;

iv. Refer victims/survivors of SH and SEA to safe and confidential victim assistance; and

v. Promptly and confidentially record and investigate any allegations credible enough to warrant an investigation of SH or SEA. The Implementing Partner shall advise UNDP of any such allegations received and investigations being conducted by itself or any of its sub-parties referred to in paragraph 4 with respect to their activities under the Project Document, and shall keep UNDP informed during the investigation by it or any of such sub-parties, to the extent that such notification (i) does not jeopardize the conduct of the investigation, including but not limited to the safety or security of persons, and/or (ii) is not in contravention of any laws applicable to it. Following the investigation, the Implementing Partner shall advise UNDP of any actions taken by it or any of the other entities further to the investigation.

b) The Implementing Partner shall establish that it has complied with the foregoing, to the satisfaction of UNDP, when requested by UNDP or any party acting on its behalf to provide such confirmation. Failure of the Implementing Partner, and each of its sub-parties referred to in paragraph 4, to comply of the foregoing, as determined by UNDP, shall be considered grounds for suspension or termination of the Project.

119. Social and environmental sustainability will be enhanced through application of the UNDP Social and Environmental Standards (http://www.undp.org/ses) and related Accountability Mechanism (http://www.undp.org/secu-srm).

120. The Implementing Partner shall: (a) conduct project and programme-related activities in a manner consistent with the UNDP Social and Environmental Standards, (b) implement any management or mitigation plan prepared for the project or programme to comply with such standards, and (c) engage in a constructive and timely manner to address any concerns and complaints raised through the Accountability Mechanism. UNDP will seek to ensure that communities and other project stakeholders are informed of and have access to the Accountability Mechanism.

121. All signatories to the Project Document shall cooperate in good faith with any exercise to evaluate any programme or project-related commitments or compliance with the UNDP Social and Environmental Standards. This includes providing access to project sites, relevant personnel, information, and documentation.

122. The Implementing Partner will take appropriate steps to prevent misuse of funds, fraud or corruption, by its officials, consultants, responsible parties, subcontractors and sub-recipients in implementing the project or using UNDP funds. The Implementing Partner will ensure that its financial management, anti-corruption and anti-fraud policies are in place and enforced for all funding received from or through UNDP.

123. The requirements of the following documents, then in force at the time of signature of the Project Document, apply to the Implementing Partner: (a) UNDP Policy on Fraud and other Corrupt Practices and (b) UNDP Office of Audit and Investigations Investigation Guidelines. The Implementing Partner agrees to the requirements of the above documents, which are an integral part of this Project Document and are available online at www.undp.org.

124. In the event that an investigation is required, UNDP has the obligation to conduct investigations relating to any aspect of UNDP projects and programmes in accordance with UNDP's regulations, rules, policies and procedures. The Implementing Partner shall provide its full cooperation, including making available personnel, relevant documentation, and granting access to the Implementing Partner's (and its consultants', responsible parties', subcontractors' and sub-recipients') premises, for such purposes at reasonable times and on reasonable conditions as may be required for the purpose of an investigation. Should there be a limitation in meeting this obligation, UNDP shall consult with the Implementing Partner to find a solution.

125. The signatories to this Project Document will promptly inform one another in case of any incidence of inappropriate use of funds, or credible allegation of fraud or corruption with due confidentiality.

    Where the Implementing Partner becomes aware that a UNDP project or activity, in whole or in part, is the focus of investigation for alleged fraud/corruption, the Implementing Partner will inform the UNDP Resident Representative/Head of Office, who will promptly inform UNDP's Office of Audit and Investigations (OAI). The Implementing Partner shall provide regular updates to the head of UNDP in the country and OAI of the status of, and actions relating to, such investigation.

126. UNDP shall be entitled to a refund from the Implementing Partner of any funds provided that have been used inappropriately, including through fraud or corruption, or otherwise paid other than in accordance with the terms and conditions of the Project Document. Such amount may be deducted by UNDP from any payment due to the Implementing Partner under this or any other agreement. Recovery of such amount by UNDP shall not diminish or curtail the Implementing Partner's obligations under this Project Document.

    Where such funds have not been refunded to UNDP, the Implementing Partner agrees that donors to UNDP (including the Government) whose funding is the source, in whole or in part, of the funds for the activities under this Project Document, may seek recourse to the Implementing Partner for the recovery of any funds determined by UNDP to have been used inappropriately, including through fraud or corruption, or otherwise paid other than in accordance with the terms and conditions of the Project Document.

    Note: The term "Project Document" as used in this clause shall be deemed to include any relevant subsidiary agreement further to the Project Document, including those with responsible parties, subcontractors and sub-recipients.

127. Each contract issued by the Implementing Partner in connection with this Project Document shall include a provision representing that no fees, gratuities, rebates, gifts, commissions or other payments, other than those shown in the proposal, have been given, received, or promised in connection with the selection process or in contract execution, and that the recipient of funds from the Implementing Partner shall cooperate with any and all investigations and post-payment audits.

128. Should UNDP refer to the relevant national authorities for appropriate legal action any alleged wrongdoing relating to the project, the Government will ensure that the relevant national authorities shall actively investigate the same and take appropriate legal action against all individuals found to have participated in the wrongdoing, recover and return any recovered funds to UNDP.

129. The Implementing Partner shall ensure that all of its obligations set forth under this section entitled “Risk Management” are passed on to each responsible party, subcontractor and sub-recipient and that all the clauses under this section entitled “Risk Management Standard Clauses” are included, *mutatis mutandis*, in all sub-contracts or sub-agreements entered into further to this Project Document.

XII. MANDATORY ANNEXES

List of Annexes submitted to this project document:

Annex Number	Title	Submitted as separate document
Annex 1	Theory of Change Diagram	Yes
Annex 2	GEF Budget Template	Yes
Annex 3	Project map and Geospatial Coordinates of project sites	No
Annex 4	Multi Year Work Plan	No
Annex 5	Monitoring Plan	No
Annex 6	UNDP Social and Environmental Screening Procedure (SESP)	Yes
Annex 7	UNDP Risk Register	No
Annex 8	Overview of Project Staff and Technical Consultancies	No
Annex 9	Stakeholder Engagement Plan	Yes
Annex 10	Environmental Social Management Framework (ESMF)	Yes
Annex 11	Gender Analysis and Gender Action Plan	Yes
Annex 12	Procurement Plan	Yes
Annex 13	GEF focal area specific annexes	No
Annex 14	Additional agreements (Co-financing letters, ICF checklist)	Yes
Annex 15	GEF Core indicators	No
Annex 16	GEF 7 Taxonomy	No
Annex 17	Derisking Renewable Energy Investment (“DREI”) in Off-Grid – Solar-Battery Mini-Grids in Nigeria	Yes
Annex 18	Detailed Project Budget and Calculation of Core Indicator 6	Yes
Annex 19	Stakeholder Engagement in Baseline Analysis	Yes
Annex 20	Linkages between Nigeria PIMS 5691 (off-grid lighting) and PIMS 6339 (AMP) projects	Yes

Annex 1: Theory of Change Diagram

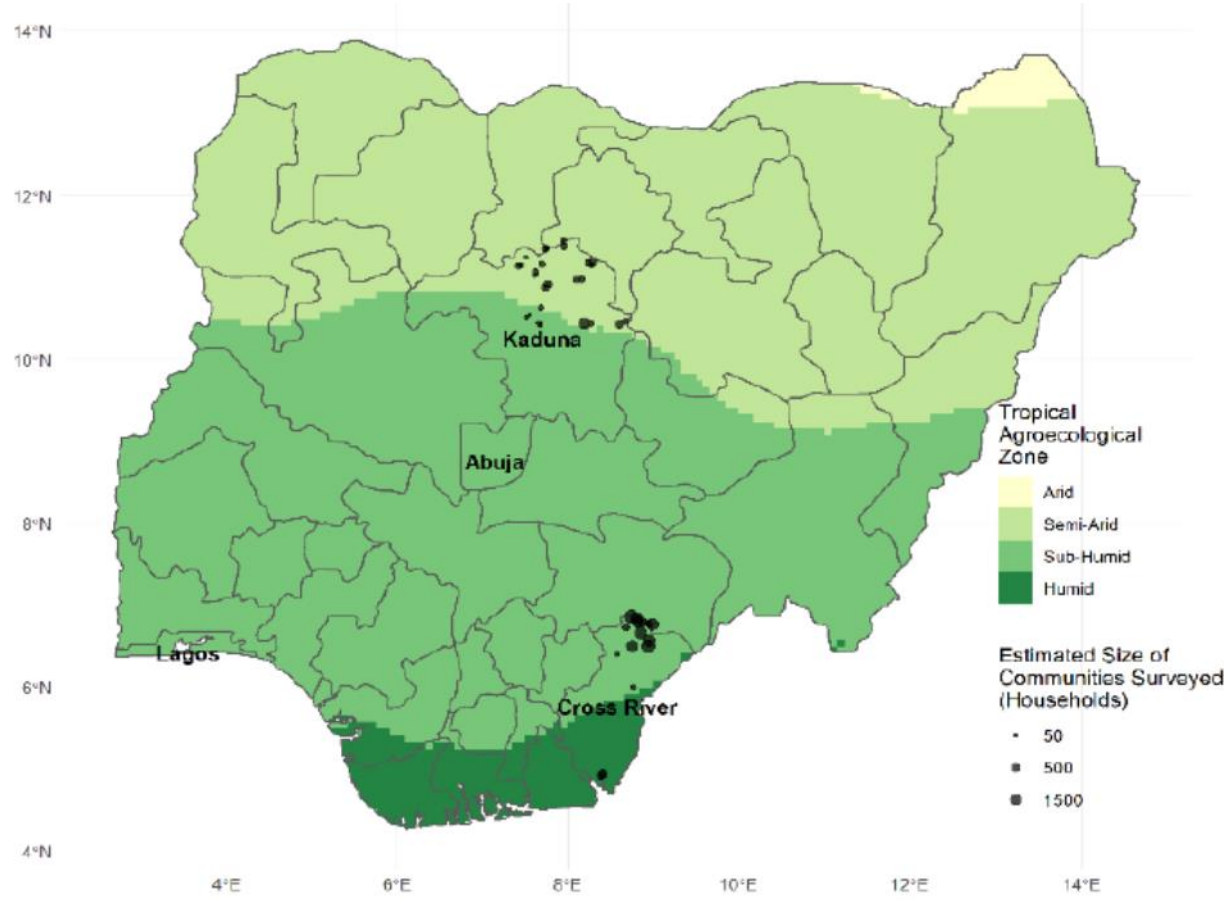
Submitted as separate document.

Annex 2: GEF Budget Template

Submitted as separate document.

Annex 3: Project map and Geospatial Coordinates of project sites

It is pointed out that the exact project sites have not been defined yet. However, baseline assessments (Annex 13) have been carried out in two agro-ecology zones in *Scarlett Santana et al. 2020. Agricultural Productive Use Stimulation in Nigeria: Value Chain & Mini-Grid Feasibility Study. Rocky Mountain Institute, Deloitte Consulting LLP. 2020.* The GEF-financed project will most likely choose appropriate sites from the baseline study as shown by the black dots in the map below.



Annex 4: Multi Year Work Plan

	Outcomes	Outputs	Year 1				Year 2				Year 3				Year 4			
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Component 1 Business Model Innovation with Private Sector Engagement	Innovative business models based on cost reduction operationalized to support and strengthen private participation in low-carbon minigrid development	Output 1.1: Pilots developed, including on productive use/innovative appliances and modular hardware/system design, leading to cost-reduction in mini-grids and sufficient growing demand for minigrid systems																
		Output 1.2: Standardized online REF Calls for Proposals for enhanced transparency in developers bidding process																
		Output 1.3: Capacity of potential tender bidders (private sector developers) strengthened to consider innovative business models and cost-reduction levers																
		Output 1.4: Capacity of winning tender bidders (private sector developers) strengthened to develop and implement innovative business models and cost-reduction levers																
		Output 1.5: Capacity building provided to public officials (regulator, ministries) specifically to design procurement/tender processes that incorporate cost-reduction levers and innovative business models																
		Output 1.6: Scaled up support for upstream equipment manufacturers and suppliers																
Component 2 Scaled-up Financing	Financing mechanism and accompanying financial instruments in place to incentivize investments in the development of low-carbon minigrids	Output 2.1: Financial advisory committee established and operational																
		Output 2.2: Innovative financing solutions for minigrid development are identified and implemented through the REF																
		Output 2.3: General market intelligence study on minigrids prepared and disseminated amongst public officials and finance community																
		Output 2.4: Feasibility study support provided to minigrid developers, creating a pipeline of investible assets																
		Output 2.5: Capacity building provide to minigrid developers and investors on measuring and																

		reporting on impact indicators, building credibility in impact investment as an asset class																		
Component 3 Digital, Knowledge Management, monitoring and evaluation and Scale up Strategy	Increased awareness and network opportunities in the minigrid market and among stakeholders, and lessons learned for scaling up rural electrification using low-carbon minigrids	Output 3.1: Inception workshop																		
		Output 3.2: Project monitoring																		
		Output 3.3: Project evaluations																		
		Output 3.4: Lessons learned captured and disseminated at the national level																		
		Output 3.5: Replication plan (including investment plan) for scaling up rural energy access developed																		
		Output 3.6: Renewable Energy and minigrid Development Associations supported and strengthened to promote minigrid development																		
		Output 3.7: Project Digital Strategy developed/implemented and Quality Assurance Framework augmented and independent verification process in place for measuring, reporting and verification of the sustainable develop impacts of MGs, including GHG emission reductions																		

Annex 5: Monitoring Plan

This Monitoring Plan and the M&E Plan and Budget in Section VI of this project document will both guide monitoring and evaluation at the project level for the duration of project implementation.

Monitoring	Indicators	Targets	Description of indicators and targets	Data source/Collection Methods[80]	Frequency	Responsible for data collection	Means of verification	Risks/Assumptions
Project objective: **Supporting access to clean energy by increasing the financial viability and promoting scaled-up commercial investment in solar PV minigrids in Nigeria.**	***Indicator 1:*** *Greenhouse gas emissions mitigated (cumulative metric tons of carbon dioxide equivalent* (tCO2e)*)*	*Midterm (MT):* *Direct: 17,815 tCO2e;* *Indirect: 0 tCO2e* *End-of-project (EoP): Direct: 74,228 tCO2e* *Indirect: 4,170,960 tCO2e*	*The expected direct and indirect emission reductions from the generation of renewable electricity as calculated in Annex 13.*	*Each project-financed MG will record the annual electricity generated and sold by type of customers (residential, productive use and social infrastructures) using the Quality Assurance Framework developed and operationalized under Outcome 3. Data collection will follow the protocol (e.g. calibrated meters) used in Output 1.1;* *Emission factor for diesel baseline calculated using IPCC factors as per MG DREI analyses*	Annually Reported in DO tab of the GEF PIR	*Project Manager with support from project consultant carrying out annual lessons learned reports*	*MRV mechanism that will integrate the Quality Assurance and Monitoring Framework (QAMF) developed and operationalized under Outcome 3.*	*Risks:* *Political and institutional instability prevents the minimum governance structures to be put in place for project implementation; Little interest shown by MG developers to integrate the agricultural value chains; low level coordination between project partners; unwillingness of end-users to pay for electricity after entering contractual agreement with MG operators.* *Assumptions:*

[80] Data collection methods should outline specific tools used to collect data and additional information as necessary to support monitoring. The PIR cannot be used as a source of verification.

Monitoring	Indicators	Targets	Description of indicators and targets	Data source/Collection Methods[80]	Frequency	Responsible for data collection	Means of verification	Risks/Assumptions
				and given in Annex 13;				*Embedding solar PV-battery minigrids in agricultural value chains is successful; continued political and institutional commitment from all project stakeholders; innovative business models centered on cost reduction levers tested and validated*
	Indicator 2: *Number of direct beneficiaries benefitting from energy access via minigrids, disaggregated by gender and by customer segment (residential, commercial/productive and social)*	*MT:* *Residential (16,815 persons; 49.3% women)* *Productive uses (144 connections)* *Social infrastructure (90 connections)* *EoP:*	*The indicator captures the total number of beneficiaries disaggregated by sex; it also gives the total number of connections for productive energy uses (e.g. commercial, light manufacturing and agricultural processing) and connections to social infrastructures like*	*These data will be collected directly from the operators of minigrids based on contractual agreements with the three types of customers, and well as the active number of customers through sales of renewable electricity by type of customer.*	Annually Reported in DO tab of the GEF PIR	*Project Manager with support from project consultant carrying out annual lessons learned reports; data collected from project-sponsored minigrids under Output 1.1.*	*SDG Impact Framework integrated in the Quality Assurance Framework developed under Outcome 3.*	*<u>Risks</u>:* *Same as above.* *<u>Assumptions</u>:* *Same as above.*

Monitoring	Indicators	Targets	Description of indicators and targets	Data source/Collection Methods[80]	Frequency	Responsible for data collection	Means of verification	Risks/Assumptions
		Residential (70,063 persons; 49.3% women) *Productive uses (600 connections)* *Social infrastructure (375 connections)*	*schools, clinics and religious centers*					
	Indicator 3: *Increase in installed solar PV capacity (MegaWatt peak (MWp)) and battery storage (MWh)*	*MT:* *725.4 kWp (solar PV)* *1.80 MWh (battery)* *EoP:* *3,022.5 kWp (solar PV)* *7.51 MWh (battery)*	*The project will support investments in solar PV-battery minigrids. This indicator will track the deployment of installed PV capacity, as well as the size of battery storage for meeting peak demand and night-time energy uses.*	*These data will be collected directly from the developers and operators of minigrids based on minigrid sizing and solar PV and battery installed capacities.*	Annually Reported in DO tab of the GEF PIR	*Project Manager with support from project consultant carrying out annual lessons learned reports; data collected from project-sponsored minigrids under Output 1.1.*	*MRV mechanism that will be integrated the Quality Assurance Framework developed and operationalized under Outcome 3*	*<u>Risks</u>:* *Same as above.* *<u>Assumptions</u>:* *Same as above.*
	Indicator 4: *Number of direct formal and informal primary jobs created in the mini-*	*MT:* *303 (direct formal jobs, 20% women)*	*Investments in solar PV minigrids that have productive energy uses will*	*These data will be collected directly from the developers and operators of*	Annually Reported in DO tab	*Project Manager with support from project*	*SDG Impact Framework integrated in the Quality*	*<u>Risks</u>:* *Same as above.*

Monitoring	Indicators	Targets	Description of indicators and targets	Data source/Collection Methods[80]	Frequency	Responsible for data collection	Means of verification	Risks/Assumptions
	grid sector, disaggregated by gender, for mini-grid development, operation and productive use. (number of jobs)	*140 (direct informal jobs, 20% women)* *EoP:* *1,263 (direct formal jobs, 40% women)* *583 (direct informal jobs, 40% women)*	*generate both direct formal and informal jobs that have been quantified. The estimates are for jobs created in the installation of solar PV minigrids and productive uses value chains.*	*minigrids based on minigrid sizing and solar PV and battery installed capacities, as well as the productive energy users to get the number of direct jobs created.*	of the GEF PIR	*consultants carrying out annual lessons learned reports and market surveys used to gather market intelligence.*	*Assurance Framework developed under Outcome 3.*	*Assumptions:* *Same as above.*
Project Outcome 1: *Innovative business models based on cost reduction operationalized to support and strengthen private participation in low-carbon minigrid development.*	***Indicator 5:*** *Number of minigrid implemented that demonstrate a delivery model, cost-reduction measure(s) and/or productive use of electricity.*	*MT:* *6 minigrids* *EoP:* *25 minigrids*	*The deployment of solar PV-battery minigrids will proceed in 2 stages under Output 1.1. The first stage will include 6 minigrids and the second stage an additional 11 minigrids – i.e. total of 17 minigrids at the end of project cycle.*	*The number of minigrids financed and supported by the project will be counted through their installation and commissioning. The latter relates to connections to end-users. So there will be a physical count of number of solar PV-battery minigrids operational.*	Annually Reported in DO tab of the GEF PIR	*Project Manager with support from project consultant carrying out annual lessons learned reports*	*MRV mechanism that will be integrated the Quality Assurance Framework developed and operationalized under Outcome 3. The physical minigrid infrastructure and electricity generated and sold form the basis for GHG*	*Risks:* *Political and institutional instability prevents the minimum governance structures to be put in place for project implementation; Little interest shown by MG developers to integrate the agricultural value chains; low level coordination between project partners; unwillingness of end-users to pay for*

Monitoring	Indicators	Targets	Description of indicators and targets	Data source/Collection Methods[80]	Frequency	Responsible for data collection	Means of verification	Risks/Assumptions
							emissions reductions.	*electricity after entering contractual agreement with MG operators.* *<u>Assumptions</u>:* *Embedding solar PV-battery minigrids in agricultural value chains is successful; continued political and institutional commitment from all project stakeholders; innovative business models centered on cost reduction levers tested and validated.*
	Indicator 6: (a) *Number of private sector minigrid developers and/or operators with enhanced ability, and (b) their level of capacity to participate in sector-wide tendering processes led by REA-REF to develop*	*MT: (a) 6 (20% women)* *(b) 50%* *EoP: (a) 30 (40% women)* *(b) 100%*	*The initial focus of the project will be to support the integration of 6 pilot solar PV-battery minigrids in the agricultural value chains to demonstrate proof-of-concept commercially viable business model*	*Data collection will be done in two ways: (i) the recorded number of private sector developers/operators that are provided with technical assistance; and (ii) project surveys carried out during lessons learned*	Quarterly and Annually Reported in project reports and also in DO tab of the GEF PIR	*Project Manager with support from project consultant carrying out annual lessons learned reports*	Project reports and reports to/minutes of the PSC	*<u>Risks</u>:* *Little interest shown by MG developers to integrate the agricultural value chains; low level coordination between project partners creating competing funding interests and crowding.*

Monitoring	Indicators	Targets	Description of indicators and targets	Data source/Collection Methods[80]	Frequency	Responsible for data collection	Means of verification	Risks/Assumptions
	and/or operate minigrids based on innovative business models		*centered on cost reduction levers. In the second half of the project, the capacity building will be extended to a larger cohort of developers. This indicator will measure both the number of developers/operators targeted with capacity building and their level of knowledge of cost reduction levers and innovative business models for bidding purposes.*	*exercises to evaluate the autonomous capacity of the capacitated developers/operators to respond to bidding processes. Assessment scores will be normalized on a scale of 100.*				*Assumptions:* *Minigrid developers understand the need for capacity utilization to increase attractiveness of solar PV minigrids, and have the resources (human and institutional capacity) to participate in REF Calls for Proposals supported by the project; women entrepreneurs are sufficiently motivated to participate in the project*
	Indicator 7: *(a) Percentage of REA-REF staff receiving training to enhance capacity, and (b) level of enhanced capacity for carrying out transparent bidding processes centred on innovative business*	*MT: (a) 40%* *(b) 75% (at least)* *EoP: (a) 100%* *(b) 95% (at least)*	*REA has the mandate to enhance rural energy access, and it also funds minigrid projects through REF. Consequently, REA-REF staff needs to have enhanced capacity to carry out public minigrid tendering processes*	*Data will be collected through regular surveys that will form part of the annual lessons learned studies. Level of capacity enhancement will be determined through standardized surveys and results*	Annually Reported in project reports and also in DO tab of the GEF PIR	*Project Manager with support from project consultant carrying out annual lessons learned reports*	Project reports and reports to/minutes of the PSC	*Risks:* *Competing demands on the time of REA-REF staff because of several parallel initiatives leads to low level participation in capacity building activities*

Monitoring	Indicators	Targets	Description of indicators and targets	Data source/Collection Methods[80]	Frequency	Responsible for data collection	Means of verification	Risks/Assumptions
	models, including cost-reduction levers and gender-transformation.		*supporting innovative minigrid business models centered on cost reduction levers. Hence, the capacity of REA-REF staff will be measured.*	*normalized on a scale of 100.*				*Assumptions:* *Low turnover of REA-REF staff ensures institutional and human capacity strengthening*
Project Outcome 2: *Financing mechanism and accompanying financial instruments in place to incentivize investments in the development of low-carbon minigrids*.	***Indicator 8: (a)*** *Capacity of financial institutions is enhanced through training, knowledge sharing, and/or awareness raising events aimed at increasing the financial sector's capacity to evaluate investments in MG*	*MT:* *(a) 5* *(b) 75% (at least)* *EoP:* *(a) 15* *(b) 95% (at least)*	*The availability of low cost and patient capital denominated in both local and foreign currencies is important for scaling up investments in solar PV minigrids for productive uses. Also, investors and financiers need to understand the business models that underpin the financial viability of minigrids in order to allow then to mitigate any risks. The project will carry out capacity building of financial institutions, whose capacity*	*Data will be collected through regular surveys that will form part of the annual lessons learned studies.* *Number of participants will be noted.* *Level of capacity enhancement will be determined through standardized surveys and results normalized on a scale of 100.*	Annually Reported in project reports and also in DO tab of the GEF PIR	*Project Manager with support from project consultant carrying out annual lessons learned reports*	Project reports and reports to/minutes of the PSC	*Risks:* *The multiplicity of capacity building initiatives from parallel development partner initiatives creates crowding and confusion among financial partners; Lower than expected interest of financing partners to invest debt and equity in the solar PV minigrids; sustainability of grant financing is not assured for ongoing mobilisation of debt and equity financing* *Assumptions:*

Monitoring	Indicators	Targets	Description of indicators and targets	Data source/Collection Methods[80]	Frequency	Responsible for data collection	Means of verification	Risks/Assumptions
			enhancements need to be measured.					*Innovative business models developed and validated and demonstrated to financial institutions; public derisking instruments are implemented to lower the risk profile in the minigrid sector*
	Indicator 9: *Number of financing instruments and mechanisms offering concessional finance for low-carbon minigrids.*	*MT:* *2* *EoP:* *4*	*The availability of low cost and patient capital denominated in both local and foreign currencies is important for scaling up investments in solar PV minigrids for productive uses. Through the FAC, the project will propose financial instruments and funding mechanisms for supporting low-cost blended finance for solar PV minigrids. The project will track the implementation*	*Data will be collected through regular surveys that will form part of the annual lessons learned studies.*	Annually Reported in project reports and also in DO tab of the GEF PIR	*Project Manager with support from project consultant carrying out annual lessons learned reports*	Project reports and reports to/minutes of the PSC	*<u>Risks</u>:* *Low coordination between parallel development partner initiatives results in a multiplicity of financing instrument and funding mechanisms leading to confusion/crowding in the minigrid market space; Lower than expected interest of financing partners to invest debt and equity in the solar PV minigrids;*

Monitoring	Indicators	Targets	Description of indicators and targets	Data source/Collection Methods[80]	Frequency	Responsible for data collection	Means of verification	Risks/Assumptions
			of the financial instruments and funding mechanisms.					*<u>Assumptions</u>:* *Innovative business models developed and validated and demonstrated to financial institutions; public derisking instruments are implemented to lower the risk profile in the minigrid sector; FAC is productive in proposing innovative financial solutions*
	Indicator 10: *Size of investible solar PV assets (MW) developed based on project-supported market intelligence and feasibility studies.*	*MT:* *4 MW (at least)* *EoP:* *10 MW (at least)*	*As part of its post-project sustainability efforts, the project will develop a pipeline of investible solar PV assets for productive uses (agricultural value chains). A pipeline of bankable projects will be developed using the results of Outcome 2 and the total solar PV capacity in the*	*The size of solar PV investible assets will be estimated from the feasibility studies conducted as part of Output 2.4. These feasibility studies will be informed by the GIS-based modeling of agricultural value chains and locations suitable for solar PV minigrids*	*Annually and also reports prepared for the PSC*	*Project Manager and consultants responsible for implementing activities related to Output 2.4*	*Project reports related to Output 2.4.*	*<u>Risks</u>:* *Difficulties in establishing the energy-agriculture nexus and commercially-viable business models not validated; low level coordination between parallel initiatives of development partners creates crowding effect in the minigrids space*

Monitoring	Indicators	Targets	Description of indicators and targets	Data source/Collection Methods[80]	Frequency	Responsible for data collection	Means of verification	Risks/Assumptions
			pipeline will be reported. The pipeline of projects can be funded through parallel or new funding sources.	*determined as part of Output 2.3.*				<u>*Assumptions*</u>*:* *Synergies found by aligning the interests of solar PV minigrids developers/operators and actors in agricultural value chains; pipeline of investible solar PV assets will be funded by parallel or new funding sources*
Project Outcome 3: *Increased awareness and network opportunities in the minigrid market and among stakeholders, and lessons learned for scaling up rural electrification using low-carbon minigrids*.	***Indicator 11:*** A digital strategy for the project is prepared and implemented by the PMU to contribute to project implementation and local minigrid market development.	*MT: 1* *EoP: 1*	In order to provide proof-of-concept for commercially-viable minigrids business models, there will need to be data gathering from project-financed minigrids followed by data validation. For this, a digital data strategy will be developed to feed into the QAF as well as supporting data exchanges with the AMP regional project.	Data generated by pilots will be captured under Output 1.1 using the digital data strategy and its data collection protocols.	Data will be collected at least on a daily basis, and parameters such as load profiles and electricity generated will be captured in real time.	Minigrid operators under the oversight of the Project Manager, and with support from the AMP regional project	Project reports and knowledge products generated by the AMP regional project using the data collected.	<u>Risks</u>: Suboptimal coordination between the national child project and the AMP regional project results in delays in establishing a digital data strategy <u>Assumptions</u>: High level of collaboration and participation of minigrid operators in data collection; high reliability of digital technology

Monitoring	Indicators	Targets	Description of indicators and targets	Data source/Collection Methods[80]	Frequency	Responsible for data collection	Means of verification	Risks/Assumptions
								used to collect data; the very high quantities of data are effectively used to groundtruth innovative business models
	Indicator 12: *Percentage of minigrid pilots sharing data on minigrid performance with the regional project and other stakeholders following best practices and guidance provided by the AMP Regional Project.*	*MT: 50%* *EoP: 100%*	*There is a bidirectional data and information sharing between the AMP regional project and national child projects, especially regarding the performance of pilots. Using the digital data strategy and accompanying protocol will be used to collect and share data with the AMP regional project for the development of knowledge products that will be useful in groundtruthing innovative business models. Given the time difference in the implantation of regional and national projects, only minigrids*	*Data will be collected from the pilot minigrids developed in phase 1 under Output 1.1 using the digital data strategy mentioned above.*	Data will be collected at least on a daily basis, and parameters such as load profiles and electricity generated will be captured in real time.	Minigrid operators under the oversight of the Project Manager, and with support from the AMP regional project	Project reports and knowledge products generated by the AMP regional project using the data collected.	<u>Risks</u>: Suboptimal coordination between the national child project and the AMP regional project results in delays in establishing a digital data strategy <u>Assumptions</u>: High level of collaboration and participation of minigrid operators in data collection; high reliability of digital technology used to collect data; the very high quantities of data are effectively used to groundtruth innovative business models

Monitoring	Indicators	Targets	Description of indicators and targets	Data source/Collection Methods[80]	Frequency	Responsible for data collection	Means of verification	Risks/Assumptions
			developed in phase 1 under Output 1.1 will share data with the regional project.					
	Indicator 13: *Number of replication plan, including detailed budget, for scaling up the deployment of solar PV minigrids for energizing agriculture in Nigeria based on national and regional lessons learned.*	*MT: 0* *EoP: 1*	*A cornerstone instruments for post-project sustainability and scaling up is the formulation of a replication plan, accompanied by an investment plan. The replication plan will build of all lessons learned in Nigeria and through the regional project Community of Practice and its technical cohorts.*	*The replication plan will be formulated based on the lessons learned reports that the project will generate. The lessons learned reports will capture among others information/data on (i) groudtruthed minigrids business models centred on cost reduction levers; (ii) market intelligence related to the energy-agriculture nexus; (iii) pipeline of solar PV investible assets; and (iv) innovative financing instruments.*	*Data will be collected from real time monitoring of minigrids to annual reports produced. The replication plan will be generated in Year 4.*	*Project Manager with assistance from project consultants.*	*Publication of replication plan and project reports*	*<u>Risks</u>:* *The lower than expected quality of lessons learned reports jeopardizes the quality and meaningfulness of replication plan; inability to project to demonstrate proof-of-concept of commercially-viable solar PV minigrids business models* *<u>Assumptions</u>:* *Government policy, strategy and action plan on rural electrification remains coherent and transparent so that the geographical relevance of off-grid renewable energies is visible to private investors; development*

Monitoring	Indicators	Targets	Description of indicators and targets	Data source/Collection Methods[80]	Frequency	Responsible for data collection	Means of verification	Risks/Assumptions
								partners interested in supporting the implementation of replication plan
Add indicators included in gender action plan, stakeholder engagement plan or other monitoring plans as needed								
Additional objective-level gender tracking indicators under Indicator 2	1.1 Women and men accessing MG electricity in their homes and working appliance inventory	MT: 8,290 women; 5,525 men EoP: 34,559 women; 35,504 men	*Additional granularity of data collected for Indicator 2, ensuring specific gender identifiers are noted in engagements, consultations, surveys, attendance registers, etc.*	*As for Indicator 2*	*As for Indicator 2*	*As for Indicator 2*	*As for Indicator 2*	*As for Indicator 2*
	1.2 Women and men accessing MG electricity (or electric services) for productive energy uses (e.g. agricultural value chains, commercial activities, light manufacturing)	*MT:* *144 connections of which 20% women beneficiaries* *EoP:* *600 connections of which 40% women*	*Additional granularity of data collected for Indicator 2, ensuring specific identifiers are noted in engagements, consultations, surveys, attendance registers, etc.*	*As for Indicator 2*	*As for Indicator 2*	*As for Indicator 2*	*As for Indicator 2*	*As for Indicator 2*
	1.3 Male-, female-led (and mixed) solar PV-battery minigrids developers in terms of installed solar PV capacity	MT: 725.4 kWp (of which 15% installed by women) EoP:	*Additional granularity of data collected for Indicator 3, ensuring specific identifiers are noted in engagements, consultations, surveys, attendance registers, etc.*	*As for Indicator 3*	*As for Indicator 3*	*As for Indicator 3*	*As for Indicator 3*	*As for Indicator 3*

Monitoring	Indicators	Targets	Description of indicators and targets	Data source/Collection Methods[80]	Frequency	Responsible for data collection	Means of verification	Risks/Assumptions
		3,022.5 kWp (of which at least one third installed by women entrepreneur)						
Environmental and Social risks related studies, as relevant[81].	N/A at this stage	N/A at this stage	N/A at this stage	As per ESMF	Annually	Project Manager with the support of project consultants	Annual lessons learned reports and project mid-term evaluation and terminal reports	To be determined individually for each pilot/activity

[81] See Section VI and Annex 10: Environmental and Social Management Framework in the ProDoc.

Annex 6: UNDP Social and Environmental Screening Procedure (SESP)

Submitted as separate document.

Annex 7: UNDP Risk Register

#	Description	Risk Category	Impact & Probability	Risk Treatment / Management Measures	Risk Owner
	Enter a brief description of the risk. Risk description should include future event and cause. Risks identified through HACT, PCAT, SES, Private Sector Due Diligence, and other assessments should be included.	Social and Environmental Financial Operational Organizational Political Regulatory Strategic Other Subcategories for each risk type should be consulted to understand each risk type (see UNDP Enterprise Risk Management Policy)	Describe the potential **effect** on the project if the future event were to occur. Enter **likelihood** based on 1-5 scale (1 = Not likely; 5 = Expected) Enter **impact** based on 1-5 scale (1 = Negligible 5 = Extreme) *Based on Likelihood and Impact, use the Risk Matrix to identify the Risk Level (high, Substantial, Moderate or Low)*	What actions have been taken/will be taken to manage this risk.	The person or entity with the responsibility to manage the risk.
1	COVID-19 pandemic is a national issue arising from a sanitary and health crisis that has negative socio-economic impacts, thereby resulting in project implementation constraints.	National risk giving rise to an Operational risk	As of 4 June 2021, Nigeria had recorded 166,650 confirmed cases of COVID-19 infections resulting in 2,099 deaths[82] – i.e. a mortality rate of 1.26 % which is below world average of 2.15%.[83] This shows that the FGN has been quite successful in limiting both the number of infections and number of COVID-19 deaths. The geographical distribution is also	The first point to note is that the Nigeria Centre for Disease Control (NCDC) mentions that most of the infection and deaths related to COVID-19 have taken place in urban and peri-urban areas. [84] Since the investments	Project Manager

[82] https://covid19.ncdc.gov.ng/ - accessed 4 June 2021.
[83] As at 4 June 2021, there were 172,165,628 cases and 3,701,957 deaths giving a mortality rate of 2.15%. Data obtained from: https://coronavirus.jhu.edu/map.html - accessed 4 June 2021.
[84] https://ncdc.gov.ng/news/276/end-of-year-travel-advisory-on-covid-19 - accessed 10 December 2020.

			important to note, with over 47% of infections in the two major urban centers of Lagos and the FCT. Lagos and FCT also accounted for 605 deaths, implying a mortality rate of 0.77%. This implies that the remaining regions had a cumulative number of infections 87,725 spread out over a much larger area. Although the density of the spread outside of the two urban centers is relatively low, the mortality rate is relatively higher at 1.7%. This may be due to several factors including access to adequate health care. This is an area where the project can have a direct impact. Cascading from the above, the COVID-19 Pandemic may slow down project implementation. As discussed in section II, the response to COVID-19 in Nigeria has been strong with mortality rates falling below the world average. However, the pandemic is still evolving and it poses a tangible threat to the continued constrained mobility of persons that can slow down project implementation. L = 4 I = 3 Risk = Moderate	made by the project will take place in rural / off-grid areas, it implies that investments in minigrids under Output 1.1 will directly contribute to COVID-proofing local development including job creation, and better access to health care as described in paragraph 25. It also means that the implementation of the project will be sheltered by this geographically-differentiated disease dynamic.[85] Nevertheless, most technical assistance provided by the project will take place in urban areas, implying appropriate hygiene and safety precautions will need to be practiced by stakeholders. There is also a higher risk of transmission between urban and rural areas arising from internal movement of people. This can aggravate the	

[85] It is assumed that the risk of contamination is less in rural areas that have lower density populations.

				rate of infections in rural areas that are known to have weak health infrastructure. [86] The effects of the pandemic, nevertheless, will be attenuated by the fact that movement within the country or overseas is not restricted as long as the precautionary measures of the NCDC are respected. The following project design provide mitigation actions that reduce the need for physical travel: • The biggest threat relates to the movement of international consultants. The project has been designed to make maximum use of local expertise as far as practicable, and to make use of home-based international consultants. This is reflected in the budget figures with national consultancy fees	

[86] Ibid.

				higher than international consultancy fees by a factor 1.04. • A project website will be developed under Output 3.4 that will facilitate data and information sharing, and enable the use of virtual meetings to carry out stakeholder meetings and consultations. For instance, the Inception Workshop can be planned to take place virtually if needed. • Regarding in-person workshops and technical working group meetings, the project will adopt precautionary measures such as social distancing and mandatory wearing of face masks. A small budget has been allocated for the purchase of face masks. • The AMP Regional Project will also allow for	

				Community of Practice peer-to-peer exchanges to take place virtually in order to minimize the need for in-person meetings and travels.	
2	There is a risk that the Implementing Partner – i.e. REA – does not have all the institutional capacity to implement the project under full NIM.	Organizational risk	The capacity assessment of the Implementing Partner (IP) has revealed the REA to be a 'low risk' IP. Nevertheless, the micro-assessments revealed few weaknesses of which one was: "Procurement system and contract administration: The IP should acquire and operate a computerized procurement system for effective procurement and contract administration. Procurement reports should be prepared and filled as soon as the procurement process is complete. There should also be a staff dedicated to monitoring contract expiration and other risk management instruments. The IP should maintain a database of past performance of contractors."[87] L = 3 I = 3 Risk = Moderate	The project has been designed by providing mitigation measures for this risk. • As discussed in Table 1, a new Output 1.2 has been formulated to support the REA establish and operationalize and online platform for receiving bids and tenders from low-carbon minigrid developers in order to enhance transparency of the bidding process.	Project Manager
3	Nigeria is a large and culturally diverse country. It has a history	Political risk	Despite political will and commitment to tackle the lack of electricity access in Nigeria,	The project is designed and based on the national	Project Manager

[87] UNDP. 2019. Micro Assessment Report for Rural Electrification Agency – Final.

	of political instability. This can be linked with changes in government and policy reversal.		political instability or a change of Government could lead to potential policy reversals that may impact energy policy and discourage private investment. L = 2 I = 4 Risk = Moderate	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).	
4	The price of oil has a significant bearing on the financial viability of solar PV minigrids compared to the baseline diesel-generated electricity.	Economic risk	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. This may jeopardize the financial viability of solar PV minigrids and/or the electrification of fossil fuel powered post-harvest processing of agricultural commodities. L = 3 I = 3	This has been an important problem in the past when energy prices in Nigeria have been very low but since January 2016 energy prices in Nigeria have increased as a result of Government policy to eliminate subsidies on liquid fuels, and it is unlikely that this	Project Manager

			Risk = Moderate	policy would be reverted. Although this risk falls outside the control of the project, Components 1 and 2 of the project aim precisely at achieving these goals and levelling the playing field for sustainable energy alternatives.	
5	The impacts of climate change are diverse including incidence of extreme events that can be harmful to property/infrastructure and agricultural production. These can have a direct bearing on the operation and financial viability of solar PV minigrids within the energy-agriculture nexus.	Climate Change risk (See SESP Risk 8)	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 products and distribution channels. In addition, the projected rise in temperatures will increase the power demand for air conditioning. Also, the impacts of climate change and climate variability on agricultural production are expected to be relatively moderate. L = 4 I = 3 Risk = Moderate	The project will put most emphasis on promoting solar PV minigrids that will diversify the supply of renewable energy and therefore represents a viable climate adaptation alternative to the Nigerian power sector (which currently depends for 30% of its capacity on hydropower generation). At the same time, by embedding solar PV minigrids in agricultural value chains, the commercial viability is exposed to the credit worthiness of agricultural end users that is coupled with detrimental impacts of climate change on	Project Manager

				agricultural production. The project will address this issue in multiple ways: - Longitudinal data collection at project sites (Output 1.1) and the generation of market intelligence (Outputs 2.3 and 2.4) will allow for a better granular understanding of the localized impacts of climate change that is currently not available. Ground-truthing of the credit worthiness of agricultural end users will also be carried out. These information will be recorded and used in validating business models and also serve to develop scenarios of minigrids performance including the impacts of	

				climate change on agricultural value chains; - Output 2.2 will assess the cost-effectiveness of financial derisking instruments in order to enhance the commercial viability of solar PV minigrids. This will cover instruments to climate-proof the financial viability of minigrids against climate impacts in agricultural value chains. The cost-effective instruments will be piloted under Output 2.3.	
6	There are areas in Nigeria wherein security threats to lives and property exist.	Security risk	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. Similarly, there are security issues in the North-Eastern States in Nigeria related to the operation of Boko Haram. Abductions and kidnappings are quite frequent.	While it is not possible to fully mitigate security risks within the framework of the proposed project, the participation of local communities will be sought in selected project sites in Output 1.1. Market intelligence to be carried out under Output 2.3 will	Project Manager

			L = 2 I = 4 Risk = Moderate	provide geographic information regarding security risks. Finally, Nigeria has such a large underserved rural communities that the project can be impactful without having to invest in communities that pose significant security risks that are beyond its control.	
7	Risk on lack of capacities.	Social and environmental risk (See SESP Risk 1)	Event: It may occur that the capacity of duty-bearers (e.g. government agencies, local skilled staff) for implementation of some project activities may be insufficient. Similarly occurs with the capacity of rights-holders (e.g. project-affected persons) to claim their rights. Cause: The project activities considered involve innovation and so that may be relatively new in the project's area of influence for both duty-bearers and right-holders. Also, the UNDP Universal Human Rights Index informs concerns in this country regarding the capacities of right-holder related groups and public officials/institutions. Impact: This may pose a potential harm to meeting the rights of right-holders. L = 3 I = 3	As the project is Substantial risk, an ESMF has been prepared and annexed to the project document (**Annex 10**). The ESMF covers all project risks. It contains procedures for the further screening, assessment and management measures that are required during the project's implementation for compliance with the SES. A Stakeholder Engagement Plan has been prepared to manage this risk. See ESMF Attachment II (Risks A&M specifications) for details of assessment	Project Manager

			Risk = Moderate	and management of this risk and all others.	
8	Risk of project activities not being safeguards responsive during the project life cycle	Social and environmental risk (See SESP Risk 2)	I = 3 L = 4 Risk = Moderate	See ESMF (**Annex 10**) Attachment II for details of assessment and management of this risk.	Project Manager
9	Risk of exclusion of affected stakeholders due to their vulnerability and/or potential concerns about the project.	Social and environmental risk (See SESP Risk 3)	Event: Stakeholders may be excluded at the participatory/beneficial activities of the project, and/or retaliation/reprisals may occur based on their grievances and objections. Cause: The UNDP Universal Human Rights Index informs concerns in this country regarding the situation of vulnerable groups/persons and some forms of freedom. And, there is no evidence that the national regulatory framework requires and/or implements clear practices at mini-grid projects for the inclusion of all potentially affected stakeholders, in particular disadvantaged groups, to fully participating in decisions that may affect them for the type of activities included in this project. Similarly, there is no evidence that grievances or objections from these same stakeholders are being managed and resolved as a usual practice through internationally recognized methods. Impact: This may pose a challenge to ensure that affected stakeholders will fully participate in decisions that	A Stakeholder Engagement Plan (**Annex 9**) has been prepared to manage this risk. A project-level GRM will be put in place. See ESMF (**Annex 10**) Attachment II for details of assessment and management of this risk.	Project Manager

			will affect them, they will feel safe to express grievances or objections, these will be taken into account, and no retaliation or reprisals will take place against those stakeholders who express concerns or grievances or seek to participate or obtain information on the project. I = 3 L = 4 Risk = Moderate		
10	Risk on Women	Social and environmental risk (See SESP Risk 4)	Event: Women may be excluded at the participatory/beneficial activities of the project. Cause: The male oriented nature of energy and the limited social statues and opportunities identified for women. Impact: This may pose a challenge to ensure that women will have the chance to participate at the decisions-making level. I = 4 L = 4 Risk = Substantial	Measures have been established through the Gender Analysis and Action Plan established at the PPG phase (**Annex 11**), to manage and reduce the risks identified on women. See ESMF (**Annex 10**) Attachment II for details of assessment and management of this risk.	Project Manager

11	Risk of damage to biodiversity and natural resources due to land changes and new productive uses of the energy.	Social and environmental risk (See SESP Risk 5)	Event: It may occur that the pilot mini-grids are within critical habitats and/or environmentally sensitive areas, will require changes to the use of lands and resources, and therefore will affect the ecosystems in it. This may be particularly important for productive use of the energy generated depending on the type of sector and activity to support. Cause: All mini-grids involve the construction of new infrastructure. New built structures alien to the pre-existing conditions in the area are an alteration, in essence, of the biodiversity and natural resources in the project area of influence. Impact: At the construction stage, expected impacts related to the removal and displacement of the existing natural resources to allow the new structures to be built. At the operational stage, expected impacts related to, for example, maintaining natural resources not needed by the project to a minimal despite their natural reproduction/growth. Furthermore, mini-grids with a productive use entail unforeseen impacts should be expected according to the type of sector and activity to develop. And at the decommission stage, since the project will leave in place a built structure alien to pre-existing conditions in the area, the recovery of the original habitat and/or ecosystems and/or	The necessary management plan/measures will be put in place as part of ESMP(s), based on the ESIAs. See ESMF (**Annex 10**) Attachment II and XIV for details of assessment and management of this risk.	Project Manager

			ecosystem services will be challenged. I = 4 L = 4 Risk = Substantial		
12	Adverse transboundary environmental concerns	Social and environmental risk (See SESP Risk 6)	Event: It may occur that the equipment/materials for the project will affect the ecosystems at a transboundary level. Cause: All mini-grids involve the procurement and management of new equipment/chemicals outsourced internationally and are regarded as very challenging from the sustainability perspective. Impact: Expected environmental impacts related to the procurement of equipment/materials outside the project influence. I = 3 L = 2 Risk = Moderate	The necessary management plan/measures will be put in place as part of ESMP(s), based on the ESIAs. See ESMF (**Annex 10**) Attachment II for details of assessment and management of this risk.	Project Manager
13	Risk due to electrical shocks/effects on fauna, flora and people.	Social and environmental risk (See SESP Risk 7)	Event: Electrical shocks/effects may occur in fauna, flora and people. Cause: All mini-grids involve electrical equipment. Impact: At the operational stage, the electrical structure alien to	The necessary management plan/measures will be put in place as part of ESMP(s), based on the ESIAs.	Project Manager

			pre-existing conditions in the area, may cause the damage/death/fire/et due to the interaction with fauna and flora. I = 3 L = 2 Risk = Moderate	See ESMF (**Annex 10**) Attachment II for details of assessment and management of this risk.	
14	Risk of overestimated emissions due to embedded activities.	Social and environmental risk (See SESP Risk 9)	Event: The procurement of equipment for the project will probably be outsourced internationally resulting in embedded emissions. Cause: All mini-grids involve solar panels and other activities that be imply indirect carbon emissions due to the project. Impact: They could decrease the calculated climate impact related to emissions avoided by the project. I = 3 L = 3 Risk = Moderate	See ESMF (**Annex 10**) Attachment II for details of assessment and management of this risk.	Project Manager
15	Risk of overestimated emissions due to aggregation to a third-party project.	Social and environmental risk (See SESP Risk 10)	Event: The aggregation of the activities within the AMP to a third-party project may be accounted as reductions assigned to the AMP activities instead of the third-party project. Cause:	There are project activities potentially considering to act as an aggregation to third-party initiatives. Therefore, to be conservative, it is	Project Manager

			Third party activities may be difficult to discern between projects. Impact: Assigning the achievements of the overall project (including third party activities) to which the AMP activities are aggregated would lead to an increase of carbon emission avoided to the atmosphere. I = 3 L = 2 Risk = Moderate	realistic to assume that each site will require assessment and management. See ESMF (**Annex 10**) Attachment II for details of assessment and management of this risk.	
16	Risk on the community due to domestic connections and electricity usage, and presence of hazardous materials (mainly batteries, e-waste, chemicals for land clearance).	Social and environmental risk (See SESP Risk 11)	Event: It may occur that activities and/or structures enabled by the project become hazardous to the community. Cause: The use of potentially hazardous materials by the project, domestic electrical wiring and connection activities and subsequent domestic usage of electricity. Impact: The novelty of some structures and practices brought about by the project could become a source of harm if not accompanied with concomitant awareness of risks and safe practices. I = 4 L = 3 Risk = Substantial	The necessary management plan/measures will be put in place as part of ESMP(s), based on the ESIAs. In particular, operators, contractors and owners of sites shall be required to abide by the ESMP's requirements on safety measures and minimum qualifications for the handling of hazardous materials. Similarly, those responsible for connecting households should ensure the provision of qualified electrician services to do so. Consumer awareness campaigns	Project Manager

				should also be performed, including through local workshops, clear signage (pictograms and local language indications) and awareness-raising activities in schools and public spaces to inform communities of risks associated with installations (e.g. prevention of trespassing and/or makeshifts connections attempts, etc.) and of the safe usage of electricity domestically. See ESMF (**Annex 10**) Attachment II for details of assessment and management of this risk.	
17	Ambient perturbance on the community due to intense works locally at construction and decommissioning, and new economic activities subsequent from productive use of the energy	Social and environmental risk (See SESP Risk 12)	Event: It may occur that some new activities and/or structures may interact with the surrounding area and/or involve the alteration of the normal functioning of the community health, safety and/or security in the project's area of influence, mainly as noise and physical hazards. Cause: The construction or/and decommissioning of the mini-grid and the energy generated by the project will raise new activities and/or new built structures. Impact: This may lead to the	The necessary management plan/measures will be put in place as part of ESMP(s), based on the ESIAs. See ESMF (**Annex 10**) Attachment II for details of assessment and management of this risk.	Project Manager

			perturbance of the community's health, safety and/or security. I = 3 L = 2 Risk = Moderate		
18	Risk on community health, safety and/or security due to the influx of people, mainly project workers and other new comers subsequent to the new economic activities resulting from the productive use of the energy	Social and environmental risk (See SESP Risk 13)	Event: It may occur that the new activities in the local area will attract new comers in the project's area of influence. Cause: The project construction/decommissioning and the energy generated by the project will raise new activities and/or new built structures. Impact: This may lead to effects on community health, safety and/or security as this new influx of people, expected to be mainly men, may interact with the local residents and/or involve the alteration of the normal functioning of the community leading to new diseases and/or gender safety concerns. I = 3 L = 3 Risk = Moderate	The necessary management plan/measures will be put in place as part of ESMP(s), based on the ESIAs. See ESMF (**Annex 10**) Attachment II for details of assessment and management of this risk.	Project Manager

19	Risk on damage of cultural heritage.	Social and environmental risk (See SESP Risk 14)	Event: It may occur that excavations and other environmental changes take place, and they may be within or adjacent to project's areas of influence containing some form of cultural heritage (i.e. sacred places). Cause: built structures involve excavations and are alien to the pre-existing conditions in the area are an alteration. Impact: At the construction stage, this may lead to impacts related to the removal and displacement of the existing cultural heritage to allow the new structures to be built. Furthermore, mini-grids with a productive use entail unforeseen impacts should be expected according to the type of sector and activity to develop. And at the decommission stage, since the project will leave in place a built structure and/or new activities alien to pre-existing conditions in the area, the recovery of the original cultural heritage will be challenged. I = 3 L = 3 Risk = Moderate	The necessary management plan/measures will be put in place as part of ESMP(s), based on the ESIAs. See ESMF (**Annex 10**) Attachment II for details of assessment and management of this risk.	Project Manager
20	Risk of physical displacement and loss of livelihood due to eviction from land	Social and environmental risk	Event: All mini-grid systems involve the acquisition of land, and they may be within or adjacent areas containing existing	The necessary management plan/measures will be put in place as part of	Project Manager

		(See SESP Risk 15)	energy/fuel providers, including those from the informal/traditional sectors. Cause: All mini-grids involve the construction of new infrastructure. New built structures occupy land, and access to the area may be restricted, and new energy service options for consumers arise. Also, the UNDP Universal Human Rights Index informs concerns in this country regarding forced evictions and/or land rights. Impact: At the construction stage, expected impacts related to the displacement of the existing legal or illegal inhabitants to allow the new structures to be built. And at the decommission stage, since the project will leave in place built structure and/or new activities alien to pre-existing conditions in the area, the return of the inhabitants and their livelihood will be challenged. I = 4 L = 4 Risk = Substantial	ESMP(s), based on the ESIAs. See ESMF (**Annex 10**) Attachment II for details of assessment and management of this risk.	
21	Risk of economic displacement due to loss of income from fuel selling	Social and environmental risk (See SESP Risk 16)	Event: Traditional fuels supplied by local providers, including those from the informal/traditional sectors see their market diminished. Cause: Some mini-grid	The necessary management plan/measures will be put in place as part of	Project Manager

			systems and project appliances to be implemented may replace an activity that was fueled with other energy sources like wood charcoal, paraffin, kerosene, diesel. For example in the households these activities may be cooking and lighting while in the community/commercial scope it may be diesel for the existing mini-grids. Impact: the change on the fuel used (i.e. from charcoal, private diesel mini-grids… to the service the renewable energy mini-grid provides) would lead to the loos of income for fuel suppliers, potentially these are mainly poor women selling in the informal market. I = 4 L = 4 Risk = Substantial	ESMP(s), based on the ESIAs. See ESMF (**Annex 10**) Attachment II for details of assessment and management of this risk.	
22	Risk to indigenous peoples.	Social and environmental risk (See SESP Risk 18)	Event: Indigenous Peoples may be excluded at the participatory/beneficial activities of the project. Cause: The formal oriented nature of energy and the limited social statues and opportunities identified for Indigenous Peoples. Impact: This may pose a challenge to ensure that Indigenous Peoples will have	As part of the ESIA/ESMP, an Indigenous Peoples Plan will be put in place and FPIC secured, if necessary for SES compliance. See ESMF (**Annex 10**) Attachment II for	Project Manager

			the chance to participate at the decisions-making level. I = 4 L = 4 Risk = Substantial	details of assessment and management of this risk.	
23	Risk on working conditions	Social and environmental risk (See SESP Risk 19)	Event: It may occur that working conditions are not meeting the minimum criteria to satisfy the UNDP's requirements. It may also occur that unskilled/manual labour loses their jobs. Cause: All project stages (i.e. construction, operation, decommissioning) will require labour, some of which may be sourced to unskilled/manual labourers who could be less familiar with the type of installations considered for this project and the concomitant occupational health and safety (OHS) requirements and risks. Maintenance of the right-of-way and bush-clearing under transmission lines by manual labourers is especially relevant in this context. It is to note that the UNDP Universal Human Rights Index informs concerns in this country regarding labour rights, employment rates and/or working conditions for some of the stakeholder groups relevant to this project. Impact: This may lead to the use of child, forces,	The necessary management plan/measures will be put in place as part of ESMP(s), based on the ESIAs. In particular, operators, contractors and owners of sites shall be required to abide by OHS measures identified in the ESMP, including for instance operational procedures manual(s), safety information, training program for all workers, the provision of adequate safety equipment, and the clarification of roles and responsibilities at each phase of the project. See ESMF (**Annex 10**) Attachment II for details of assessment and management of this risk.	Project Manager

			discriminatory, under-minimum practices and/or occupational health and safety accidents/incidents. I = 4 L = 4 Risk = Substantial		
24	Risk on labour opportunities	Social and environmental risk (See SESP Risk 20)	Event: It may occur that unskilled/manual laborers see their jobs displaced. Cause: some project investment (productive machinery, minigrids) could displace unskilled/manual labour Impact: This may lead manual laborers whose labour is made redundant to seek out alternative income-generating activities which may involve greater risk. I = 3 L = 3 Risk = Moderate	The necessary management plan/measures will be put in place as part of ESMP(s), based on the ESIAs. See ESMF (**Annex 10**) Attachment II for details of assessment and management of this risk.	Project Manager
25	Risk on pollution and resource efficiency	Social and environmental risk (See SESP Risk 21)	Event: Pollution may occur and resource-efficient practices may not be adopted strongly enough to meet the minimum criteria satisfying UNDP's requirements. Cause: Minigrids will require resources and will lead to the	The necessary management plan/measures will be put in place as part of ESMP(s), based on the ESIAs. In particular, operators, contractors and owners of sites	Project Manager

			processing of additional materials, waste and/or chemicals. In particular, electronic waste ("e-waste") in the form of solar panels and/or batteries at the end of their useful lives will be generated, principally (but not exclusively) at the time of de-commissioning. Impact: Without proper handling directives, disposal and/or recycling mandate for obsolete equipment, this could result in additional waste generation, including of hazardous/phase-outs materials, chemicals or other pollutants (e.g. from batteries). Failure to recycle non-hazardous waste could also contribute to additional waste generation. It is to note that the UNDP Universal Human Rights Index informs the raising of concerns for this country regarding "responsible consumption and production, clean water and sanitation, and life on land. I = 3 L = 3 Risk = Moderate	shall be required to abide by a waste management plan that includes specific measures during all phases (i.e. preparation, construction, operation and decommissioning). Private companies will only be eligible to access grant funding for developing pilot projects if they include a product take back clause at the end of product lives in their proposals. The ESMP(s) will also provide the measures required for supporting State and Local Governments in discharging their roles and responsibilities in the sound management of these wastes. All institutional and regulatory frameworks will also be reviewed in the process for formulating the Strategy and Action Plan. An essential element of the ESMP will be to propose technologically and socio-economically viable means for developing a circular economy around off-grid RETs that will	

				generate jobs and economic development in additional to being environmentally sound. This is captured under Output 1.1 of the project. See ESMF (**Annex 10**) Attachment II for details of assessment and management of this risk.	

Annex 8: Overview of Project Staff and Technical Consultancies

Consultant	Time Input	Tasks, Inputs and Outputs
For Project Management		
Local / National contracting		
Project Manager *Rate: $3,267/month*	*43 weeks per year / over 4 years*	*The Project Manager (PM) will be responsible for the overall management of the project, including the mobilization of all project inputs, supervision over project staff, consultants and sub-contractors.* *Duties and Responsibilities* • *Manage the day-to-day implementation of the project.* • *Plan the activities of the project and monitor progress against the approved workplan.* • *Execute activities by managing personnel, goods and services, training and low-value grants, including drafting terms of reference and work specifications, and overseeing all contractors' work.* • *Monitor events as determined in the project monitoring plan, and update the plan as required.* • *Liaise with the AMP Regional Project PMU Staff to request and receive operational and technical support as needed, to participate in activities led by the AMP Regional Project, and share data and information with the AMP regional Project as required. The Terms of Reference (ToR) for this position should include a clear statement indicating that a minimum of 10% of the person's time will be allocated to AMP Regional Project activities[88].* • *Provide support for completion of assessments required by UNDP, spot checks and audits.* • *Manage requests for the provision of UNDP financial resources through funding advances, direct payments or reimbursement using the FACE form.* • *Monitor financial resources and accounting to ensure the accuracy and reliability of financial reports.* • *Monitor progress, watch for plan deviations and make course corrections when needed within project board-agreed tolerances to achieve results.* • *Ensure that changes are controlled and problems addressed.* • *Perform regular progress reporting to the project board as agreed with the board, including measures to address challenges and opportunities.* • *Prepare and submit financial reports to UNDP on a quarterly basis.* • *Manage and monitor the project risks – including social and environmental risks - initially identified and submit new risks to the Project Board for consideration and decision on possible actions if required; update the status of these risks by maintaining the project risks log;* • *Capture lessons learned during project implementation.* • *Prepare revisions to the multi-year workplan, as needed, as well as annual and quarterly plans if required.*

[88] If the PM is also delegated as the 'beneficiary(ies) representative' on the AMP Regional Project board, this should also be included in their ToR.

Consultant	Time Input	Tasks, Inputs and Outputs
		• *Prepare the inception report no later than one month after the inception workshop.* • *Ensure that the indicators included in the project results framework are monitored annually in advance of the GEF PIR submission deadline so that progress can be reported in the GEF PIR.* • *Prepare the GEF PIR;* • *Assess major and minor amendments to the project within the parameters set by UNDP-GEF;* • *Monitor implementation plans including the gender action plan, stakeholder engagement plan, and any environmental and social management plans;* • *Monitor project progress and participate in the production of progress reports ensuring that they meet the necessary reporting requirements and standards;* • *Ensure project's M&E meets the requirements of the Government, the UNDP Country Office, and UNDP-GEF; develop project-specific M&E tools as necessary;* • *Oversee and ensure the implementation of the project's M&E plan, including periodic appraisal of the Project's Theory of Change and Results Framework with reference to actual and potential project progress and results;* • *Oversee/develop/coordinate the implementation of the stakeholder engagement plan;* • *Ensure environmental and social risks are identified, avoided, mitigated and managed throughout project implementation; Oversee/develop/coordinate implementation of all safeguard related plans;* • *Ensure social and environmental grievances are managed effectively and transparently;* • *Monitor and track progress against the GEF Core indicators.* • *Support the Mid-term review and Terminal Evaluation process.* • *Add technical tasks as necessary*
Project Administrative Assistant *Rate: $2,114/month*	*43 weeks per year / over 4 years*	*The Administrative Assistant will have enhanced responsibilities combining support to the PM in the day-to-day implementation of the project and a number of administrative responsibilities including financial management of the project and its monitoring & evaluation.* *<u>Duties and Responsibilities</u>* *Under the guidance and supervision of the Project Manager, the Administrative Assistant will carry out the following tasks:* • *Assist the Project Manager in day-to-day management and execution of project activities;* • *Assist the M&E officer in matters related to M&E and knowledge resources management;* • *Assist in the preparation of progress reports;* • *Ensure all project documentation (progress reports, consulting and other technical reports, minutes of meetings, etc.) are properly maintained in hard and electronic copies in an efficient and readily accessible filing system, for when required by PB, TAC, UNDP, project consultants and other PMU staff;* • *Provide PMU-related administrative and logistical assistance;*

Consultant	Time Input	Tasks, Inputs and Outputs
		• *Keep records of project funds and expenditures, and ensure all project-related financial documentation are well maintained and readily available when required by the Project Manager;* • *Review project expenditures and ensure that project funds are used in compliance with the Project Document and UNDPGoI financial rules and procedures;* • *Validate and certify FACE forms before submission to UNDP;* • *Provide necessary financial information as and when required for project management decisions;* • *Provide necessary financial information during project audit(s);* • *Review annual budgets and project expenditure reports, and notify the Project Manager if there are any discrepancies or issues;* • *Consolidate financial progress reports submitted by the responsible parties for implementation of project activities;* • *Liaise and follow up with the responsible parties for implementation of project activities in matters related to project funds and financial progress reports.*
For Technical Assistance		
Outcome 1		
Local / National contracting		
National Environmental Expert *Rate: $500/day*	*25 days / year 1*	*One of the environmental risks is the management of used batteries. Under Output 1.1, a National Environmental Expert will be recruited to:* • *Enhance the Environmental and Social Management Plan for solar PV minigrids for the environmentally sounf collection, storage and disposal of electronic and electrical waste, includingbatteries;* • *Review of environmental eligility criteria for REF Calls for Proposals for includingtake-back clause for battery and other electronic wastes.* *Inputs: GEF financing resources + support of TWG for Components 1* *Outputs: (1) updated eligibility criteria for REF Calls for Proposals; (2) updated ESMP covering safe disposal of used batteries*
Website/Portal Developer *Rate: $500/day*	*66 days / Year 1, 2 and 3*	*The Website / Portal Developer will carry out the following:* • *Develop an online portal for REF Calls for Proposals for ensuring transparency;* • *Update/develop a reppository of prominent solar PV minigrids in Nigeria based on the results of GIS mapping and market intelligence generated under Outputs 2.3 and 2.4, respectively. The repository can be in one of two forms, namely: (i) updating the repository that already exists at FMP; and (ii) develop a new repository on the project website that will be done under Outcome 3.* *Inputs: GEF financing resources + support of TWG for Components 1 & 3*

Consultant	Time Input	Tasks, Inputs and Outputs
		Outputs: (1) Online portal for REF Calls for Proposal; (2) Repository of promonent solar PV minigrids sites
Monitoring and evaluation expert *Rate: $500/day*	*30 days / Year 2-4*	• *Support provided to minigrid developers/operators on financial reporting (as an integral part of the QAF developed under Outcome 3);* • *Develop templates for financial reporting;* • *Carry out training for minigrid developers/operators on financial reporting.* *Inputs: GEF financing resources + support of TWG for Component 1 & 3* • *Outputs: (1) template for financial reporting; (2) capacity builind of developers/operatrors on fianncial reporting; (3) support selected developers/operators to produce fianncial reports*
Local Minigrid Expert *Rate: $500/day*	*135 days / Years 1-4*	• *The Local Minigrid Expert will support the International Minigrid Market Development Expert to support develpers/operators to develop business plans under Output 1.3;* • *While the international consultant will provide technical support in Years 1 and 2, the national expert will take the relay to support developers/operators in Years 3 and 4 also. A learning-by-doing caapcity development of the national consultant will be carried out by the international consultant;* *The local expert will also support the Industry Specialist for carrying out the activities under Output 1.6;* • *Support with the identification and prioritization of electrical equipment use in the agriculture-energy nexus;* • *Support with development of a roadmap for promoting local assembly and manufacturing of prioritized equipment;* • *Support with the identification of policy instruments for supporting the road map;* • *Contribute to the capacity building of project stakeholders on the means for actualising any potential for local assembly and manufacturing equipment* *Inputs: GEF financing resources + inputs from TWG of Components 1 & 2* *Outputs: (1) support in developing business plans for selected minigrid developers/operators based on productive energy uses; (2) report on the prioritization of equipment; (3) roadmap, including policy instruments for local assembly or manufacturing of prioritized equipment; (4) report on training completed for project stakeholders potential and means for local assembly and manufacturing of electrical equipment in agriculture-energy nexus*
National Stakeholder Coordination Expert *Rate: $500/day*	*90 days / Years 1-4*	• *The national consultant will be responsible for coordinating the stakeholders in the energy-agriculture value chains in Activity 1.4.1;* • *Identify the all groups of stakeholders that operate in the energy-agriculture value chains;* • *Based on the Stakeholder Engagement Plan methodologies, develop networking arrangements based on their respective interests and influences on the electrification of agricultural value chains;* • *Demonstrate the usefulness of networking arrangements in facilitating minigrid development in agricultural value chains through a stakeholder participatory/inclusiveness approach;* • *Create connections with minigrid and renewable energy associations that will be supported under Outcome 3.*

Consultant	Time Input	Tasks, Inputs and Outputs
		Inputs: GEF financing resources + support of TWG for Component 1 • *Outputs: (1) groups of stakeholders in energy-agriculture nexus identified and their interest/influence mapped out; (2) Networking arrangements proposed and tested to facilitate electrification of agricultural value chains while taking into consideration the interests/influences of the stakeholders*
Local Finance / DREI Expert *Rate: $500/day*	*15 days / Year 1*	• *The national consultant will support the International Minigrid Business Model and Finance Expert developing an equipment leasing scheme for productive energy uses.* *Inputs: GEF financing resources + support of TWG for Component 1* • *Outputs: (1) equipment leasing scheme for productive energy uses (agricultural value chains) developed*
International / Regional and global contracting		
International Minigrid Business Model and Finance Expert *Rate: $ 900/day*	*182 days / Years 1-4*	*The International Minigrid Business Model and Finance Expert will be responsible for developing minisgrids business models based on groudtruthed data from pilots implemented under Output 1.1, support minigrid developers/operators on financial reporting (Output 1.3),develop an equipment leasing scheme under Output 1.4, and providing technical support to the REA under Output 1.5* • *Propose and design commercial business models for scaling up solar PV minigrids in agricultural value chains;* • *The business models will be accompanied by financing instruments that will be identified under Output 2.2;* • *Capacity building of project stakeholders on the project-demonstrated minigrids business models;* • *Capacity building of minigrid developers/operators on financial reporting;* • *Equipment leasing scheme developed for uptake of effieicnt electrical equipment in agricultural value chains;* • *Design tendering process and accompanying tendering docuemnts for the REA based on innovative business models centred on cost reduction;* • *Support provided to REA to assess bid under Calls for Proposals;* • *Review of electricty tariffs through cross-subsidy and balanced tariffs to promote uptake of renewable electricity generated from solar PV minigrids.* *Inputs: GEF financing resources + support of TWG for Components 1 & 2* • *Outputs: (1) report on business models for scaling up investments in solar PV minigrids; (2)capacity building of project stakeholders on proposed minigrids business models; (3) training provided to minigrid developers/operators on financial reporting; (4) equipment leasing scheme developed; (5) tendering process and tendering docuemnts developed; (6) assessment of bids report; (7) report on the analysis of tariffs and recommendations for possibility of cross-subsidy schemes to promote equitable access of renewable electricity*
International Minigrid Market Development Expert	*35 days / Years 1 and 2*	*The International Minigrid Market Development Expert will be respomsible for supporting companies to develop business plans for productive energy uses in agricultural value chains.* • *Carry out feasibiliy studies and develop business plans for short-listed minigrid developers/investors in agricultural value chains;*

Consultant	Time Input	Tasks, Inputs and Outputs
Rate: $ 900/day		• *Capacity building of stakeholders to carry out feasibility studies and to develop business plans.* *Inputs: GEF financing resources + inputs from TWG of Components 1 & 2* • *Outputs: (1) site-specific market intelligence for solar PV minigrids development within the energy-agricultura nexus; (2) feasibility studies for bankable solar PV assets embedded in agricultural value chains; (3) capacity building of project stakeholders on the results of feasibility studies*
Industry Specialist on assembly & manufacturing of electrical equipment *Rate: $ 900/day*	*86 days / Years 2 and 3*	*The industry specialist will carry out Activity 1.6.1* • *Identify and prioritize electrical equipment use in the agriculture-energy nexus;* • *Develop a roadmap for promoting local assembly and manufacturing of prioritized equipment;* • *Identify and propose policy instruments for supporting the road map;* • *Capacity building of project stakeholders on the means for actualising any potential for local assembly and manufacturing equipment* *Inputs: GEF financing resources + support of TWG for Component 1 & 2* • *Outputs: (1) report on the prioritization of equipment; (2) roadmap, including policy instruments for local assembly or manufacturing of prioritized equipment; (3) Report on training completed for project stakeholders potential and means for local assembly and manufacturing of electrical equipment in agriculture-energy nexus*
		•
		•
Outcome 2		
Local / National contracting		
National Stakeholder Coordination Expert *Rate: $500/day*	*34 days / Year 1 and 2*	• *The national consultant will be responsible for coordinating the stakeholdersthat will comprise the Finanical Advisory Committee (FAC) that will be set up and operationalized under Output 2.1;* • *Identify the FAC stakeholders;* • *Develop Terms of Reference (ToR) for the FAC in close collaboration with the REA. This will cover the objectives and aims of FAC, its roles and responsibilities, modus operandi and institutional structure, among others;* • *Support organization of FAC meetings in Year 1 and Year 2 of project.* *Inputs: GEF financing resources + support of TWG for Component 2* • *Outputs: (1) ToR for FAC operation; (2) Organization of FAC meetings in Year 1 and Year 2*
National GIS and Field Survey Expert *Rate: $500/day*	*626 days / Year 1 to 4*	*The National GIS and Field Survey Expert will be responsible to support the work of the International GIS-based Modeling Expert and the International Minigrid Market Development Expert under Outputs 2.3 and 2.4.* • *Support sourcing and analyzing spatial data through the use of mapping software (e.g. Village Data Analytics);* • *Assist with data munging and cleaning to convert data into its desired form;*

Consultant	Time Input	Tasks, Inputs and Outputs
		• *Assist in the production of map overlays showing the spatial distribution of various kinds of data, including MSMEs, PUEs, sattelite / value chain analysis data, mobile network data;* • *Support spatial modeling to build on existing GIS data housed at the FMP;* • *Support in the production of reports on geographic data utilizing data visualizations;* • *Carry out field surveys to collect site-specific data to develop market intelligence for Tier 1 and Tier 2 agricultural value chains;* • *Contribute in the assessment of climate risks in agricultural value chains;* • *Contribute to the capacity building of stakeholdes on results of feasibility studies and market intelligence.* *Inputs: GEF financing resources + support of TWG for Component 2* *Outputs: The national expert will be respomsible for (1) site-specific data collection through field surveys, and will contribute to the following outputs: (2) GIS maps overlaying minigrid potential within agricultural values chains; (3) Reports / data visualisation of mini-grid potential; (4) site-specific market intelligence for solar PV minigrids development within the energy-agricultura nexus; (5) feasibility studies for bankable solar PV assets embedded in agricultural value chains; (6) capacity building of project stakeholders on the results of feasibility studies*
Local Finance / DREI Expert *Rate: $500/day*	*110 days / Years 1 to 4*	• *The national consultant will support the International Minigrid Business Model and Finance Expert in capacity building activities for financial institutions under Activity 2.5.1. This support will be in Year 1, and in which year the local comsultant will be trained by the international expert;* • *In subsequent years (i.e. Years 2 to 3), the national consultant will provide direct support and capacity building to local financial institutions.* *Inputs: GEF financing resources + support of TWG for Component 2* • *Outputs: (1) capacity building of financial institutions on solar PV minigrids business and financial models*
Monitoring and evaluation expert *Rate: $500/day*	*120 days / Year 1-4*	• *The Local M&E Expert who will carry out most of his/her work under Outcome 3, will also be responsibl e for operatinalizing the integrated indicator framework that will be developed under Output 3.7;* • *The target beneficiatries of the technical assistance will be minigrid developers/operators, investors and downstream operators in the agricultural value chains;* • *Training of beneficiaries on the architecture of the augmented Quality Assurance Framework (QAF) for minigrids integrating SDG impacts and MRV mechanism for GHG accounting that will be adopted under Output 3.7;* • *Operationalizing the use of the augmented QAF by applying the indicator framework on the minigrid pilots that support productive energy uses in agriculture that will be implemented under Output 1.1;* • *Development of a template for reporting the sustainable development impacts of investments around the agriculture-energy nexus* *Inputs: GEF financing resources + support of TWG for Component 2 & 3*

Consultant	Time Input	Tasks, Inputs and Outputs
		• *Outputs: (1) template for reporting on sustainabl edevelopment impacts; (2) SDG Impact Framework under QAF is operational; (3) stakeholders/beneficiaries capacitated to use the common indicator framework for reporting purposes*
International / Regional and global contracting		
International Minigrid Business Model and Finance Expert *Rate: $ 900/day*	*97 days / Years 1 and 2*	*The International Minigrid Business Model and Finance Expert will be responsible for carrying out the two activities of Output 2.2, and capacity bulding of financial institutions under Activity 2.5.1* • *Identify and assess the cost effectiveness of alternative financial instruments to promote solar PV minigrids in Nigeria;* • *Based on the results of assessmenst, to design and pilot the most cost-effective financial instruments;* • *Capacity building of REA-REF staff on the prioritized financial instruments;* • *Capacity buidling of financial institutions on business models and financial models of solar PV minigrids;* • *Capacity building through learning-by-doing of the Local Finance/DREI Expert* *Inputs: GEF financing resources + support of TWG for Component 2* *Outputs: (1) report on the identification and analysis of cost-effectiveness of financial instruments; (2)Piloting the use of prioritized cost-effective financial instruments; (3) capacity building of REA-REF staff and the Local Finance / DREI Expert; (4) capacity building of financial institutions on solar PV minigrids business and financial models*
International GIS-based modelling Expert for agricultural value-chain overlays *Rate: $ 900/day*	*160 days / Years 1-4*	*The Technical Expert on GIS modelling will be responsible for the delivery of the data overlays and map analysis for minigrid potential for Nigeria within agriculural value chains (Output 2.3).* • *Sourcing and analyzing spatial data through the use of mapping software (e.g. Village Data Analytics);* • *Performing data munging and cleaning to convert data into its desired form;* • *Identifying patterns and trends through spatial mapping of data;* • *Producing map overlays showing the spatial distribution of various kinds of data, including MSMEs, PUEs, sattelite / value chain analysis data, mobile network data;* • *Contributing spatial modeling to build on existing GIS data housed at the FMP;* • *Collaboration with international initiatives such as SPAM dataset on agricultural land use and Power for All;* • *Produce reports on geographic data utilizing data visualizations.* *Inputs: GEF financing resources + existing tools/datasets (as mentioned earlier) + inputs from TWG of Component 2* • *Outputs: (1) GIS maps overlaying minigrid potential within agricultural values chains; (2) Reports / data visualisation of mini-grid potential*
International Minigrid Market Development Expert *Rate: $ 900/day*	*229 days / Year 1 - 4*	*The International Minigrid Market Development Expert will be respomsible for carrying out Activity 2.3.2 and Activity 2.4.2 related to developing country-wide market intelligence for agricultural value chains and developing site-specific feasibility studies to develop a pipeline of investible solar PV minigrids assets.* • *Develop market intelligence for Tier 1 and Tier 2 agricultural value chains;* • *Assess the risks of current and future climate changes and cliamte variabilities on agricultural value chains;*

Consultant	Time Input	Tasks, Inputs and Outputs
		• *Develop feasibility studies for developing a bankable pipeline of investible solar PV minigrids assets (using groudthruthed data that is collection under Activity 2.4.1)* • *Produce reports for use by stakeholders such as the REA-REF, minigrid developers, financial institutions etc …;* • *Capacity building of stakeholdes on results of feasibility studies.* *Inputs: GEF financing resources + existing tools/datasets (as mentioned earlier) + inputs from TWG of Component 2* *Outputs: (1) site-specific market intelligence for solar PV minigrids development within the energy-agricultura nexus; (2) feasibility studies for bankable solar PV assets embedded in agricultural value chains; (3) capacity building of project stakeholders on the results of feasibility studies*
Outcome 3: Knowledge Management		
Local / national contracting		
Lessons learned expert *Rate: $500/day*	*214 days / Year 1-4*	• *Carrying out annual lessons learned investigations for whole project, including conducting field/project site surveys for tracking the indicators given in the M&E Plan and the project Results Framework;* • *Supporting the international consultants carrying out independent review of the project at mid-term (year 2) and end-of-project (year 4) that will be carried out under Output 3.3;* • *Supporting the development of a Replication Plan for project sustainablity under Output 3.5;* • *Visit project sites as and when required to appraise project progress on the ground and validate written progress reports;* *Inputs: GEF financing resources + support of TWG for Component 3* • *Outputs: (1) annual lessons learned reports; (2) mid-term evaluation report and terminal evaluation report; (3) Replication Plan (inlcuding invstment plan)*
Monitoring and evaluation expert *Rate: $500/day*	*280 days / Year 1-4*	• *Monitor progress in implementation of the project Gender Action Plan ensuring that targets are fully met and the reporting requirements are fulfilled;* • *Oversee/develop/coordinate implementation of all gender-related work;* • *Review the Gender Action Plan annually, and update and revise corresponding management plans as necessary;* • *Facilitate mid-term and terminal evaluations of the project; including management responses;* • *Facilitate annual reviews of the project and produce analytical reports from these annual reviews, including learning and other knowledge management products;* • *Support project site M&E and learning missions;* • *Monitor progress in development/implementation of the project ESMP/ESMF ensuring that UNDPs SES policy is fully met and the reporting requirements are fulfilled;* • *Review the SESP annually, and update and revise corresponding risk log; mitigation/management plans as necessary;* • *Ensure full disclosure with concerned stakeholders;*

Consultant	Time Input	Tasks, Inputs and Outputs
		• *Ensure operationalization of the SDG Impact Framework within the broader ambit of the minigrids Quality Assurance Framework (annual data collection will be carried out by the Lessons Learned Expert);* • *Work with the Lessons Learned Expert to ensure reporting, monitoring and evaluation fully address the safeguard issues of the project;* *Inputs: GEF financing resources + support of TWG for Component 3* *Outputs: (1) SDG Impact Framework under QAF is operational; (2) GAP reviewed and updated annually; (3) SEP reviewed and updated annually; (4) Risk Register is tracked, including application and review of SES and ESMF; (5) GRM is operational and responsive to stakeholders' expectations; (6) independent evaluation reports (mid-term and terminal evaluation)*
Local Finance / DREI Expert *Rate: $500/day*	*45 days / Year 2 and 4*	• *The national consultant will support the International DREI Expert in carrying out minigrid DREI analyses and report at mid-term and at the end-of-project;* • *Coordinate with local and regional stakeholders (minigrid developers/operarors, financial institutions, development partners) to organise structured DREI interviews;* • *Carry out collection of data for input in DREI modeling;* • *Support in write up of DREI reports on a needs basis.* *Inputs: GEF financing resources + support of TWG for Component 2 & 3* • *Outputs: (1) minigrid DREI modeling; (2) minigrid DREI report*
National Stakeholder Coordination Expert *Rate: $500/day*	*45 days / Year 1 and 2*	• *The national consultant will be responsible for coordinating local stakeholders and assisting beneficiary groups to acgieve their objectives under different project activities. Concerning Outcome 3, this relates to Activity 3.6.1 for coordinating and supporting renewables and minigrids associations better organize themselves and to purposefully support networking for promoting renewable energies in Nigeria;* • *Formulation of a strategic plan for the associations in order to formalise their operation, and to enhance their networking, public outreach and advocacy activities;* • *Support the setting up of a coordination platform for stakeholders in the renewables minigrids value chains (Activity 3.6.2).* *Inputs: GEF financing resources + support of TWG for Component 3* *Outputs: (1) strategic plan for renewables and minigrids associations; (2) coordination platform for associations*
Website/Portal Developer *Rate: $500/day*	*111 days / Year 1 - 4*	• *The local consultant will be responsible to develop the project website in Year 1;* • *Carry out maintenance and upgrades to the website as per REA requests;* • *Work with the M&E Expert to ensure the contents of the website are updated as and when new projects results / outputs are generated.* *Inputs: GEF financing resources + support of TWG for Component 3* *Outputs: (1) project website operational; (2) maintenance of website; (3) regular updates to the website contents*

Consultant	Time Input	Tasks, Inputs and Outputs
International / Regional and global contracting		
International DREI Expert *Rate: $ 900/day*	*65 days / Year 2 and 4*	• *Carrying out mini-grid DREI analyses and report at mid-term and end-of-project;* • *Carry out structured DREI interviews;* • *Carry out modeling of (i) instrument costing; and (ii) LCOE of baseline and solar PV-battery minigrids;* • *Write up of MG DREI reports in close coordination with the UNDP DREI Advisor;* • *Presentation of the MG DREI results to local stakeholders.* *Inputs: GEF financing resources + support of TWG for Component 2 & 3* *Outputs: (1) minigrid DREI modeling; (2)minigrid DREI report; (3) presentation of minigrid DREI results to local stakeholders*
International minigrid digital strategy (including QAF and Audit Expert) *Rate: $ 900/day*	*58 days / Year 1*	• *Develop a digital strategy with the following attributes: (i) to support the collection of data for the real-time monitoring of minigrid performance that will be carried out under Output 1.1; (ii) to propose the best approach for the digitalization of the REF Calls for Proposals that will be carried out under Output 1.2; and (iii) to provide a digital platform for integrating various forms of digital data that will be generated by the project such as GIS information (Output 2.3), market intelligence (Output 2.4), and the common monitoring and indicator framework (Output 3.7).* • *Operationalizing a minigrid QAF that integrates SDG Impact indicators and MRV system for tracking GHG emission reductions from renewable minigrids;* • *Establishing an independent verification process for thrid party auditing of the QAF;* • *Training delivered to REA and FMP staff on the use of the QAF.* *Inputs: GEF financing resources + support of TWG for Component 3* • *Outputs: (1) digital strategy; (2) augmented QAF set up and operational; (3) independent auditing process for QAF developed; (4) Training on use of QAF delivered to REA and FMP staff*
International Learning and Knowledge Management Expert *Rate: $ 900/day*	*65 days / Year 4*	• *Formulating a replication plan for scaling up of investments in solar PV minigrids based on lessons learned and to ensure sustainability beyond project lifetime;* • *Developing an investment plan to accompany the replication plan;* • *Carry out dissemination of the Replication Plan among all project stakehodlers.* • *Liaise with the AMP Regional Project PMU Staff to request and receive operational and technical support as needed, to participate in activities led by the AMP Regional Project, and share data and information with the AMP regional Project as required.*[89]

[89] The Terms of Reference (ToR) for this position should clearly indicate commitment not only to the national project but also to the Regional Project's M&E protocols as regards provision of timely reporting data to the regional project staff. The ToR should also include a clear statement indicating that a minimum of 10% of the person's time will be allocated to regional project activities.

Consultant	Time Input	Tasks, Inputs and Outputs
		Inputs: GEF financing resources + support of TWG for Component 3 • *Outputs: (1) Replication Plan; (2) investment plan; (3) workshop presentation the plans*

Annex 9: Stakeholder Engagement Plan

Submitted as separate document.

Annex 10: Environmental Social Management Framework (ESMF)

Submitted as separate document.

Annex 11: Gender Analysis and Gender Action Plan

Submitted as separate document.

Annex 12: Procurement Plan

Submitted as separate document.

Annex 13: GEF focal area specific annexes

A. Baseline Assessment

National Policies and Strategies Supporting Rural Electrification

Table 1 summarizes the policy and strategic objectives to promoting electrification in Nigeria. The Energy Policy explicitly acknowledges the need for private investments to complement public funding for achieving electrification targets.

Table 1. Selected goals for off-grid renewables in national policies, strategies and action plans.

Policy/Strategy	Specific Goals
1. National Renewable Energy and Energy Efficiency Policy (NREEEP) 2015[90]	▪ To increase the percentage contribution of solar energy to the total energy mix and to ensure a minimum electricity contribution of 3% (1.34 GW) by 2020 and 6% (6.83 GW) by 2030. ▪ To further contribute to remote and off-grid power development in Nigeria. ▪ To ensure the provision of electricity to all remote and off-grid areas of Nigeria. ▪ The nation shall promote the adoption of energy saving appliances and devices.
2. National Renewable Energy Action Plan (NREAP) 2015-2030[91]	▪ Share of rural population served with off-grid (minigrids and stand-alone) renewable electricity: 25% (2020); 40% (2030). ▪ Rural population served with renewable electricity (pure and hybrid): 912,000 (2020; 49% women); 15.4 million (2030; 50% women). ▪ Minigrids installed capacity: 2020 (180 MW pure; 4 MW hybrid); 2030 (5,314 MW pure; 171 MW hybrid).
3. Rural Electrification Strategy and Implementation Plan 2016 (RESIP)[92]	▪ Establishing the Rural Electrification Fund (REF) under the aegis of the Rural Electrification Agency (REA)
	▪ 75% of total population electrified by 2020; 90% access by 2030; universal coverage by 2040
	▪ 75% electrification will require between NGN317.8 billion[93] and NGN 525.8billion for administration and project costs combined
	▪ Using decentralised solar technologies (e.g. solar PV mini-grids) to supply off-grid communities with clean electricity more affordably
	▪ Financial incentives[94] offered by the Rural Electrification Fund (REF) as capital grants to reduce economic barriers to the entry of

[90] Federal Ministry of Power. 2015. National Renewable Energy and Energy Efficiency Policy.
[91] Federal Republic of Nigeria. 2016. National Renewable Energy Action Plans (NREAP) 2015-2030.
[92] Federal Ministry of Power, Works and Housing. 2016. Rural Electrification Strategy and Implementation Plan.
[93] The official exchange rate is 1 USD = NGN 385; https://www.cbn.gov.ng/rates/ExchRateByCurrency.asp - accessed 7 December 2020.
[94] FGN intends to use subsidies for rural electrification as a tool for social justice and for alleviating poverty in rural areas.

	decentralised PV technologies in full accountability and transparency

Regulatory framework and legislations

The *Electric Power Sector Reform (EPSR) Act* provides for the vertical and horizontal unbundling of the electricity company into separate and competitive entities, the development of a competitive electricity markets, setting out of a legal and regulatory framework for the power sector, a framework for rural electrification, framework for the enforcement of consumer rights and obligations and establishment of performance standards. Through the reform the monopolistic framework in the power sector was broken thereby allowing: (i) private operators to apply for and obtain a license through the Nigerian Electricity Regulatory Commission (NERC) to build and operate a power plant with aggregate capacity above 1MW, and (ii) the establishment of the Rural Electrification Agency (REA) together with an independent Rural Electrification Fund (REF) whose major objective is to fully incorporate renewable energy in the energy options.

Regulations for Independent Electricity Distribution Networks: This document states the necessary provisions for the issuance of licences for distribution network operators and electricity distributors independent of a distribution company. An Independent Electricity Distribution Network (IEDN) entails all isolated rural or urban networks not connected to the national grid and embedded networks.

Environmental Impact Assessment Act: The EIA Act requires that the proponents of major development projects should subject their projects to the provision of the EIA Act. The purpose for the EIA Act is to ensure that development project do not undermine the environment, human health and safety, livelihood and critical resources that people depend upon not matter the beneficial outcome of the project. The EIA Act is a regulation domiciled in the Federal Ministry of Environment. Since mini grid projects are small-scale project and to reduce the cost of project development, minigrid developers are required to carry out an Environmental and Social Management Plan (ESMP) instead of an EIA. The purpose of the ESMP is to ensure that the application of the mitigation and monitoring measures needed to minimize and control environmental and social impacts are effectively implemented. Assessments of ESMPs are carried out by the Federal Ministry of Environment.

The *Distribution Code* is based on the EPSR Act (2005). It is the reference document for all distribution networks operated by the distribution companies (DISCOS) that perform the functions of distributing electricity. However, renewable generators are not specifically addressed either in the connection conditions of the Code or in the Operation Code.

The *Metering* Code is essential for the set-up of commercial projects. The regulation covers metering both in the transmission system and the distribution networks. It defines the conditions and requirements for electricity meters in the country.

The Standards Organization of Nigeria, with support from GIZ developed standards for solar panels and batteries. The standards are already approved by the government.

Energizing Agriculture Programme (EAP)

Energy access is necessary but insufficient to enable income growth and economic development. Many electrification projects across sub-Saharan Africa have failed to stimulate the local economy because electricity itself does not lead to greater economic activity. In Nigeria, unreliable central grid electricity supply hinders the productivity, profitability, and growth of businesses—particularly for micro-, small-, and medium-scale enterprises (MSMEs). To ensure that investments in rural electrification succeed in growing local economies, electricity must be used productively. This will allow communities to access greater productivity as well as improved quality of life through lighting, healthcare, education, information, and other amenities usually associated with electricity access.

The Nigerian Rural Electrification Agency (REA) and other agencies have recognized the importance of productive use, and agricultural value chains (as described below) offer significant opportunities. The Federal Government of Nigeria (FGN) and development partners are opening opportunities for agricultural advancement through projects like the World Bank's Fadama and Agro-Processing, Productivity Enhancement and Livelihood Improvement Support

Project (APPEALS) projects. However, the challenges of rural agro-processing are vast, and rely on external support—including from electrification, education, and financial partners.

The REA can dramatically accelerate the electrification of agricultural productive use activities across rural and peri-urban Nigeria through a new *Energizing Agriculture Programme.* The recommended programme would include a comprehensive approach that implements three critical components:

- Component 1: Align national decision-makers and facilitate collaboration between electrification and agriculture development agencies to optimize funding and synergies across initiatives. Attract investment to allow the market for agricultural electrification to scale.
- Component 2: Provide non-market services through focused government support to fill gaps where the private sector may be unable to overcome all barriers to a national productive use ecosystem.
- Component 3: Address barriers to commercially-viable agriculture electrification by creating an accelerator to facilitate and align demonstration deployments and testing at the local level.

By implementing these components, REA will navigate the concept of agricultural productive use electrification from niche idea to mainstream, market-led scale across Nigeria and leverage over $270 million in funding.

The EAP would create alignment and partnerships among cross-sector stakeholders to provide the required expertise to effectively implement agricultural productive uses of electricity at the decision-making and community levels. It prioritizes convening opportunities for coordination of actors with required expertise; pilot projects to prove the concept; and scaling mechanisms to ensure that productive uses are widely adopted in Nigeria. Via Component 2, the programme provides services to address barriers to scaling. In Components 1 and 3, the programme leverages coordination and pilots to tackle first-order barriers and develop a proof of concept of coordination in specific geographic hubs. Details on the three components are indicated in **Table 2**.

Table 2. Energizing Agriculture Programme Logframe.

	Short-Term Outputs (0-2 Years)	**Long-Term Outputs (2–5 Years)**
Component 1. Sector Leadership	• **Regular meetings of executive leaders** from rural development initiatives result in the coordination of existing agriculture and electricity initiatives (e.g., NEP) to support a set of productive use pilots (some of these would be implemented under Component 3) • FGN and development partners provide **affordable financing** and enable a pipeline of productive use pilots, which eventually demonstrate the pathway for coordinated productive use approaches (some of these would be implemented under Component 3).	• **REA analyses** and documents share findings from the projects implemented through the early pipeline. • REA and partners provide **investor educational materials** to stimulate financing for commercial agricultural productive use projects.
Component 2. Non-Market Services	• **Stage 1 of data collection and mapping**—including updated geospatial information on crop production, processing opportunities, electrification opportunity, proximity to market, load data etc.—identifies high-opportunity clusters for initial focus.	• **Stage 2 of data collection**—including the same inputs as before, completed and made available nationally. • **Market gaps are identified** through assessment of government and private sector short-term work (Components 1 & 3).

	• **Initial coordination** among key government stakeholders around data.	• **Sustainable initiatives** enable universities, agricultural extensions, and NGOs to focus on community-level support for scaling agricultural productive use efforts.
Component 3. Private Sector Innovation Accelerator	• **Stakeholders convene annually** at an Electrifying Agriculture charrette for alignment and sharing of information, knowledge, and relationships to propose and prioritize solutions that fill market gaps. • **Facilitated cross-sector partnerships**, including agricultural, electricity, and financial experts, meet and problem-solve throughout the first year. • **Commercial business models** are designed and demonstrated during the second year. Accelerator projects are implemented in geographically representative hubs to demonstrate the viability of specific productive use approaches. • **Cross-sectoral leaders are developed** as team members learn from their peer's expertise and actively co-solve problems outside of their sector siloes	• **Productive use projects scale rapidly**, led by private sector leaders. • **Business models are fully commercialized**, with private sector businesses taking the lead as profitable enterprises. • **Next-level market opportunities** in previously un-addressed value chains and activities are being considered by stakeholders, facilitated by REA to develop and test potential solutions.

REA & RMI. 2021. *REA Energizing Agriculture Programme* (draft version – 25 January 2021).

Development partner minigrid initiatives

1. Nigeria Energy Support Programme (NESP)

The Nigeria Energy Support Programme (NESP) is a programme implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) and is co-funded by the European Union and e German Federal Ministry for Economic Cooperation and Development (BMZ). The Programme has contributed immensely to the development of commercial minigrids in Nigeria. During the first phase of the NESP (2013-2017), in addition to supporting the Nigeria Electricity Regulatory Commission (NERC) to develop the Minigrid Policy for Nigeria, supported the development of six (6) commercial solar PV minigrids spread across different regions of the Country. As shown in Table 3 below, the sizes of the minigrid supported by the NESP ranged from 50kWp to 100kWp. The systems were deployed using the public private partnership (PPP) and the split assets model. Under the split assets model, the NESP supported the developers with in-kind grants catering for a fraction (50%) of the capital expenditure (CAPEX) while the developers use debt or equity to raise resources for the other fraction of CAPEX. The minigrids were developed in closed partnership with the benefiting state governments. The six minigrid systems are operational and are expected to provide reliable electricity for 10,000 individuals.

Table 3. Minigrid supported during the first phase of the NESP

Community	**State**	**Geopolitical Zone**	**System Size (kWp)**	**Developer**
Umon Island	Cross River	South-south	50	CREDCENTRE
Gbamu Gbamu	Ogun	South-west	85	Rubitec Solar Ltd.
Tunga Jika	Niger	North-central	100	Nayo Tropical Technology Ltd.
Kurdula	Sokoto	North-west	80	GoSolar
Angwan Rina	Plateau	North-central	50	GVE Projects Ltd.
Demshin	Plateau	North-central	50	GVE Projects Ltd

During the second phase (NESP 2; 2018–2020), NESP will further support the implementation of investor-friendly minigrids. NESP 2 aims to provide electricity services to 100,000 people and at least 400 businesses in rural areas through local partners. This will be achieved through two schemes – The Minigrid Acceleration Scheme (MAS) and the Interconnected Minigrid Acceleration Scheme (IMAS). The MAS is an off-grid programme to facilitate access to electricity in isolated communities across the six geopolitical zones of Nigeria. On the other hand, IMAS is a programme that has both minigrid and grid elements and both elements are interconnected. The IMAS will provide electricity to communities that are underserved by the national grid. The goals of the MAS will provide electricity to 21,000 customers with partial capital in-kind grants of up to Six Million Euros (EUR 6 Million) while IMAS will facilitate access to electricity for 15,000 customers spread across regions controlled by 10 Electricity Distribution Companies (DISCOS).

The NESP has benefitted both public and private sector organizations, and the main accomplishments to date are:

→ Work on framework and regulation (with public institutions, such as REA, REF, FMP and NERC)

- Helped to operationalize REF and supported tendering process – REF Calls for Proposals (designing the tender, tools for evaluation of the proposals, etc.);
- Supported planning of the NEP;
- Indirectly supported solar connection facility by CBN;
- Supported PRGs ;
- Supported the MG regulations for NERC and also supporting NEMSA (technical inspection) and FME with guidelines for Environmental and Social Management plan tailored for PV MG;
- At States level: Supported State Governments with issues related to land management and issuance of civil works permit. Worked with some States to streamline this processes;

- SEforALL portal was launched at the end of 2020. The portal contains data the GIZ has collected on potential demand and data on the grid status. Sub-portal called 'MG Monitoring Dashboard' gives the status on existing MGs;

→ Work on projects (with developers and financiers)

- Supporting 25 projects. One tender launched in partnership with REA called MG acceleration scheme (MAS + IMAS) and also supporting REF Call 1 and 2. Covers the entire project development cycle from site identification to commissioning, including site survey, demand profile, system design, financial modelling, regulatory approval, procurement, etc.;
- Also early stage of operations, including demand stimulation. Has developed training for end users for potential PUE such as retrofitting of electric mills;
- Cost reduction with developers (in collaboration with RMI): Reduce CAPEX by supporting the development of local manufacturing capacities e.g. of meters;
- Due diligence guidelines and trainings for the banks, and collaboration with crowdfunding platform BetterVest.

The GIZ has embedded consultants in the REF, and this institutional arrangement should allow for good coordination with the AMP Nigeria project. It is also supporting clean cooking through the uptake of liquefied petroleum gas (LPG).

2. Nigeria Electrification Project (NEP)

The Nigeria Electrification Project (NEP) is a rural electrification programme supported by the World Bank (WB) and the African Development Bank (AfDB) and implemented by the Rural Electrification Agency (REA). The aim of the NEP is to accelerate the deployment of solar PV minigrids in isolated rural areas in order to increase electricity access to households and micro small and medium enterprises (MSMEs. The Programme is catalyzing the off-grid market by providing financial incentives to private minigrid developers. Partial grants are provided to support the development of private sector mini grids to electrify households, local enterprises, and public institution in selected communities that have high economic growth potential. The target of the NEP is to provide reliable power supply for 250,000 (MSMEs) and 1 million households. The grants amount is set at $350 per connection. The funds available for the mini grid component of the NEP is US$150million and consist of two funding windows: M**inimum Subsidy Tender** to electrify selected communities that have high economic growth potential, and the grant amount will be determined competitively through the tender; and a **performance-based grant program** for the development of mini grids on a spontaneous basis. The grant amount is set at US$350 per connection.

B. Feasibility Study

The design of the project interventions are drawn from the feasibility study[95] recently carried out under the Nigeria Power Sector Program executed by the Rocky Mountain Institute and implemented by Deloitte Consulting LLP. This study identifies win-win opportunities to electrify agricultural productive uses today, how they can be developed through commercial business models, and the tools stakeholders can use to overcome barriers to deployment. The focus on the agriculture-electricity nexus is justified from the perspectives that agricultural activities are the bedrock of most rural communities – i.e. agricultural development equates to socio-economic development of local communities, and renewable electricity can be seen as a meta-technology that is ubiquitous across modern societies – i.e. underpins most facets of modern life and accompanies socio-economic development. Hence, there are bold opportunities for using the agriculture-electricity nexus for supporting the socioeconomic development of rural communities in an environmentally-sound way.

This section provides a summary of the methodology and results of the feasibility study on agricultural productive energy use stimulation in Nigeria. To stimulate agricultural productive uses, the minigrid sector must understand which specific activities are appropriate for rural off-grid contexts, identify barriers to implementation, and design

[95] Scarlett Santana, Andrew Allee, Zihe Meng, Wayne Omonuwa, James Sherwood, Balaji MK, Kira Rosi-Schumacher. 2020. *Agricultural Productive Use Stimulation in Nigeria: Value Chain & Mini-Grid Feasibility Study.* Rocky Mountain Institute, Deloitte Consulting LLP. 2020. Prepared for the U.S. Agency for International Development Power Africa Nigeria Power Sector Program.

solutions to overcome them. This study applied a value chain and techno-economic analysis to discover which potential productive use opportunities are suitable for rural Nigerian minigrids and entrepreneurs.

Scope of study

The study was carried out in the Cross River and Kaduna states that cover two most prevalent agro ecological zones in Nigeria, namely tropical sub-humid and tropical semi-arid environments, respectively. The agricultural value chains that were studied are listed in **Table 2**.

Table 2. Agricultural value chains covered.

	Aquaculture	Cashew	Cassava	Cocoa	Cotton	Cowpea	Maize	Milk	Rice	Shea Nut	Sorghum	Soybean
Cross River	✓	✓	✓	✓	✓	✓	✓		✓			✓
Kaduna					✓	✓	✓	✓	✓	✓	✓	✓

Source: Scarlett Santana et al. 2020. Agricultural Productive Use Stimulation in Nigeria: Value Chain & Mini-Grid Feasibility Study. Rocky Mountain Institute, Deloitte Consulting LLP. 2020.

For each target value chain, four characteristics were studied:

1. **Crop characteristics and background,** including how and where the crop is farmed, the local yields, and its seasonality;
2. **Market status and trends,** particularly in what form and by whom the end products are consumed locally, and product market intelligence (state of local markets, market demand, pricing);
3. **Value chain activities,** focusing on the key steps between harvest and consumption, which value chain paths are most prominent, who participates in processing, and which crops or intermediate products face post-harvest losses; and
4. **Productive use opportunities,** identifying process steps best suited for electrification.

A total of 264 interviewees across four respondent types – community champion, agricultural processer, farmer and agricultural trader - participated in field survey to collect data. No surveyed communities had grid access. In Cross River State, 50% of households utilized a diesel generator. In Kaduna State, 30% households utilized a generator and another 30% used a solar home system (SHS) – mainly by community champions. Though some processing happens on either the buyer or seller side of these trade flows, many products are still traded as raw commodities. These observations clearly indicate the potential for growth in local processing within mini-grid communities.

Multi-criteria analysis (MCA) was applied to identify the most promising agricultural values chains that could be electrified using minigrids. The four criteria were: level of local capacity, state of offtake market, availability of electric equipment, and scalability. MCA has been used to classify prospective productive use activities into three tiers based on their readiness for electrification and implementation (**Figure 1**).

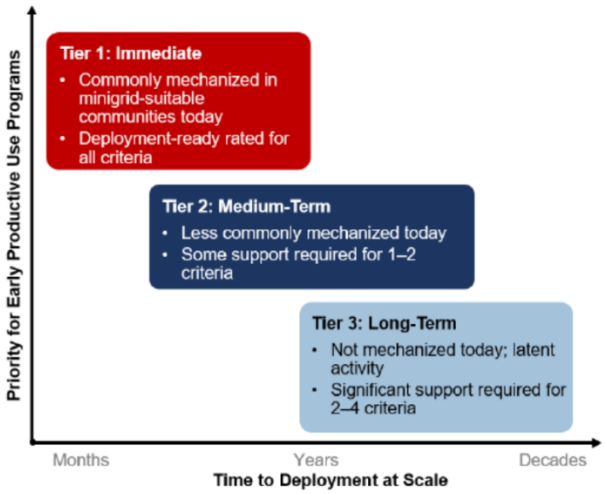


Figure 1. Classification of agriculture productive use activities into three tiers.
Source: Scarlett Santana et al. 2020. Agricultural Productive Use Stimulation in Nigeria: Value Chain & Mini-Grid Feasibility Study. Rocky Mountain Institute, Deloitte Consulting LLP. 2020.

Value chain analysis

Figure 2 shows this prioritization into: *Tier 1*, indicating immediate readiness for deployment; *Tier 2*, indicating strong medium-term potential with support to overcome one or more barriers, and; *Tier 3*, indicating longer-term potential if additional barriers are addressed. The main barriers identified in the study were:[96]

1. **Lack of access to credit for equipment purchase** often prevents small-scale processors and mini-grid developers from obtaining new machinery. These actors lack the credit history and collateral to obtain financing with reasonable terms. Neither microfinance institutions nor commercial bank agents were active in the rural communities surveyed;
2. **Lack of reliable electricity** in rural communities to operate equipment limits adoption, as most small-scale processors surveyed identified access to reliable electricity as the second most important barrier they face;
3. **Lack of awareness and education for would-be equipment purchasers** prevents them from seizing opportunities to invest in electric productive use equipment—over 80% of survey respondents in mini-grid-appropriate communities indicated it was difficult or very difficult to access extension or business development services;
4. **Lack of market access** limits the ability of local actors to sell new products made possible by mechanization, or to receive premium prices for higher-quality commodities. Absence of formal off-take agreements increases the revenue risk perceived by lenders; and
5. **Lack of access to electric equipment** which is not always evaluated alongside the development of mini-grid systems and only considered after operations begin, which means electricity is available but electric agricultural processing equipment may not be.

[96] *Scarlett Santana et al. 2020, p.3.*

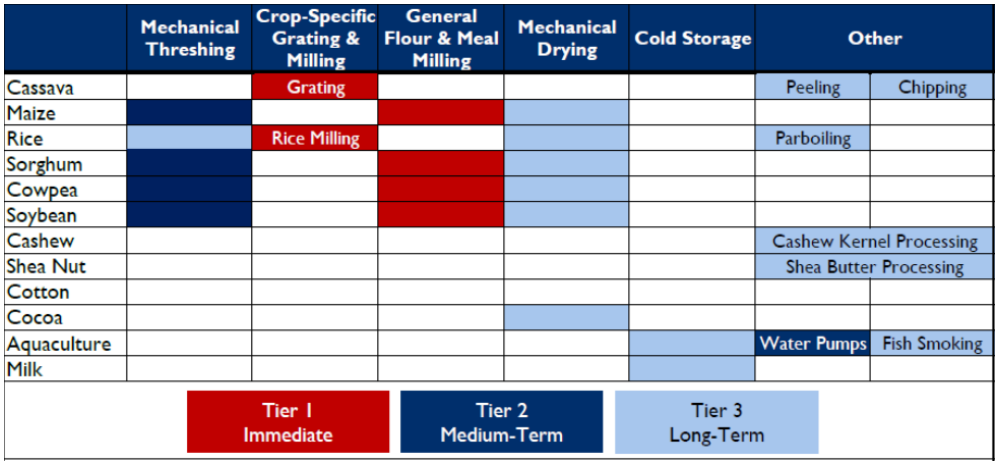


Figure 2. Tier Classifications for Value Chain Activities.
Source: Scarlett Santana et al. 2020. Agricultural Productive Use Stimulation in Nigeria: Value Chain & Mini-Grid Feasibility Study. Rocky Mountain Institute, Deloitte Consulting LLP. 2020.

There are three clear **Tier 1** activities that are primed for electrification. These are: (i) cassava grating, (ii) rice milling, and (iii) flour milling (across several grains), and cover crops that are commonly produced in high volumes. These crops are already commonly mechanically processed before sale into robust local markets. These are also the activities with the most robust appliance market, where mini-grid-compatible equipment is already available for purchase and pilot testing. Consequently, these activities are viable for immediate electrification, and will serve to increase capacity utilization of mini-grids with minimal programmatic support beyond appliance financing and procurement.

Tier 2 activities (medium-term), such as flour and meal milling, and drying are not far from being viable for electrification today but will require more program support than the *immediate* activities. Beyond just appliance financing, these supports may include enabling offtake, developing suitable appliances, or building local capacity. Tier 2 activities have significant potential given community acceptance of new practices,[97] mini-grid-compatible electrical equipment, and robust market linkages for processed products. Although these hurdles are surmountable with proper support, the average mini-grid developer would not be likely to address them alone. These activities are recommended for consideration by larger electrification programs that can include this support, or for local entrepreneurs and off takers with special sector expertise.

Tier 3 activities may have long-term potential for electrification, but significant support for extensive barriers removal would be required to make mini-grid deployment economic and sustainable. This category includes the hundreds of latent agricultural processing activities that could conceivably utilize electricity but would require considerable effort to build adequate local capacity (e.g. aggregation of raw commodities to achieve scale of economies), market linkages (e.g. industrial offtake markets where orders are in thousands of tonnes per year or collocation of dairy-producing communities and industrial dairy processors), and supply of mini-grid-compatible equipment from the ground up (e.g. electric parboilers). These are activities which are either rarely conducted in rural communities or are primarily conducted manually. Though incorporation of these activities into a mini-grid deployment program is not recommended today, many may be prime targets for study by agricultural development institutions or corporate actors interested in developing their local supply chains.

The results of the opportunities for energizing agricultural activities in Cross River and Kaduna States are shown in **Figure 3**. Maize and rice emerge as the most frequently cultivated crops in the two target states. Cassava is especially

[97] For example, adoption of a centralized multi-crop thresher depends on farmers' ability and willingness to transport their dried cereals to the town center, rather than hiring labour to thresh grains in the field.

important in Cross River's sub-humid agro ecological zone. In Kaduna's semi-arid zone, drought-resistant crops like cowpea and sorghum were grown alongside maize and rice.

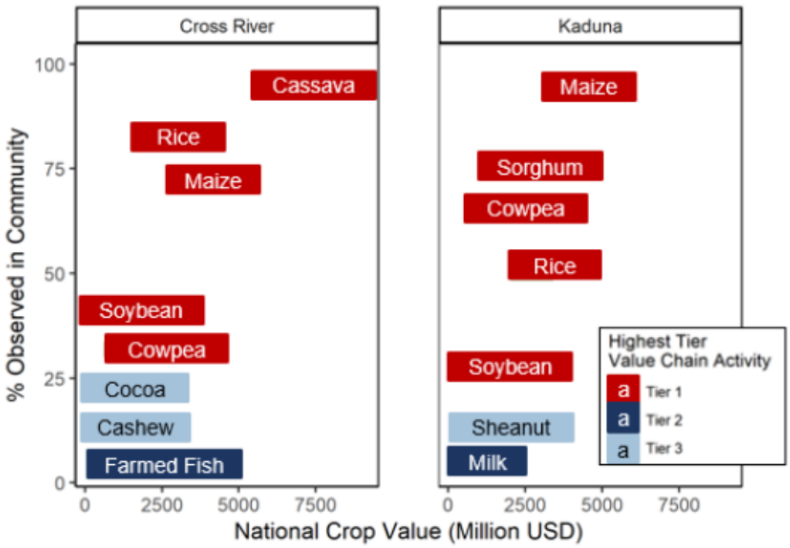


Figure 3. Value Chain Activities in Cross River and Kaduna States.
Source: Scarlett Santana et al. 2020. Agricultural Productive Use Stimulation in Nigeria: Value Chain & Mini-Grid Feasibility Study. Rocky Mountain Institute, Deloitte Consulting LLP. 2020.

Table 3 summarizes crop specific attributes related to the electrification of value chains. It covers only Tier 1 and Tier 2 activities.

Table 3. Crop specific attributes of Tier 1 and Tier 2 activities.

Cassava (Tier 1) is a critical staple that is nearly always mechanically processed before consumption or sale. Electrification of cassava graters by replacing aging diesel listers with electric motors will decrease operations and maintenance costs significantly.
Maize was the most widely cultivated crop across the two target states and many small milling businesses grind maize into flours and meals using fossil-powered motors. Maize flour milling is a Tier 1 opportunity with large potential to scale across Nigerian mini-grids, while maize threshing is a Tier 2 opportunity that shows promise if the business model for a stationary mini-grid-connected thresher can be proven.
Rice is processed by small-scale processors 80% of the time, most of whom operate outdated, one-stage, diesel rice mills. Introducing modern electric two-stage mills is a Tier 1 opportunity that can improve head rice yields and produce a higher quality product fetching a 50% price premium. Popularity of rice is growing in Nigeria.
Aquaculture is one of the least prevalent value chains studied, but also one of the fastest growing, averaging 12% annual growth for the past three decades. An unknown fraction of fish farmers use ground-source or aeration water pumps for their ponds. If pumping loads are located within mini-grid service territory, mini-grid-powered pumps can beat diesel pump operating costs by 25% (Tier 2).
Cowpeas are hardy, nutritious legumes that are commonly grown, processed and consumed within mini-grid-suitable communities. Properly operated, multi-crop mills can be utilized to process cowpea into flours, pastes and meals alongside other cereal grains (Tier 1). Cowpeas are second only to maize in prevalence of mechanical threshing today (Tier 2).
Soybean is the industrially oriented cousin of cowpea in Nigeria. Compared to cowpea, it is less of a local staple food and less geographically common, but opportunities to mechanize soybean processing strongly resemble those for cowpea in soybean-producing communities including both Tier 1 and Tier 2
Sorghum grows even on marginal lands with limited water resources, making it an important food security crop, especially in northern communities. Compared to maize, sorghum is much more likely to be self-consumed by

farmers rather than marketed as a cash crop. If sorghum can be milled (Tier 1) or threshed (Tier 2) alongside other grains, it may improve capacity utilization of multi-crop equipment utilized for other grains cultivated in larger quantities.

Source: Scarlett Santana et al. 2020. Agricultural Productive Use Stimulation in Nigeria: Value Chain & Mini-Grid Feasibility Study. Rocky Mountain Institute, Deloitte Consulting LLP. 2020.

Economic analysis

The economic viability of Tier 1 activities was analyzed for two prevalent processor business approaches, namely: (i) buying the raw commodity and selling the processed product (BnS), or (ii) a fee-for-service (FFS) modality in which commodities are processed for others against a fee payable. A total of five combinations of crops, activities, and processor modalities were studied as shown in **Table 4**.

Table 4. Combinations of crops, activities and processor modalities analyzed.

Crop	Activity	Processor modality
Cassava	Grating	BnS
Cassava	Grating	FFS
Maize	Flour milling	FFS
Rice	Milling	BnS
Rice	Milling	FFS

The investment economics are consistently strong across all activities and sale modalities based on the volumes of raw commodities produced in local communities. **Table 5** shows that all cases except fee-for-service rice milling have a positive NPV over the investment lifetime, ranging from roughly $2,100 to as high as $8,800, and discounted payback times between a little over 3 years to less than a year. There is a significant difference in NPV between the BnS and FFS rice miller sale modalities because buy and sell millers cut out the middleman and capture a price markup by playing the trader role, and they also enjoy the benefit of increased milling efficiency from the electric equipment (increasing yield and revenue).[98]

Beyond processing volume, investment economics are sensitive to a number of other factors. Sensitivity analyses were conducted to test key variables, including sale price, electricity price, financing specifications, and others. This analysis showed that within reasonable increases or decreases of these variables, electrifying these activities remained economically viable.

Table 5. Summary of economic analyses.

[98] An important takeaway for FFS processors is the need to adapt their pricing structure to compete. For example, if FFS rice millers increase their fee to reflect the better service they are providing with an electric mill, by 10%, or $1 per tonne, the investment becomes economically viable.

	Cassava Grating (*Gari*)		Grain Flour Milling	Rice Milling	
Assumptions:	1,000 kg/hour capacity 2,500 kg/day processed $3,940 capital cost 5 kW motor		300 kg/hour capacity 300 kg/day processed $830 capital cost 3 kW motor	1,000 kg/hour capacity 1,000 kg/day processed $1,800 capital cost 11.2 kW motor	
	BnS	**FFS**	**FFS**	**BnS**	**FFS**
NPV: Electric Equipment	$5,500	$2,900	$2,100	$8,800	-$600
IRR	73%	53%	108%	179%	19%
Discounted Payback (years)	2.0	3.2	1.3	0.7	n/a

Source: Scarlett Santana et al. 2020. Agricultural Productive Use Stimulation in Nigeria: Value Chain & Mini-Grid Feasibility Study. Rocky Mountain Institute, Deloitte Consulting LLP. 2020.

Mini-grids economics

To investigate the impact of agricultural productive energy uses on the economics of mini-grids, the five scenarios shown in **Table 6** were analyzed. The results showed that expected loads from Tier 1 activities can improve mini-grid economics and enable lower cost-reflective tariffs for customers.

Table 6. Mini-grids scenarios analyzed for economic impact study.

Scenario	Added Productive Use	Mini-grid system design
BASE	None	Optimized hybrid system with solar PV, lead acid battery, and diesel backup with 50% oversizing to reflect current practice
BASE + Cassava	Cassava grating	Same as BASE scenario
BASE + Maize	Maize flour milling	Same as BASE scenario
BASE + Rice	Rice milling	Same as BASE scenario
BASE + All	All three	Designed without oversizing to show an ideally sized system

Source: Scarlett Santana et al. 2020. Agricultural Productive Use Stimulation in Nigeria: Value Chain & Mini-Grid Feasibility Study. Rocky Mountain Institute, Deloitte Consulting LLP. 2020.

The results have shown that, relative to a baseline scenario with a 77 kW PV-diesel hybrid mini-grid (without added productive use), mini-grid electricity tariffs in communities with electrified cassava grating, rice milling, and maize flour milling could be 6–19% lower while still earning a 15% internal rate of return (IRR) for mini-grid investors. In the BASE scenario, the mini-grid electricity tariff is US$0.60/kWh. Furthermore, if the community electrified all three activities and the mini-grid optimized design fully integrated them, a 26% reduction in tariff can be achieved.[99] The additional productive use loads improve the mini-grid's economics by increasing the system utilization rate and increasing sales to generate more revenue. While the volume of additional electricity sales is helpful, the timing of the added load is critical.[100]

[99] This assumes the number of processors found in a community of this size as reported in survey results, meaning nine cassava graters, five rice mills, or 12 flour mills are electrified, adding 30%, 15% and 12% load to the existing load in BASE scenario, respectively.

[100] Cassava grating, for example, represents a greater increase in both peak demand and energy usage compared to rice milling, but the latter has a greater impact on reducing the mini-grid tariff (**Figure 12**). This is because rice milling operations occur primarily during the day (as reported by survey respondents), which better matches the availability of low-cost solar generation and avoids the need to run additional expensive diesel generation. Mini-grid operators can take advantage of this benefit by adding agricultural processing loads that already occur during the day, or by encouraging customers to change their behavior to shift loads during these hours (for example through time of use tariffs).

In the BASE+All scenario, an optimized mini-grid design calls for an additional 10 kW of PV capacity, equally sized genset, and 40 kWh more battery storage compared to the BASE scenario. There is significantly more daytime load in the BASE+All scenario (**Figure 4**), most of which can be served by solar generation in combination with battery storage. Despite higher upfront capital investment, mini-grid operating costs are lower and revenues increase from the additional load. Productive use has the potential to significantly reduce the tariff, making the mini-grid more financially viable.

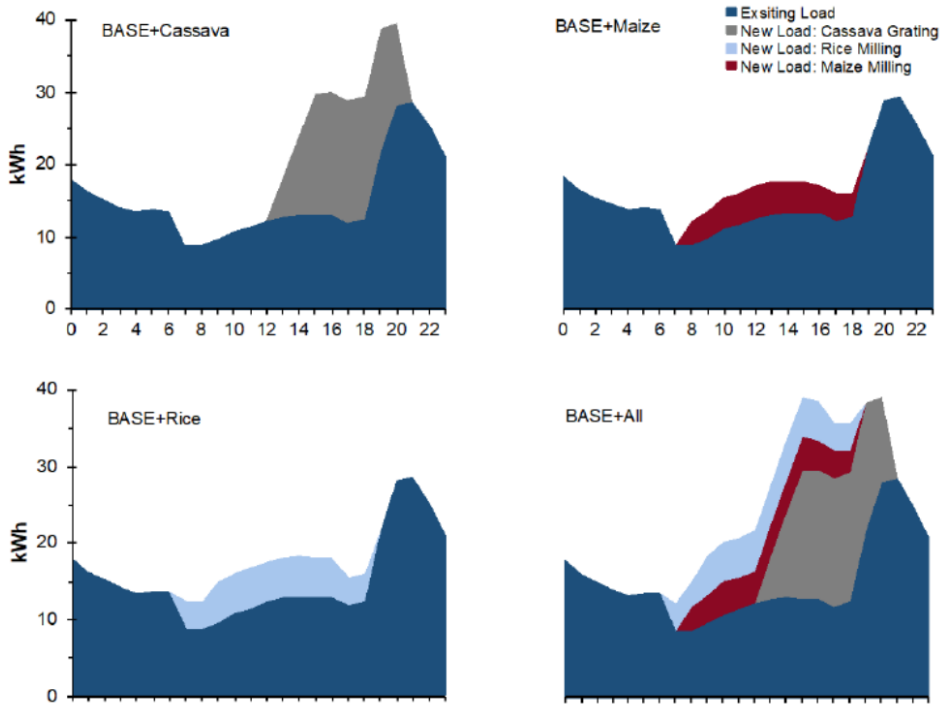


Figure 4. Load profiles under different scenarios.
Source: Scarlett Santana et al. 2020. Agricultural Productive Use Stimulation in Nigeria: Value Chain & Mini-Grid Feasibility Study. Rocky Mountain Institute, Deloitte Consulting LLP. 2020.

Business models

While the economics show the attractive value proposition of the nexus that exists between mini-grid electricity and agricultural activities, several implementation barriers remain as documented above. The study has proposed two business models – Facilitator Model (FM) and the Processing Center Model (PCM) - for barriers removal in order to implement electrified Tier 1 and Tier 2 agricultural activities at scale in Nigeria.

Facilitator Model (FM)

The **Facilitator Model** is led by a facilitator who enables small-scale processors to invest in equipment by serving as their education resource and connection point to finance providers. While the small-scale processor is ultimately responsible for the credit and operational risk, the facilitator builds awareness about the investment opportunity and provides business development training to support loan applications and equipment selection, as shown in **Figure 5**. Over time, once the viability of lending to small-scale processors is proven, the role of the facilitator would be phased out or reduced and the private financial institution (PFI) assumes the role of identifying and selecting would-be processors. One key benefit of the FM is that it de-risks participation by third parties to provide financing and capacity building, which enables equipment purchases and reduces the burden on the mini-grid developer.

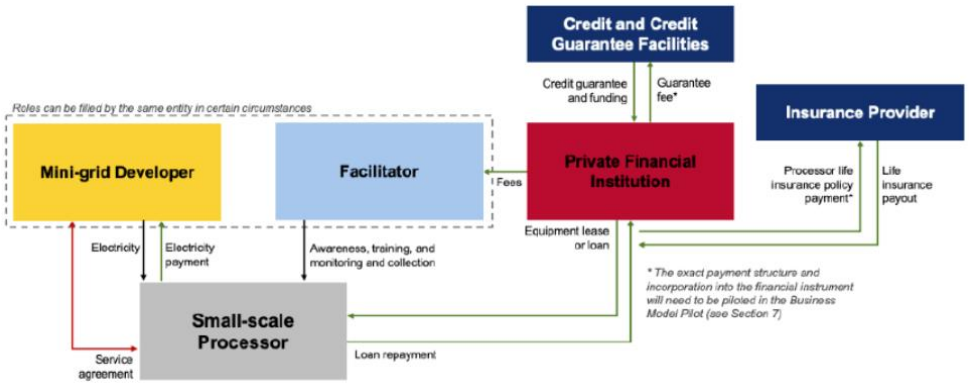


Figure 5. Schematic illustration of the Facilitator Model.
Source: Scarlett Santana et al. 2020. Agricultural Productive Use Stimulation in Nigeria: Value Chain & Mini-Grid Feasibility Study. Rocky Mountain Institute, Deloitte Consulting LLP. 2020.

The following are examples of actors well-suited to fulfill **key roles** in the Facilitator Model:

- A **small-scale processor** invests in electric equipment and is responsible for operating the equipment and repaying the equipment loan. They are a local entrepreneur that already invests in processing for sale in local markets and first-time buyers of electric equipment;
- The **facilitator** leverages its local presence and relationships to connect small-scale processors to finance and equipment access. For an organization to fill the facilitator role, it must be embedded in the farming communities and have an operational model that aligns with the activities required by this role;[101]
- A **private finance institution** (PFI) on-lends from the credit facility to the small-scale processor. The PFI should have experience lending to the agriculture sector and have a mandate to support financial inclusion;[102] and
- The **mini-grid developer** serves a limited role under the FM, focusing on its core utility business of producing and selling electricity. As such, candidates suitable for participating in this model are those that have limited additional management capacity to assign to manage a new business line or would prefer to not diversify their business.[103]

Processing Centre Model (PCM)

The **Processing Center Model shown in Figure 6** relies on a mini-grid developer based in a rural community to invest in, own, and operate the equipment for a new processing service that existing entrepreneurs are not able to provide. Under the PCM, the mini-grid developer is ultimately responsible for the credit and operational risk. It is appropriate for activities where there is proven demand for the product, but the activity is not prevalent in the local community. Using these criteria to determine when the PCM is appropriate can ensure that local entrepreneurs are not displaced by the mini-grid developer.

The following are examples of actors well-suited to fulfill **key roles** in the PCM:

- The **mini-grid developer** serves the most important role under the PCM, because in addition to providing reliable electricity service, it also owns the processing center, invests in the electric equipment, and is responsible for operating the equipment and repaying the equipment loan. Mature companies with experience deploying appliance financing programs, and a management structure that can accommodate additional business lines, are better suited to implement the PCM; and

[101] For example, an organization like Solar Sisters, which specializes in selling and distributing solar equipment in un- or under-served communities, has an operational model aligned with the facilitator role as they already perform similar functions.
[102] For example, LAPO Microfinance Bank meets both criteria.
[103] In sector interviews mini-grid developers, both early entrants and experienced companies often stated that they prefer a business model where they do not need to absorb additional operational responsibility and investment functions beyond their main business line.

- A **private finance institution** on-lends funding from the credit facility to the mini-grid developer. Like in the FM, the PFI should have experience lending to the agriculture sector because it will have a better understanding of common risks, already have mechanisms to address these risks, and be more willing to lend for agricultural activities. Alternatively, banks that are already lending to mini-grid companies may be more comfortable extending credit for a new credit line.[104]

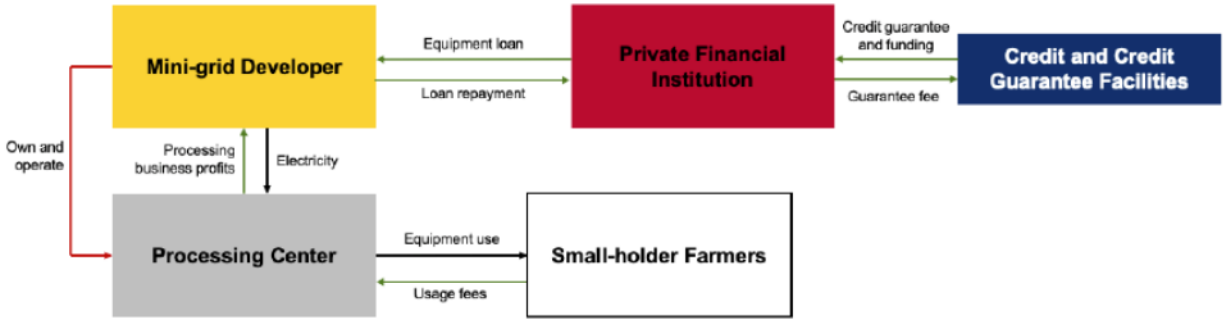


Figure 6. Schematic illustration of the Processing Centre Model.
Source: Scarlett Santana et al. 2020. Agricultural Productive Use Stimulation in Nigeria: Value Chain & Mini-Grid Feasibility Study. Rocky Mountain Institute, Deloitte Consulting LLP. 2020.

Applicability of business model options

The applicability of business model options will depend on their relative effectiveness at removing the barriers identified earlier, and any additional burden that they place on value chain actors. Both models address most barriers. The PCM requires fewer stakeholders than the FM, but the latter imposes a smaller burden on the mini-grid developer. There are applications for both models, and deployment should be determined based on the particular situation in a given community. Considering this, the study made the following recommendations:

- **Use the FM for Tier 1 activities** because it will not displace local small-scale processors already engaged in these activities and it is simple to implement. For activities that are prevalent today, the FM ensures the local community captures the most value and does not impose an operational burden and credit risk on the mini-grid developer. The model has a relatively simple design and still addresses the key barrier that would-be processors face—access to credit.[105]
- **Use the PCM for Tier 2 activities** because it would reduce the size of investment needed and would not displace local entrepreneurs. In general, mechanized Tier 2 activities are not as prevalent in rural agricultural communities because the investment size needed to develop a processing business is a barrier to entry for local small-scale processors. Processes that conserve the purity and integrity of the crop and where investment is a barrier to entry for small-scale processors are good candidates for this model.[106]

Deployment strategy and financing

The study has focused on the deployment strategy of the FM for Tier 1 activities that are ready for immediate deployment. It has identified a selection of four financing instruments as follows:[107]
Several financial instruments can be considered to de-risk investment and crowd-in commercial financing:

[104] The following banks are lending or have demonstrated interest in lending to mini-grid developers in Nigeria: Sterling Bank, First City Monument Bank, Access Bank, WEMA Bank Debt.
[105] Furthermore, survey results and the analysis of local trade volumes suggest that demand for Tier 1 activities is strong enough in these communities to support implementation without a dedicated offtaker in the design.
[106] For example, threshing that can be consolidated in the town center and multi-purpose drying meet these criteria. The Processing Center Model is suitable for these conditions because the mini-grid developer would face lower investment costs by leveraging their existing operational capabilities.
[107] *Scarlett Santana et al. 2020, pp.31-32.*

- ***Senior and subordinated debt.*** Credit lines designated to on-lend to small-scale processors to encourage lending by PFIs;
- ***Partial credit guarantees.*** PFIs in Nigeria lend a low share of their loan portfolios to agriculture and so may be ill-equipped to properly assess risks and serve sectors related to agriculture. In addition to targeting the few PFIs that do lend to the agriculture sector, partial credit guarantees can derisk lending to small-scale processors connected to the agriculture sector and attract additional sources of commercial financing;
- ***Life Insurance***. As opposed to the credit guarantee which covers loan repayment in the event of a loan default, life insurance would cover the loan repayment in the event of the small-scale processor's death. Life insurance would reduce collection costs and credit risk and would further derisk loans to small-scale processors; and
- ***Grants for funding initial set-up costs and capital cost reduction.*** Initial coordination, preparation, and studies are needed to connect actors through workshops, fund pilots to test, identify, and standardize suitable equipment to connect to mini-grids, and conduct monitoring and evaluation to demonstrate the success of and lessons learned from pilots and programs. Grants are suitable for financing set-up costs and pre-investment studies because these investments do not offer an immediate and direct financial return to the investor, but they are critical to attract commercial financing later.

The institutional arrangement proposed to implement the deployment strategy for electrifying Tier 1 agricultural productive use equipment is illustrated in **Figure 7**.

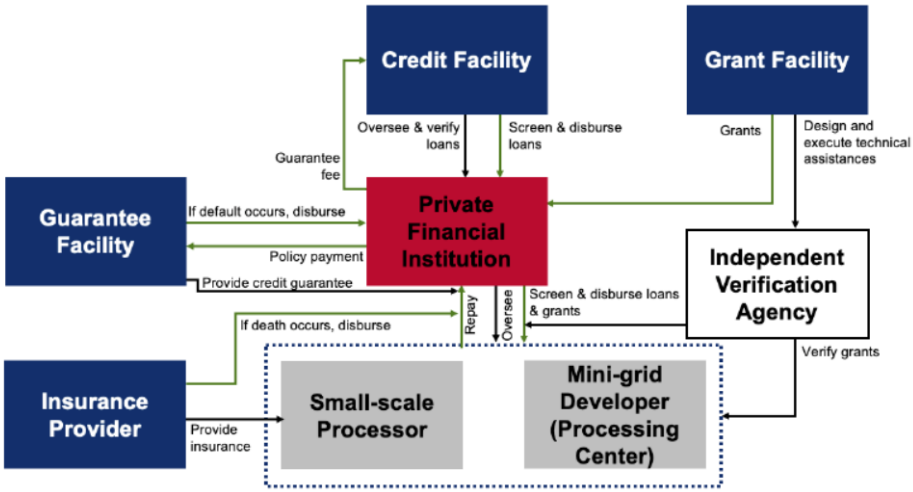


Figure 7. Institutional arrangement for implementing deployment strategy.
Source: Scarlett Santana et al. 2020. Agricultural Productive Use Stimulation in Nigeria: Value Chain & Mini-Grid Feasibility Study. Rocky Mountain Institute, Deloitte Consulting LLP. 2020.

The roles and responsibilities of the different actors have been identified as follows:

- **Grant Facility.** This facility provides matching grants to reduce the blended cost of capital and funds technical assistance. The grant facility could issue matching grants to PFIs to reduce the cost of capital for equipment purchases that do not generate enough revenue (FFS rice milling). The grant facility would also fund an independent verification agency to verify the grants provided for these specific applications, and would also fund technical assistance needed for set-up and to conduct pre-investment analysis.
  In Nigeria, the Rural Electrification Agency (REA) is well positioned to operate the grant facility, potentially leveraging the project management structures established for the Rural Electrification Fund (REF). The grant facility would need to access concessional funding from development finance institutions, or taxpayer funding from the state or federal government budgets.

- **Credit Facility.** This facility lends senior and subordinated debt to PFIs to derisk investment. Possible candidates to fund and/or operate the credit facility include the Development Bank of Nigeria (DBN)[108] and international funders like the International Finance Corporation (IFC).
- **Private Finance Institutions.** PFIs receive financing from the credit facility that they on-lend to the small-scale processor or mini-grid developer. The role played by PFIs is key to the deployment strategy, as they are the ultimate lender to the equipment investor. The type of PFI best suited to fund the Facilitator and Processing Center Models would be different. A PFI for the FM would need to include financial institutions with a mandate or programs that support financial inclusion and so have the systems and administrative capacity to oversee smaller loans to small-scale processors. In contrast, loans provided to a mini-grid developer under the PCM could be provided by commercial banks targeting larger customers. Both sets of PFIs should ideally already be lending to the agriculture firms working in upstream activities close to cultivation and with knowledge of how to assess and manage risks common in small-holder farming (e.g., weather, sickness, etc.). Examples of PFIs that may be suited to on-lend to small-scale processors under the FM have been identified as the Bank of Industry (BOI) and LAPO Microfinance Bank Ltd.
- **Credit Guarantee Facility.** This facility offers partial credit guarantees to backstop the PFI's loans to reduce credit risk and enable the PFI to offer loans. Various options for guarantee providers exist in Nigeria but further engagement and due diligence will be needed to determine which providers might present the best combination of fit and interest. Potential providers that have been identified are: Impact Credit Guarantee Ltd (a subsidiary of DBN), Infracredit and NIRSAL. Impact Credit Guarantee Ltd may be better suited for Tier 1 activities, while Infracredit for Tier 2 activities.
- **Insurance provider.** An insurance provider provides life insurance to repay the equipment loan in the event of the death of the small-scale processor. There are various insurance providers that offer life insurance in Nigeria. BOI's subsidiary, BOI Insurance Broker's Ltd., provides insurance services, and LAPO provides insurance to its borrowers through third party providers. Grant funding may need to be made available to cover the insurance premium charged up front to the policy holder.
- **Small-scale processor or mini-grid developer.** Under the Facilitator Model, a small-scale processor with support from the facilitator applies for financing to purchase the electric equipment. The loan would be deposited by the PFI into the account of the small-scale processor, and the PFI would implement controls to ensure that the small-scale processor cannot use financing for purposes other than the equipment purchase.[109]

An important consideration across the recommended institutional arrangements is the inclusion of multiple funding streams originating from different financial institutions. Each of these funders will have their own requirements for borrowers or beneficiaries to meet, complicating the application process that the borrower will face. To combat this, a single application portal should be established through the PFI. This application can include the various information requirements that both the PFI and grant facility require. This would not preclude the grant facility from establishing specific criteria for grant approval and would enable it to delegate screening and approval to the PFI or choose to carry out their evaluation separately in parallel. However, both approval processes should be coordinated through the application portal to simplify the process for the applicant.

[108] DBN can only lend to organizations that are regulated by the Central Bank of Nigeria.

[109] PFIs targeting micro-entrepreneurs, like BOI's GEEP, have expertise developing disbursement systems that embed controls like these. Under the PCM, a mini-grid developer would apply for financing to purchase electric equipment.

Part C: Calculation of core indicators, including GHG emission reductions

1. Estimating grant per minigrid **117,977** USD / MG

RBF approach based on estimating number of connections *179,900* USD / MG

- obtained from load profile in MG DREI analysis

Household s	475	units	475
Productive use	47	units	24
Public infrastructure	19	units	15
		TOTAL	**514**

Principle of pre-derisking LCOE parity with diesel baseline (using MG DREI LCOE model)

- approach used is to decrease the investment cost of generation in cells S71 to S74 in IV. Solar Inputs until the pre-derisking solar PV-battery LCOE is equal to USD 0.52 / kWh.

- baseline solar PV LCOE without subsidy	USD 0.8 / kWh	- investment cost	**278,681**
- baseline solar PV LCOE with subsidy	USD 0.52 / kWh	- investment cost	**160,704**
		Subsidy for LCOE parity	*117,977*

2. Number of solar PV-battery MGs supported **26**

Allocation of GEF INV	**Yr1**	**Yr2**	**Yr3**	**Yr4**
Number of minigrids	6	19		
INV, USD	707,862	2,241,563	0	0
Allocating differential	34,620	115,402		
Effective INV, USD	742,482	2,356,965	0	0

25%

ESTIMATING GHG EMISSION REDUCTIONS

A. DIRECT EMISSIONS

- Baseline number of solar PV-battery MGs
- Annual electricity demand
- Emission factor for diesel baseline
- Technology lifetime
- Pro-rating factor

	Yr1	Yr2	Yr3	Yr4
Number of minigrids financed	6	19	0	0
Number of minigrids operational	0	6	25	25
Total renewable electricity generated, MWh/yr	0	1,002	4,175	4,175
CO2 emission reductions, tCO2/yr	0	890.735328	3711.3972	3711.3972
Cumulative emission reduction, tCO2	0	890.735328	4602.13253	8313.529728

	Not pro-rated	Pro-rated	
- at Mid-term, ktCO2 (cumulative)	0.891	0.802	GEF grant abatement cost (direct lifetime)
- at end-of-project, ktCO2 (cumulative)	8.314	7.482	
- lifetime ER, ktCO2	74.228	66.805	abatement cost (direct + consequential)

B. INDIRECT EMISSIONS REDUCTIONS

- Top-Down using DREI modeling to 2031			77,240.000	ktCO2e	- time factor	0.6
			Low	Medium	High	
Low	0.1	Causality factor	0.10	0.20	0.40	
	- Consequential top-down, tCO2		4,170.960	ktCO2e		
			Low	Medium	High	
- Bottom-up		- replication factor	2.000	5.000	8	High
	- consequential bottom-up		480.997	ktCO2e		8

ESTIMATING INCREASE IN INSTALLED CAPACITY PER TECHNOLOGY (IN THIS CASE SOLAR PV-BATTERY MINIGRID)

- Installed capacity per solar PV MG	120.9	kWp	- Optimized size for load profile defined in MG DREI analyses in 'IV. Inputs Solar'
- battery storage capacity	300.59	kWh	- Optimized size for load profile defined in MG DREI analyses in 'IV. Inputs Solar'

	Yr1	Yr2	Yr3	Yr4
Number of MGs operational	0	6	25	25
Solar PV installed capacity, kWp	0.0	725.4	3,022.5	3,022.5
Battery storage, kWh	0.0	1,803.5	7,514.8	7,514.8

ESTIMATING NUMBER OF BENEFICIARIES

- typically, the beneficiaries of productive use and social infrastructure will come from the households that will be serviced with renewable electricity
- so the breakdown into productive use and social infrastructure are mainly number of connections, and the beneficiaries are already included in the household beneficiaries
- The calcualtions use the number of connections estimated above

		Yr1	Yr2	Yr3	Yr4
A	**Number of beneficiaries, households**	0	2,850	11,875	11,875
	Number of persons	0	16,815	70,063	70,063
	Number of women	0	8,294	34,559	34,559
	Number of men	0	8,521	35,504	35,504
B	**Number of productive use, connections**	0	144	600	600
C	**Number of social infrastructure, connections**	0	90	375	375

ESTIMATING DIRECT NUMBER OF JOBS CREATED

DIRECT JOBS - formal

A	**Construction and O&M of MG**	Manufac	C&I	O&M
	- job creation coefficient, direct jobs per MW installed	0.844	13.46	7.34
	- excluding manufacturing, total direct jobs/MW		20.8	
		Yr1	**Yr2**	**Yr3**	**Yr4**

direct jobs created, jobs	0.0	15.0	63.0	63.0

B

Productive Uses

		Low	Medium	High
- direct job creation coefficient, jobs/connections		2	3	4
	Yr1	**Yr2**	**Yr3**	**Yr4**
direct job created, jobs	0	288	1200	1200
TOTAL DIRECT FORMAL JOBS	**0.0**	**303.0**	**1,263.0**	**1,263.0**

DIRECT JOBS - informal

Power for ALL (2019)
Powering Jobs Census - by 2022 - 2023

direct formal jobs
direct informal jobs

- direct informal jobs coefficient	(direct informal / direct formal)	0.461538462

	Yr1	**Yr2**	**Yr3**	**Yr4**
TOTAL DIRECT INFORMAL JOBS	0	**140**	583	**583**

Annex 14: Additional agreements

such as cost sharing agreements, project cooperation agreements signed with NGOs (where the NGO is designated as the “executing entity”), letters of financial commitments etc..

Submitted as separate documents (Co-financing letters and ICF checklist).

Annex 15: GEF Core indicators

Core Indicator 6	**Greenhouse gas emission mitigated**					***(Metric tons of CO_2e)***
			Expected metric tons of CO_2e (6.1+6.2)			
			PIF stage	Endorsement	MTR	TE
		Expected CO2e (direct)	*177,300*	*74,228*		
		Expected CO2e (indirect)	*4,936,129*	*4,170,960*		
Indicator 6.4	Increase in installed renewable energy capacity per technology					
		Technology	Capacity (MW)			
			Expected		Achieved	
			PIF stage	Endorsement	MTR	TE
		Solar PV	*3.58*	*3.022*		
		Energy Storage	*0*	*7.51*		
Core Indicator 11	**Number of direct beneficiaries disaggregated by gender as co-benefit of GEF investment**					***(Number)***
			Number			
			Expected		Achieved	
			PIF stage	Endorsement	MTR	TE
		Female	*175,286*	*34,559*		
		Male	*182,440*	*35,504*		
		Total	*357,726*	*70,063*		

Annex 16: GEF 7 Taxonomy

Level 1	Level 2	Level 3	Level 4
☒**nfluencing models**			
	☐ **Transform policy and regulatory environments**		
	☒**Strengthen institutional capacity and decision-making**		
	☒**Convene multi-stakeholder alliances**		
	☒**Demonstrate innovative approaches**		
	☒**Deploy innovative financial instruments**		
☒**Stakeholders**			
	☐**Indigenous Peoples**		
	☒**Private Sector**		
		☒Capital providers	
		☒Financial intermediaries and market facilitators	
		☐Large corporations	
		☒SMEs	
		☒Individuals/Entrepreneurs	
		☐Non-Grant Pilot	
		☐Project Reflow	
	☒**Beneficiaries**		
	☒**Local Communities**		
	☒**Civil Society**		
		☒Community Based Organization	
		☒ Non-Governmental Organization	
		☐Academia	
		☐ Trade Unions and Workers Unions	
	☒**Type of Engagement**		
		☒Information Dissemination	
		☒Partnership	
		☒Consultation	
		☒Participation	
	☒**Communications**		
		☒Awareness Raising	
		☐Education	
		☐Public Campaigns	
		☒Behavior Change	
☒ **Capacity, Knowledge and Research**			
	☐**Enabling Activities**		
	☒**Capacity Development**		
	☒ **Knowledge Generation and Exchange**		
	☐**Targeted Research**		
	☒**Learning**		
		☒Theory of Change	
		☒Adaptive Management	
		☒Indicators to Measure Change	
	☒**Innovation**		
	☒**Knowledge and Learning**		
		☒Knowledge Management	
		☒Innovation	
		☒Capacity Development	

		☒Learning	
	☒**Stakeholder Engagement Plan**		
☒**Gender Equality**			
	☒**Gender Mainstreaming**		
		☒Beneficiaries	
		☐Women groups	
		☒Sex-disaggregated indicators	
		☒Gender-sensitive indicators	
	☒**Gender results areas**		
		☐Access and control over natural resources	
		☒Participation and leadership	
		☒Access to benefits and services	
		☒Capacity development	
		☒Awareness raising	
		☒Knowledge generation	
☒**Focal Areas/Theme**			
	☐**Integrated Programs**		
		☐ Commodity Supply Chains (Good Growth Partnership)	
			☐ Sustainable Commodities Production
			☐Deforestation-free Sourcing
			☐Financial Screening Tools
			☐High Conservation Value Forests
			☐High Carbon Stocks Forests
			☐Soybean Supply Chain
			☐Oil Palm Supply Chain
			☐Beef Supply Chain
			☐Smallholder Farmers
			☐Adaptive Management
		☐ Food Security in Sub-Sahara Africa	
			☐Resilience (climate and shocks)
			☐Sustainable Production Systems
			☐Agroecosystems
			☐Land and Soil Health
			☐Diversified Farming
			☐ Integrated Land and Water Management
			☐Smallholder Farming
			☐Small and Medium Enterprises
			☐Crop Genetic Diversity
			☐Food Value Chains
			☐Gender Dimensions
			☐Multi-stakeholder Platforms
		☐ Food Systems, Land Use and Restoration	
			☐Sustainable Food Systems
			☐Landscape Restoration
			☐Sustainable Commodity Production
			☐Comprehensive Land Use Planning
			☐Integrated Landscapes
			☐Food Value Chains
			☐Deforestation-free Sourcing
			☐Smallholder Farmers
		☐Sustainable Cities	
			☐Integrated urban planning
			☐Urban sustainability framework
			☐Transport and Mobility

			☐ Buildings
			☐ Municipal waste management
			☐ Green space
			☐ Urban Biodiversity
			☐ Urban Food Systems
			☐ Energy efficiency
			☐ Municipal Financing
			☐ Global Platform for Sustainable Cities
			☐ Urban Resilience
	☐ **Biodiversity**		
		☐ Protected Areas and Landscapes	
			☐ Terrestrial Protected Areas
			☐ Coastal and Marine Protected Areas
			☐ Productive Landscapes
			☐ Productive Seascapes
			☐ Community Based Natural Resource Management
		☐ Mainstreaming	
			☐ Extractive Industries (oil, gas, mining)
			☐ Forestry (Including HCVF and REDD+)
			☐ Tourism
			☐ Agriculture & agrobiodiversity
			☐ Fisheries
			☐ Infrastructure
			☐ Certification (National Standards)
			☐ Certification (International Standards)
		☐ Species	
			☐ Illegal Wildlife Trade
			☐ Threatened Species
			☐ Wildlife for Sustainable Development
			☐ Crop Wild Relatives
			☐ Plant Genetic Resources
			☐ Animal Genetic Resources
			☐ Livestock Wild Relatives
			☐ Invasive Alien Species (IAS)
		☐ Biomes	
			☐ Mangroves
			☐ Coral Reefs
			☐ Sea Grasses
			☐ Wetlands
			☐ Rivers
			☐ Lakes
			☐ Tropical Rain Forests
			☐ Tropical Dry Forests
			☐ Temperate Forests
			☐ Grasslands
			☐ Paramo
			☐ Desert
		☐ Financial and Accounting	
			☐ Payment for Ecosystem Services
			☐ Natural Capital Assessment and Accounting
			☐ Conservation Trust Funds
			☐ Conservation Finance

		☐Supplementary Protocol to the CBD	
			☐Biosafety
			☐Access to Genetic Resources Benefit Sharing
	☐**Forests**		
		☐ Forest and Landscape Restoration	
			☐REDD/REDD+
		☐Forest	
			☐Amazon
			☐Congo
			☐Drylands
	☐**Land Degradation**		
		☐Sustainable Land Management	
			☐ Restoration and Rehabilitation of Degraded Lands
			☐Ecosystem Approach
			☐ Integrated and Cross-sectoral approach
			☐Community-Based NRM
			☐Sustainable Livelihoods
			☐Income Generating Activities
			☐Sustainable Agriculture
			☐Sustainable Pasture Management
			☐ Sustainable Forest/Woodland Management
			☐ Improved Soil and Water Management Techniques
			☐Sustainable Fire Management
			☐Drought Mitigation/Early Warning
		☐Land Degradation Neutrality	
			☐Land Productivity
			☐Land Cover and Land cover change
			☐ Carbon stocks above or below ground
		☐Food Security	
	☐**International Waters**		
		☐Ship	
		☐Coastal	
		☐Freshwater	
			☐Aquifer
			☐River Basin
			☐Lake Basin
		☐Learning	
		☐Fisheries	
		☐Persistent toxic substances	
		☐SIDS : Small Island Dev States	
		☐Targeted Research	
		☐Pollution	
			☐Persistent toxic substances
			☐Plastics
			☐Nutrient pollution from all sectors except wastewater
			☐Nutrient pollution from Wastewater
		☐ Transboundary Diagnostic Analysis and Strategic Action Plan preparation	
		☐ Strategic Action Plan Implementation	
		☐ Areas Beyond National Jurisdiction	

		☐Large Marine Ecosystems	
		☐Private Sector	
		☐Aquaculture	
		☐Marine Protected Area	
		☐Biomes	
			☐Mangrove
			☐Coral Reefs
			☐Seagrasses
			☐Polar Ecosystems
			☐Constructed Wetlands
	☐**Chemicals and Waste**		
		☐Mercury	
		☐Artisanal and Scale Gold Mining	
		☐Coal Fired Power Plants	
		☐Coal Fired Industrial Boilers	
		☐Cement	
		☐Non-Ferrous Metals Production	
		☐Ozone	
		☐Persistent Organic Pollutants	
		☐ Unintentional Persistent Organic Pollutants	
		☐ Sound Management of chemicals and Waste	
		☐Waste Management	
			☐Hazardous Waste Management
			☐Industrial Waste
			☐e-Waste
		☐Emissions	
		☐Disposal	
		☐ New Persistent Organic Pollutants	
		☐Polychlorinated Biphenyls	
		☐Plastics	
		☐Eco-Efficiency	
		☐Pesticides	
		☐DDT - Vector Management	
		☐DDT - Other	
		☐Industrial Emissions	
		☐Open Burning	
		☐ Best Available Technology / Best Environmental Practices	
		☐Green Chemistry	
	☒**Climate Change**		
		☐**Climate Change Adaptation**	
			☐Climate Finance
			☐Least Developed Countries
			☐Small Island Developing States
			☐Disaster Risk Management
			☐Sea-level rise
			☐Climate Resilience
			☐Climate information
			☐Ecosystem-based Adaptation
			☐Adaptation Tech Transfer
			☐National Adaptation Programme of Action
			☐National Adaptation Plan
			☐Mainstreaming Adaptation
			☐Private Sector
			☐Innovation
			☐Complementarity
			☐Community-based Adaptation
			☐Livelihoods

		☒**Climate Change Mitigation**	
			☐ Agriculture, Forestry, and other Land Use
			☐Energy Efficiency
			☐ Sustainable Urban Systems and Transport
			☒Technology Transfer
			☒Renewable Energy
			☒Financing
			☐Enabling Activities
		☐**Technology Transfer**	
			☐ Poznan Strategic Programme on Technology Transfer
			☐ Climate Technology Centre & Network (CTCN)
			☐Endogenous technology
			☐Technology Needs Assessment
			☐Adaptation Tech Transfer
		☐**United Nations Framework on Climate Change**	☐Nationally Determined Contribution
	☒ **Rio Markers**		
		☐Paris Agreement	
		☐Sustainable Development Goals	
		☐Climate Change Mitigation 0	
		☒Climate Change Mitigation 1	
		☐Climate Change Mitigation 2	
		☐Climate Change Adaptation 0	
		☐Climate Change Adaptation 1	
		☐Climate Change Adaptation 2	

Annex 17: Derisking Renewable Energy Investment ("DREI") in Off-Grid – Solar-Battery Mini-Grids in Nigeria

Submitted as separate document.

Annex 18: Detailed Project Budget and Calculation of Core Indicator 6

Submitted as separate document.

Annex 19: Stakeholder Engagement in Baseline Analysis

Submitted as separate document.

Annex 20: Linkages between Nigeria PIMS 5691 (off-grid lighting) and PIMS 6339 (AMP) projects

Submitted as separate document.