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Institute for Global Climate Change and Energy

SECTION I

EFFICIENT PAYG STRATEGY FOR ENERGY SALES

1. Introduction

Togo's lack of energy access presents itself as gaps that can be utilized by new market entrants into the energy provision space. The country's PAYG attractiveness index as determined by the International Finance Corporation is designated as low but has been on an upward trend since 2018. This signals much needed growth in Togo, which is a Least Developed Country (LDC). This business model (already included as part of deliverable 2 for the TA) is premised on a number of factors and cites valuable findings from key industry leaders. Some key considerations and lessons learned are highlighted in the report followed by the proposed business model.

2. PAYG lessons and key considerations from around the world

2.1. Consultative group to assist the poor recommendations

The Consultative Group to Assist the Poor (CGAP), an independent think tank that aims to promote development in the developing world outlines some key components of making PAYG systems work in sub-Saharan Africa[5]. These are obtained as part of the Financial Inclusion on Business Runways (FIBR) research to increase the affordability of PAYG solar systems. These considerations are as follows:

2.1.1. Longer loans

Extending loan tenors is a common and effective way of improving affordability. An elongated loan tenor greatly reduces the cost of energy per unit time and increases the demographic to which it is appealing. However, this strategy has its drawbacks affecting but the consumers and energy or finance provider. Consumers face interest rates that are sometime higher than typical and often ambiguous. The devices they own also wear out after a few years which seem to be a characteristic of majority of the relatively affordable systems. For the provider, the challenges of repayment risks become more eminent.

2.1.2. Smaller deposits

Initial costs are a huge barrier to energy access for the poor. Numerous households cannot afford the steep cost of initial deposits but can often comfortably pay in small sums over time. The risk with this approach as a solution is that majority of users in these situations does not have credit histories backed by formal financial institutions. As such it could lead to nonperforming loans. Albeit this might be the case in our recent study at the Institute for Global Climate Change and Energy, Kyungpook National University, we argue that credit histories of individuals in organized savings groups – which often recover over 90% of member loans – can be used to expand the reach of these systems.

2.1.3. Flexible loan terms

Flexibility is seen as one of the core drivers of PAYG adoption. Since numerous individuals have erratic sources of income with no fixed payment dates, flexible repayment plans that do away with fears of repossession and shame attract more users. However, this also has its drawbacks and one is that paying on time subsidizes late payment and as such becomes unsustainable in the long term.

2.1.4. Push volumes not margins

The tendency to focus on products with a larger profit margin by the providers of PAYG solar systems by promoting incentives to their resellers and marketers on those products is a huge barrier to the adoption of smaller margin products. In order to push the sale of products with a smaller margin, the providers would need economies of scale which is capital intensive and therein lies the challenge.

2.2. United Nations Framework Convention on Climate Change report on Kenya and Peru

In Kenya, the focus was firmly placed on small businesses and entrepreneurs. In peri-urban locations in Nairobi, over 1,500 small-scale enterprises keyed in to purchase high quality PAYG solar products at different price points[6]. The variation in pricing is a key promoter of acceptance as it caters to multiple income levels and behaviors. This is echoed in the Harvard Business Review magazine article on pricing[7] which explains how pricing helps drive purchases.

Peru's approach was to support and build distribution infrastructure. Approximately 50 PAYG solar system distributors, distributed over 4,000 solar powered products reaching almost 20,000 homes[6]. This used the bus network to reach more consumers. The reliance on existing structures like bus systems depicted the innovative ways by which PAYG models are applying already existing structures to the issue of energy access.

In both approaches, the decision to develop different segments of the market helps connect funding from private and public sector to small-scale businesses and consumers. The model has proven to be scalable and applicable in places with carrying socio-economic realities.

3. Business model

The business model proposed in this report is targeted at places with existing mobile money platforms and mobile telecommunications penetration while considering their lack of energy access as such rural settings.

The model aims to improve energy access including its attendant co-benefits and minimize the cost of initial investment in energy.

Two models are proposed (Fig 1). One mostly carters to business clusters, housing apartments or estates and medium to small-scale commercial consumers. The second is targeted at providing energy for individual consumers. Both models are delineated below:

3.1. Model A

This model leverages complex financial systems and sources of credit to provide the initial capital needed for solar PAYG systems. It considers the enormous risk manufacturers and suppliers of the system would face otherwise and such recommends a best-case scenario that offers wins for both suppliers and consumers. It requires the presence of willing capital in form of government support, development bank or multilateral financial institution grants.

In this model, energy suppliers and energy consumers after reaching an agreement on how much energy is required, agree on the exact system that would provide adequate energy. The energy system is costed and a timeline for completion and delivery designated. Details of funding and need are presented to a development bank or government agency which guarantees the consumer in the event of a default. The PAYG system is delivered and the consumer makes payment to the supplier as agreed. Typically, these systems are prepaid and metered by units of the local currency per KWh. This model if adopted by farming clusters, business colleagues or strings of community based organizations is very effective.

It is possible to improve this model by including aspects that are outside of the traditional PAYG model. However, if these changes are made, it greatly improves the model and increases the opportunity for communities to gain access to energy. One such recommendation is that a loan facility be included in the PAYG model, this capital injection goes to the project developer, paid on behalf of the consumer by a development bank or government agency. This could be for part ownership of the system, to cover the cost of metering systems or an upfront payment of guarantee or for initial construction costs in cases of larger systems. An advantage of this is that it removes the limit of PAYG applying to only small-scale systems.

3.2. Model B

Model B relies on mobile technology and where possible fintech solutions leveraging blockchain technology. In this model, energy systems and meters are supplied to end users who pay using mobile money through a prepaid or in the case of employed individuals automatically deductible accounts. Low-cost meters are recommended as these systems are usually used by low-income individuals. Systems deployed in this model will be of two types, mobile systems strictly for lighting and in cases of higher wattage, fixed systems. Fixed systems require agreements of fair usage, maintenance and ownership rights between the user and supplier. In the case of fixed systems, a path to ownership can also be included as an incentive. Again, if a multifaceted finance structure is applied instead of a strict PAYG business model, it is possible to obtain better results.

In this case, we recommend a model that utilizes mobile service providers or banking institutions as the supplier instead of the main energy company. Funds from international development institutions can be applied to this to provide non-interest loans for individuals with proven capacity and willingness to repay. This loan once replenished can be reused by others.

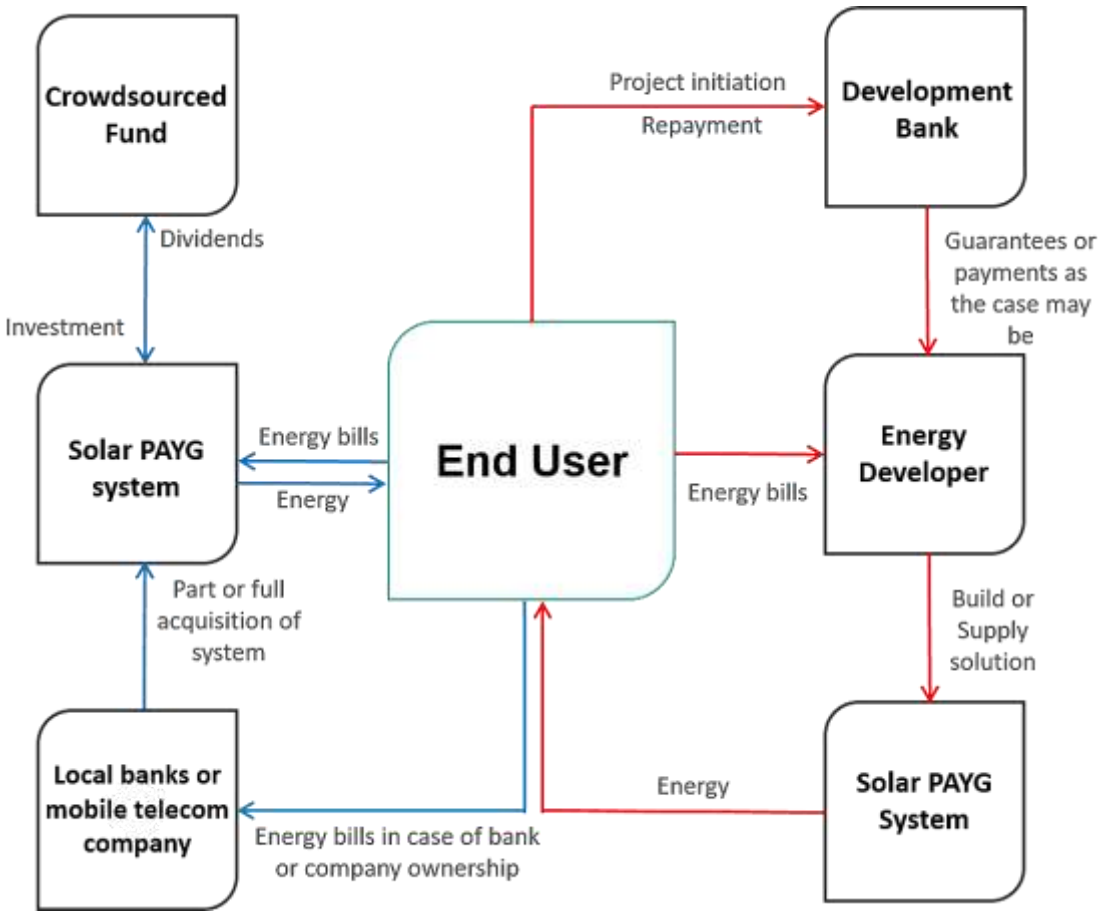


Figure 1. Business model structure for Model A (red) and Model B (blue)

3.3. Models: Summary

Predicting a near future of stifled global funds, it is pertinent to consider new avenues for financing for the proposed business models above. Crowdfunding is one way of dealing with the shortage of capital, because of its robustness and ability to aggregate considerable amounts of funds from all over the world[8]. Typically, not much is raised from crowdsourced funds but similar application of crowdfunding in Nigeria[9] and other parts of East Africa have shown great promise and has been exemplary. Also, strategically including Africans in the diaspora in raising crowdsourced funding is guaranteed to increase the chances of success. This is informed by the willingness of this demographic to invest in Africa and their record remittance figures to the continent, estimated at $40 billion annually since 2010[10].

The benefit of both models is that they cater to the needs of both commercial and domestic energy users. They provide an arguably better application of ODA funds and grants while also relying on the PAYG models to enable low-income individuals and businesses to afford clean and renewable energy.

3.4. Critical Success Factors

These models are not to be taken as silver bullets that solve every problem. They represent the possible outcome in an ideal implementation. For these goals to be achieved, there are key factors that must be considered and accounted for as outlined below.

- Availability of government or development finance to energy development.
- Institutional and legal support from relevant organizations and government agencies e.g. legislation or a defined national PAYG solar policy
- Commitment to implementation and ratification of policies and agreements.
- Improvements in data collection, knowledge sharing and synergies between institutions and stakeholders
- Standardization and approaches to guarantee ROI. e.g. metering and adopting monitoring systems to proof against vandalism and tampering.

Compulsory monitoring, reporting and performance requireme

SECTION II

PRE-CONCEPT NOTE FOR PROJECT FINANCING

Concept Note

Project/Programme Title:	Developing a solar hybrid microgrid in Kablive
Country(ies):	Togo
National Designated Authority(ies) (NDA):	Ministry of Environment
Accredited Entity(ies) (AE):	African Development Bank
Date of first submission/ version number:	2021-03-25
Date of current submission/ version number	2021-03-25

GREEN CLIMATE FUND

Notes

- The maximum number of pages should **not exceed 12 pages**, excluding annexes. Proposals exceeding the prescribed length will not be assessed within the indicative service standard time of 30 days.
- As per the Information Disclosure Policy, the concept note, and additional documents provided to the Secretariat can be disclosed unless marked by the Accredited Entity(ies) (or NDAs) as confidential.
- The relevant National Designated Authority(ies) will be informed by the Secretariat of the concept note upon receipt.
- NDA can also submit the concept note directly with or without an identified accredited entity at this stage. In this case, they can leave blank the section related to the accredited entity. The Secretariat will inform the accredited entity(ies) nominated by the NDA, if any.
- Accredited Entities and/or NDAs are encouraged to submit a Concept Note before making a request for project preparation support from the Project Preparation Facility (PPF).
- Further information on GCF concept note preparation can be found on GCF website Funding Projects Fine Print.

A. Project/Programme Summary (max. 1 page)			
A.1. Project or programme	☒ Project ☐ Programme	**A.2. Public or private sector**	☒ Public sector ☐ Private sector
A.3. Is the CN submitted in response to an RFP?	Yes ☐ No ☒ If yes, specify the RFP: _____	**A.4. Confidentiality**[1]	☐ Confidential ☒ Not confidential
A.5. Indicate the result areas for the project/programme	Mitigation: Reduced emissions from: ☒ Energy access and power generation ☐ Low emission transport ☐ Buildings, cities and industries and appliances ☐ Forestry and land use Adaptation: Increased resilience of: ☐ Most vulnerable people and communities ☐ Health and well-being, and food and water security ☐ Infrastructure and built environment ☐ Ecosystem and ecosystem services		
A.6. Estimated mitigation impact (tCO2eq over lifespan)	143.183 tCO2eq	**A.7. Estimated adaptation impact (number of direct beneficiaries and % of population)**	362 persons (about 60% of which are women) The beneficiary population of Kablive is 0.0045% of the population of Togo
A.8. Indicative total project cost (GCF + co-finance)	Amount: 975 thousand USD	**A.9. Indicative GCF funding requested**	Amount: 777 thousand USD
A.10. Mark the type of financial instrument requested for the GCF funding	☒ Grant ☐ Reimbursable grant ☐ Guarantees ☒ Equity ☐ Subordinated loan ☐ Senior Loan ☐ Other: specify_____		
A.11. Estimated duration of project/ programme:	a) repayment period, if applicable:	**A.12. Estimated project/ Programme lifespan**	25 Years
A.13. Is funding from the Project Preparation Facility requested?[2]	Yes ☒ No ☐ Other support received ☐ If so, by who:	**A.14. ESS category**[3]	☐ A or I-1 ☐ B or I-2 ☒ C or I-3
A.15. Is the CN aligned with your accreditation standard?	Yes ☒ No ☐	**A.16. Has the CN been shared with the NDA?**	Yes ☒ No ☐
A.17. AMA signed (if submitted by AE)	Yes ☒ No ☐ If no, specify the status of AMA negotiations and expected date of signing:	**A.18. Is the CN included in the Entity Work Programme?**	Yes ☒ No ☐
A.19. Project/Programme rationale, objectives and approach of programme/project (max 100 words)	Togo has one of the poorest access to energy in sub-Saharan Africa especially in its rural areas. Citizens are confined to using polluting sources of energy therefore increasing GHG emissions across the country. This project is thus expected to improve living conditions by establishing eco-friendly power generation facilities for Togo and a pathway to meeting its NDCs. The project will rely on a grant facility from GCF and equity contribution from the Togolese government and will be implemented in partnership with Ministries of		

[1] Concept notes (or sections of) not marked as confidential may be published in accordance with the Information Disclosure Policy (Decision B.12/35) and the Review of the Initial Proposal Approval Process (Decision B.17/18).
[2] See here for access to project preparation support request template and guidelines
[3] Refer to the Fund's environmental and social safeguards (Decision B.07/02)

	Environment and Energy, the AfDB.

B. Project/Programme Information (max. 8 pages)

B.1. Context and baseline (max. 2 pages)

Togo's energy insecurity creates several conundrums for the nation in terms of economic and, environmental issues. They are net importers of energy from Nigeria and Ghana despite their abundant solar energy resource. This lack of energy is directly causal to the millions of deaths that result from using polluting sources of energy like fuelwood and charcoal which the WHO outlines as one of the most pervasive environmental issues in the world. This lack of adequate energy supply also means that the rural poor are unable to store or process their agricultural produce. Those relying on rain-fed agriculture are also unable to power the irrigation of their crops. This has a large effect on yield harvested and the consequent amount stored or processed. This effect is in percentages that vary from place to place from *** to *** percent. These reductions cumulatively affect the ability of farmers to earn a living wage and further entrenches poverty in rural areas in Togo. The World Bank categorically states that "without urgent action, climate impacts could push an additional 100 million people into poverty by 2030." This means that for nations like Togo already grappling with poverty; with over 58 percent of its population experiencing poverty, it is important they pursue growth and growth in ways that are consistent with climate action and sustainable development.

Togo sees a huge contribution to its GHG emission from its energy, agriculture and land use, land-use change and forestry (LULUCF) sectors. Yet renewables still form a small fraction of the energy mix, often used to provide electricity for social infrastructure (e.g. schools, clinics, drinking water pumps). In its current trajectory, renewable energy will not exceed 8.92 percent by 2030 in rural areas. Although the nation has very minute emissions when measured in comparison with global emissions, it has reiterated its commitment to climate action severally over the years. Togo emits on average 20.45 Mt of CO_2e annually which is a mere 0.05 percent of global emissions which are 40,000 Mt annually. Figure 1 below details Togo's GHG emissions profile.

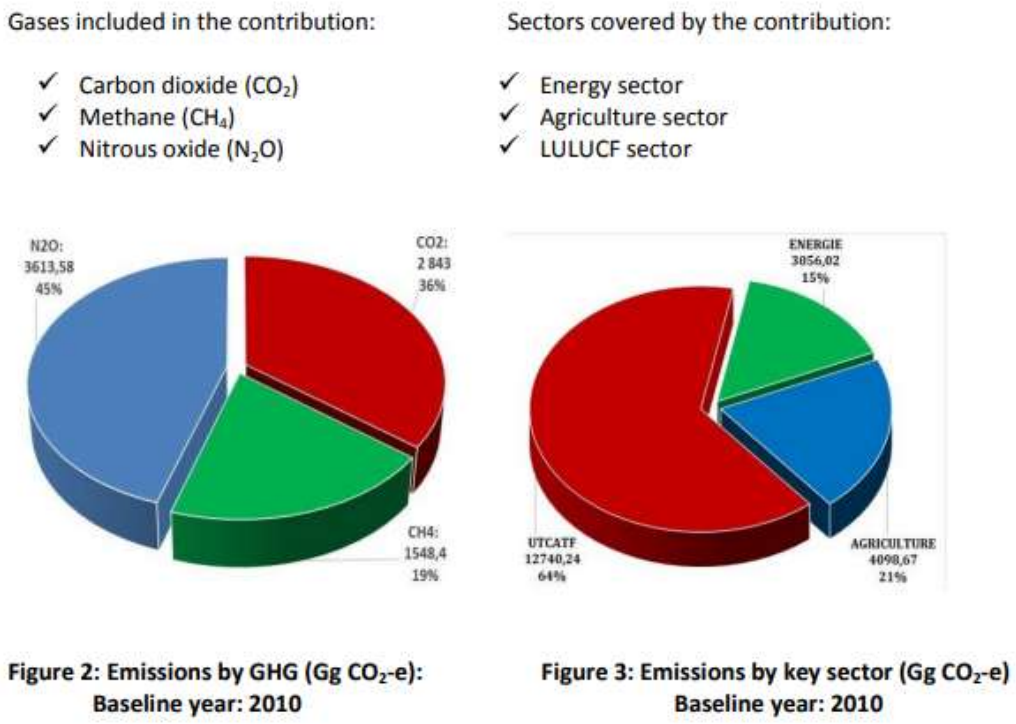


Figure 1: GHG emissions profile for Togo

Togo's current national policy on solar energy deployment favours the development of market-based solutions such as Pay-As-You-Go systems for the various income brackets that exist in the country. It is imperative that the systems deployed be market-based as their feasibility is key to the continuity and attractiveness of Togo as the country will need to attract a lot of private sector finance from within and outside of its borders.

The Togolese government has articulated its solar energy plan and outlined a list of outcomes that will be considered a

success. These are time bound and were launched in 2015 with 2030 as the expected deliverable date. They include:

- Strengthen the country's capacity for the use of solar energy;
- Use solar energy as a complementary energy source in rural and urban areas;
- Develop the market for solar technologies;
- Develop solar technologies at the local level;
- Bring the share of solar in final energy consumption to 4% in 2020 and 10% in 2030

These formed a major part of the Togo's National Renewable Energy Action which was enshrined in the national action plan issues by the ministry of energy.

Togo's Nationally Appropriate Mitigation Actions cover a range of actions including forestry, energy, and research. In its initial NAMA submission, forests made the top priority with the official statement being that the actions were issued "to increase forest cover from 7 per cent in 2005 to 30 per cent in 2050 in relation to the national area through reforestation and the improvement of the availability of forest resources". These actions delineated the following priorities:

(a) Energy efficiency in urban and rural areas:

- The reduction of energy consumption (public transport, the use of gas as a substitute for heating fuel, etc.);
- The reduction of GHGs;
- The replacement of light bulbs that consume more energy by those that consume less energy;

(b) The conservation of traditional energies:

- The rational use of traditional energy sources (biomass);
- The use of improved stoves;
- The improvement of yields from the carbonization of wood in charcoal making;

(c) The promotion of the use of renewable energies (solar, wind, biogas, biofuel):

- Research on the use of solar and wind power;
- Research on the use of biogas and biofuel energies.

NDCs for Togo are focused on the main sources of its emissions namely energy, agriculture and LULUCF with the target gases being CO_2, CH_4 and N_2O. The plan is to unconditionally reduce emissions by 11.4 percent as a minimum and up to 31.14 percent contingent on certain conditions. The total expected budget of implementation will be USD 3.54 billion. This sum is split almost 50:50 between mitigation and adaptation with a small percentage left for capacity building.

Women tend to be the most affected by the lack of energy in Togo as has been evidenced by several studies. Time spent in getting water, and gathering fuelwood and their proximity to burning wood means they are at risk of dying earlier than men which is a stark contrast to other developed nations where mortality is lowest among women. Education is another facet where the difference between male and female is glaring in Togo with 74 percent male literacy and only 47.9 percent female literacy. This is of course exacerbated by the factors already listed above.

Institutional capacity to develop and delivery sustainable energy solutions is also lacking. The same can be said about the capacity of government and regulatory agencies to provide the requisite oversight. This massive lack of resources means government policy no matter how meaningful can fail to be implemented or face delays which cause delays of other tasks further down the chain.

Togo has a very small economy and the country is considered as one of the least developed countries LDCs. It has huge solar energy potentials and some peculiarities that make it apt for the development of a solar-hybrid microgrid. For starters, its adoption of mobile money makes money transfers easier and reduces the technological barrier to adopting smooth payment of energy bills which can hinder certain PAYG technologies. In addition, the lack of energy has created huge demand which remains yet to be satisfied. The government's will to pursue technical assistance with relevant institutions like the CTCN has provided a much needed stimulus to the private sector and pertinent institutional capacity building on GCF fund applications, sustainable energy planning and analyses.

B.2. Project/Programme description (max. 3 pages)

Togo has very low access to clean energy and extensively depends on import from neighbouring Nigeria and Ghana. Current access to clean energy is at 35% but with huge disparities between urban areas with access rate at 91.84%

and rural with access rate at 22.35%[4]. Consequently, rural areas in Togo would most probably continue to rely on fossil fuel like charcoal, diesel and kerosene resulting to increase in national CO_2 emission and global warming. The provision of clean, affordable, reliable energy through the development and deployment of customized solar micro-grids in rural Togolese communities can directly support the transition to renewables and the achievement of its intended nationally determined contribution (INDC) in which compared to 2010, Togo opted for the reduction of 31.14% of national greenhouse gases emissions by the year 2030[5]. This project would directly benefit people living in rural Togo who are poor but paradoxically pay very high to access these polluting fuels. It is worth noting that apart from the negative health effects and greenhouse gas emissions resulting from the consumption of these energy sources, the conventional diesel generator systems are unreliable and more costly.

The deployment of solar energy technology in rural Togo would improve the adaptive capacity of inhabitants in rural areas especially women who are most vulnerable to the impacts of climate of change through the development of solar powered irrigation systems in drought affected areas. Post-harvest loss would be reduced and food security would be improved through the development of silos and food processing machines. In addition, the supply of clean energy to schools, commercial centres and public offices made available through the micro-grid energy system would create more jobs for youths, as well as increase the production capacity thus improving the economic growth in rural Togo.

The development and deployment of the micro-grid energy systems is composed of two main interconnected components as presented below.

Component 1: Development and operation of solar micro-grid energy systems

The main objective of this project is to improve access to clean, reliable and affordable energy in Kablive through the development of a solar micro-grid energy system. The specific objectives include: To reduce GHGs emissions and global warming; reduce indoor pollution; to reduce post-harvest loss and improve food security; improve living standard and health of the population through the availability of energy for domestic use and health centres; and to increase job opportunities through the development of factories. Kablive was chosen based on the results of pre-feasibility study (see Annex 1). This component constitutes the following sub-components, outputs and activities.

Subcomponent 1.1: Development, construction, and commissioning of a 130kW solar micro-grid system

- Output 1.1.1: Launch of commercial operations of a 130kW solar micro-grid system
  - Activity 1.1.1.1: Configuration design and development of a hybrid solar micro-grid system
  - Activity 1.1.1.2: Negotiation and acquisition of contributed assets
  - Activity 1.1.1.3: Procurement and installation of technical components for generation (PV modules, balance batteries, etc.)

Subcomponent 1.2: Operation and maintenance of commissioned solar micro-grid system

- Output 1.2.1: Development of operation and maintenance system
- Activity 1.2.1.1: Training of local technicians
- Activity 1.2.1.2: Recruitment of O&M agents

Component 2: Technical assistance to build local capacity for the development and management of micro-grid energy system

This component would improve the technological know-how of actors on solar energy planning and management, as well as link actors to solar companies for the development of customized solar systems in Togo. The TA is expected to have the following impacts.

- Improve the adoption of solar energy technologies in homes, schools and offices.
- Reduce GHG emissions from the energy and LULUCF sectors
- Improve capacity and knowledge on planning, deployment and raising financing for solar energy projects
- Build a national renewable energy adoption strategy
- Improved wellbeing of citizens by replacing polluting sources of energy with clean energy
- Increase the percentage of renewables in the national energy mix

Sub-component 2.1: Raise awareness on energy use and energy efficiency through sensitization workshops, trainings and meetings.

Output 2.1.1: Establishment of awareness strategy

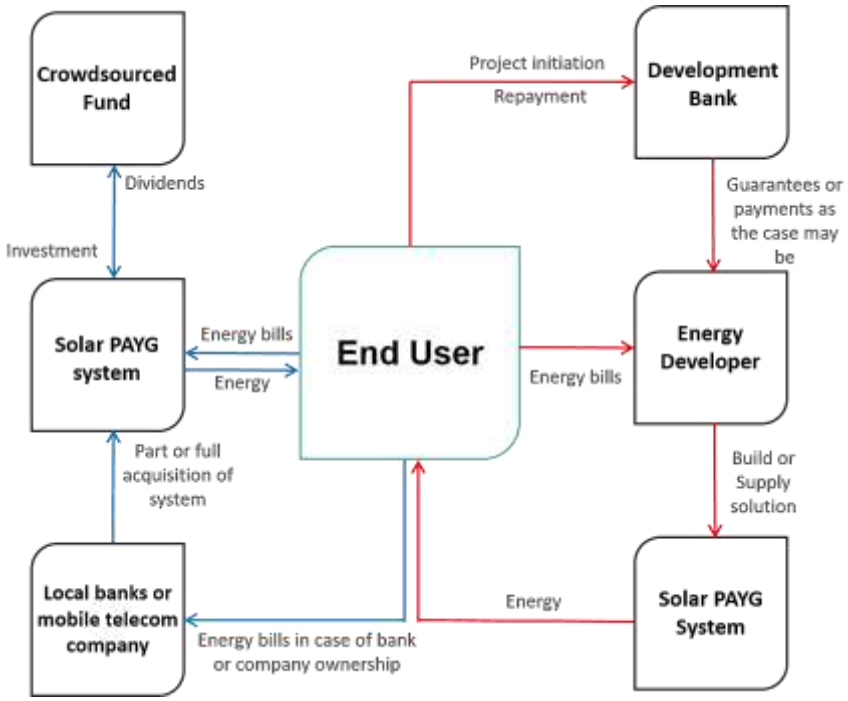
[4] https://data.worldbank.org/indicator/EG.ELC.ACCS.ZS?locations=TG. Accessed at 10.54am on 9th March 2021
[5] https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Togo%20First/INDC%20Togo_english%20version.pdf. Accessed at 10.56am on 9th March 2021

- Activity 2.1.1.1: Identify and national stakeholders and experts to attend the training program
- Activity 2.1.1.2: Establish training requirements (e.g. skills needed, stationery, tools required)
- Activity 2.1.1.3: Design and develop training agenda
- Activity 2.1.1.4: Conduct training, workshop, seminars etc.

Output 2.1.2: Build the capacity of local engineers and technicians on solar energy systems

- Activity 2.1.2.1: Develop and conduct specific training requirements
- Activity 2.1.2.2: Define and develop training materials Identify key speakers and trainers
- Activity 2.1.2.3: Assess participants' current knowledge of solar energy development and financing before training.
- Activity 2.1.2.4: Conduct training.
- Activity 2.1.2.5: Reassess participants' knowledge after training

The Accredited Entity would present to GCF two different business models (Figure 2) for Kablive that has been developed based on Pay-As-You-Go (PAYG). Model A carters to business clusters, housing apartments or estates, and medium to small-scale commercial consumers. While Model B is targeted at providing energy for individual consumers. The business model was developed based on the total income rate of different end-users to establish the smooth sales and purchase of energy. The PAYG index developed by the World Bank and IFC program "Lighting Global" was used to analyse Togo's PAYG use case filled and to show how a solar PAYG in Togo would work optimally. According to data in the International Finance Corporation (IFC) attractiveness index, Togo accumulated a total of just over 17,000 units of PAYG energy systems between 2014 and 2017[6]. The market size for PAYG in
Togo is unknown at the moment, but reports of sales over 10,000 units in 2018 with plans to reach 550,000 units by 2030 depict growth[7]. Currently ranked by IFC as 21 out of 24 countries in market attractiveness, Togo presents investors with gaps that if filled represent massive opportunities as well as risks. Togo is also ranked 1st and 3rd in starting a business and registering property respectively[8]. Although Togo's attractiveness in 2017 was depicted as low, the growth observed between 2018 and now is impressive and points to an upward trend in the adoption of PAYG energy systems. Mobile money is an already existing flexible payment platform that has been identified in Togo as key components needed to deploy PAYG.



[6] Lighting Global. PAYGo Market Attractiveness Index. 2015 2 April 2020]; Available from: https://www.lightingglobal.org/work-with-us/paygo-mai/
[7] Bavier, J. Togo subsidises off-grid solar to extend electricity access to all. Africatech 2019 3 April 2020]; Available from: https://af.reuters.com/article/commoditiesNews/idAFL5N20O4AJ
[8] World Bank. Ease of Doing Business Rankings. 2020 23 March 2020]; Available from: https://www.doingbusiness.org/en/rankings?region=sub-saharan-africa#.

Figure 2. Business model structure for Model A (red) and Model B (blue)

B.3. Expected project results aligned with the GCF investment criteria (max. 3 pages)

Impact potential: The emission analysis calculates the greenhouse gas (GHG) emission reduction resulting from carrying out the solar PV installation. It is also used to calculate the revenue that may occur from the sales of the GHG reduction emission. According to IPPC's methodology, CO_2 emissions are calculated by multiplying the relevant fuels to be substituted by the applicable emission factors. The transmission and distribution losses of 18% and GHG emission factor of 0.251tCO_2/MWh were considered as the base case electricity system in Togo. The gross annual GHG emission reduction in Kablive is gotten by subtracting the calculated emission in the proposed case from the calculated emission in the based case as shown. This is because the GHG emission during the project operational period is only considered and not during the life cycle of the project and the emission factors depend primarily on the carbon content and net calorific value of the fuels involved.
The project in the village of Kablive has the maximum GHG emission reduction of 143tCO_2eq that is equivalent to the 13.14 Hectares of forest absorbing carbon not cut down for the entire life span of the project. The Global Forest Resources Assessment (FRA), coordinated by FAO, found that the world's forest area decreased from 31.6 percent of the global land area to 30.6 percent between 1990 and 2015, but that the pace of loss has slowed in recent years because of development of clean energy technology for sustainable development. According to the sustainable development goals (SDGs), countries under the United Nations committed to achieving sustainable development agenda by 2030 to tackle the complex challenges human-faced from ending poverty and hunger and responding to climate change to building resilient communities, achieving inclusive growth, and sustainably managing the Earth's natural resources. Hence this project will help in achieving the set goals if implemented.

Paradigm shift: It is a reality in electricity markets that the adoption of solar energy technology is on the rise in Togo and is predicted to continue its upward trend. In 2017, the Government of Togo launched a presidential initiative called "CIZO," which seeks to increase rural electrification rates to 40 percent by 2022. The Government is partnering with off-grid companies to offer solar home systems to rural customers. Power Africa partner BBOXX signed an agreement with the government to deliver more than 500,000 systems to rural Togolese over the next five years. Greenlight Planet, a U.S. company, signed an agreement to deliver more than 300,000 solar home systems. Also, in 2018, the Government of Togo announced a new electrification strategy for the country with a vision of achieving universal access by 2030. The International Finance Corporation, a Power Africa partner, is supporting Togo's off-grid efforts. The majority of Togo's generation capacity is thermal. Togo generates some of its electricity but imports the majority from Nigeria and Ghana. Togo's first independent power producer (IPP), Contour Global, started commercial operations in 2010, tripling the country's generation capacity. Togo has established a regulatory body, passed a public-private partnership (PPP) law and a public procurement decree, and established an agency to promote rural electrification. As part of its national strategy for universal access by 2030, Togo is exploring a legal framework to promote renewable energy and a new off-grid rural electrification strategy. It is also currently in the planning stages of revising its national energy law to strengthen the role of the regulator.

Sustainable development potential: wider benefits: The program will generate 3 types of benefits if implemented: (I) Economic and social benefits through cost savings on fuels and a value chain with more local inputs such as PV panels and jobs creation for installers. Apart from a limited number of jobs in the hydrocarbons sector, agriculture is the main source of income in Togo, particularly for small-scale farms owned and/or managed by women. Deployment of renewables coupled with water and other input savings would increase agriculture's cost-effectiveness, improves people's livelihoods and job opportunities in Togo. Indeed hundreds of thousands of hectares of fertile land are not currently exploited due to high energy costs, particularly electricity; (II) Environmental benefits with less greenhouse gas emissions thanks to wider use of renewables; (III) the program particularly in its dissemination phase will ensure that women are involved along the whole value chain and that their livelihood will improve. Awareness campaigns and training will be carried out targeting particularly women-owned or controlled farms.

Needs of the recipient: The implementation of a solar mini-grid in Togo will contribute a great deal to limit the problem faced by farmers and other artisans by addressing key vulnerability issues the local farmers are dealing with to include access to good electricity and water supplies Furthermore the Government of Togo is interested in increasing private sector investment in the power sector and attracting off-grid companies to increase access to electricity in rural areas. While Togo has limited experience with IPPs, it has taken significant strides to reform its legal framework to attract private-sector investment.

Country ownership: The whole program will be piloted by the Ministries of Energy and Environment in close partnership with local solar developers, local authorities, and the accredited agency (AE) to ensure the program's scaling-up. This program is in line with the government of Togo's CIZO program which seeks to increase rural electrification rates to 40 percent by 2022 in Togo. Despite its small contribution to global emissions, Togo has developed an ambitious plan to address the issue of lowering its carbon footprint. In tandem with their Nationally Determined Contribution (NDC), the National Plan for the Reduction of Air and Short-Lived Climate Pollutants adopted in 2019 would lead to direct in-country benefits derived from SLCP mitigation measures. The implementation of all 14 measures would lead to a reduction of fine particles by more than 70% by 2040 compared to baseline scenarios, a 67%

reduction in black carbon and nitrogen oxides, and a 56% reduction in methane. Full implementation of the measures would also reduce Togo's CO_2 emissions by 38% in 2040, achieving the country's climate change mitigation commitments under the Paris Agreement.

Cost-effectiveness and efficiency: Compared with the existing model based on electricity generation from diesel, the solar energy options which would be deployed would not only be more cost-effective for both small and large scale users when fossil fuels are not subsidized but also, there will be over the lifetime of the program (25 years) and beyond a significant impact on greenhouse gas emissions. Furthermore, scaling-up solar energy technology can be considered as innovation in the Togolese context although these technologies are matured thus users will not incur any risk in deploying these technologies.

B.4. Engagement among the NDA, AE, and/or other relevant stakeholders in the country (max ½ page)

The NDA has been engaged in the sensitization of actors for the adoption of renewable energy which has a significant role in climate change mitigation. The NDA led the Technology Needs Assessment (TNA) which focused on the promotion of renewable energy, in particular solar and hydro energy generation. In addition, the Directorate General of Energy and the Togolese Agency for Rural Electrification and Renewable Energy (AT2ER) supported the TNA project and the project for the deployment of solar energy technology in rural areas. A consultation framework already exists in this direction and this commitment will continue in the development and implementation phase of renewable energy projects. The DNA will ensure that the actors involved in the management of renewable energy in Togo contribute in drafting the concept note and the funding proposal.

C. Indicative Financing/Cost Information (max. 3 pages)

C.1. Financing by components (max ½ page)

Please provide an estimate of the total cost per component/output and disaggregate by source of financing.

Component	Output	Indicative cost (USD)	GCF financing		Co-financing		
			Amount (USD)	Financial Instrument	Amount (USD)	Financial Instrument	Name of Institutions
Subcomponent 1.1: Development, construction, and commissioning of a 130kW solar micro-grid system	Output 1.1.1: Launch of commercial operations of a 130kW solar micro-grid system	N/A	N/A	N/A	N/A	N/A	N/A
Subcomponent 1.2: Operation and maintenance of commissioned solar micro-grid system	Output 1.2.1: Development of operation and maintenance system	N/A	N/A	N/A	N/A	N/A	N/A
Sub-component 2.1: Raise awareness on energy use and energy efficiency through sensitization workshops, trainings and meetings.	Output 2.1.1: Establishment of awareness strategy Output 2.1.2: Build the capacity of local engineers and technicians on solar energy systems	N/A	N/A	N/A	N/A	N/A	N/A
Indicative total cost (USD)	N/A	N/A	N/A		N/A		

For private sector proposal, provide an overview (diagram) of the proposed financing structure.

C.2. Justification of GCF funding request (max. 1 page)

Togo is classified as a Least Developed Country (LDC) which by definition means, its national budget as a whole is meagre and unable to fulfil its needs. This is no different in its budget for the environment and climate change mitigation and adaptation. In its NDCs the total budget of implementation was an estimated USD 3.4 billion. Togo's national energy budget per annum for the last three years has been below 264,450 USD and grossly inadequate to finance the

much needed development of renewable energy systems and supporting structures.

Togo's private sector is grossly underequipped to finance its climate change adaptation and mitigation programs. The country's priorities are established on solving much needed issues of poverty and development; and although there is a clear link between climate change and poverty, it is difficult to realign already set national priorities. This is harder in a nation like Togo where no system has been set up to advance climate finance.

The government of Togo just recently undertook a technical assistance funded by the Climate Technology Center and Network (CTCN). This technical assistance was part of an ODA funded activity by the Korean Government in its support to developing nations. This project undertook a detailed feasibility studies, market analysis, business model development and capacity building for key stakeholders in Togo. Alternative sources of funding for Togo include such programs from the Global Environment Facility (GEF), Global Green Growth Institute (GGGI) and applications have been made to these organizations pending approval.

There are also barriers to accessing financing from other organizations, Togo's credit rating puts it at the bottom of the list and its risk rating is considered unsuitable. Togo is also characterized by high interest rate loans with short tenors.

The Kablive hybrid microgrid will centre the provision of energy for communal use as opposed to simply domestic use. Community centres where end users can charge their low energy lamps and other devices at a fee seem the most pro mising delivery mechanism for the project. Financing from the GCF is expected to cater for a bulk of the capital cost exc ept land which the national government has pledged and non-technical labour which will be sourced from the local bene fitting community

C.3. Sustainability and replicability of the project (exit strategy) (max. 1 page)

The project is targeted to support the social component of Togo's rural electrification program (PRAVOST) which is an initiative to promote solar energy in rural areas through off-grid solutions as part of the national program, "CIZO" ("CIZO" means "light up" in Mina, a Togolese language). The project is part of the Togo Electrification Strategy launched in June 2018. It is designed to respond to socio-economic developments in the country, which are characterized by growth and the government's willingness to modernize the agricultural sector through agro-industrial transformation and related services as well as the improvement of the quality of life of people who need electricity to achieve the desired modernization. Furthermore, PRAVOST complements a particular component of CIZO, household energy access, by electrifying community facilities, hence achieving "whole village electrification" through mini-grid solar systems. The project has four components: (a) a social component that includes the electrification of 314 health centres and equipping 122 health centres with solar water heaters, the solar electrification of 400 drinking water supply stations, and the deployment of 600 solar irrigation pumps; (b) electrification of approximately 2000 households by smart mini-grids; (c) implementation of a PAYG platform for the integration of payments and data collection; and (d) coordination, management, monitoring, and evaluation.

This project is in-line with the aforementioned projects aimed at improving access to clean, reliable and cost-effective energy in rural communities in Togo. The project bring sustainability to Togo's energy problem by (i) increasing the electrification rate of households and community infrastructure in rural off-grid areas; (ii) increasing the number of small farms using sustainable renewable energy systems; (iii) reduce the energy bill for farmers and other stakeholders under the scaling-up program; and reduce emission resulting from the consumption of polluting fuels. Based on the results of the feasibility study, the concept and technology configuration for a solar PV system in Kablive can be expanded to other areas in Togo. This is thanks to the abundant solar resource potential across the national territory, and the energy consumption profile of Togo is almost similar across different sectors.

D. Supporting documents submitted (OPTIONAL)

- ☐ Map indicating the location of the project/programme
- ☐ Diagram of the theory of change
- ☐ Economic and financial model with key assumptions and potential stressed scenarios
- ☒ Pre-feasibility study
- ☐ Evaluation report of previous project
- ☐ Results of environmental and social risk screening

Self-awareness check boxes

Are you aware that the full Funding Proposal and Annexes will require these documents? Yes ☒ No ☐

- Feasibility Study
- Environmental and social impact assessment or environmental and social management framework
- Stakeholder consultations at national and project level implementation including with indigenous people if relevant
- Gender assessment and action plan
- Operations and maintenance plan if relevant
- Loan or grant operation manual as appropriate
- Co-financing commitment letters

Are you aware that a funding proposal from an accredited entity without a signed AMA will be reviewed but not sent to the Board for consideration? Yes ☒ No ☐