LESSONS LEARNT | GHANA

CLEAN CAPTIVE INSTALLATIONS FOR INDUSTRIAL CLIENTS IN SUB-SAHARA AFRICA

LESSONS LEARNT FROM THE IMPLEMENTATION OF PILOT PROJECT IN GHANA

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CICSA
CLEAN CAPTIVE INSTALLATIONS FOR INDUSTRIAL CLIENTS IN SUB-SAHARA AFRICA

Frankfurt School
FS-UNEP Collaborating Centre
for Climate & Sustainable Energy Finance

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INTRODUCTION

The Clean Captive Installations for Industrial Clients in Sub-Sahara Africa (CICSA) project currently developed in Kenya, Ghana, Nigeria, and South Africa, is running since 2019 aiming to demonstrate the economic and financial viability of clean captive energy installations for industries and to enhance their adoption in the four African partner countries and beyond to the entire continent. Captive energy installations are electricity generation facilities that are used and sometimes also managed by commercial or industrial energy users for their own energy consumption. Captive power plants can be operated off-grid or can be connected to the grid.

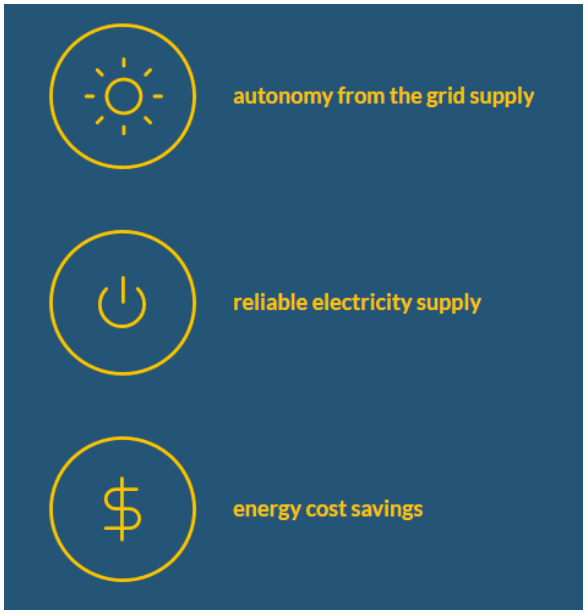
Renewable energy captive installations alleviate the pressure to generate electricity from national grids and reduce commercial & industrial clients' needs to rely on private supplementary fossil-fueled generators, which are expensive to run. These clean captive installations are frequently referred to as the second generation of renewable energy business models, as they do not rely on national governments' incentivizing policies to enhance the deployment of clean energy technologies.

The CICSA project is funded by the International Climate Initiative (IKI) of Germany. The Federal Ministry for Economic Affairs and Climate Action (BMWK) supports this initiative based on a decision adopted by the German Bundestag. The implementing team of the project comprises the United Nations Environment Programme (UNEP) in partnership with its collaborating centre at Frankfurt School of Finance & Management (Frankfurt School), together with locally hired consultants who provide local market and captive power expertise.

THE PROJECT

The project's activities fall under four components:

Component 1	Baseline studies and awareness raising
Component 2	Economic and financial tools and assessments
Component 3	Realization of one pilot project per country
Component 4	Knowledge dissemination and outreach.



Since the project's launch, scoping missions, country reports, awareness raising, call for proposals, and a selection process for candidates have been held, among other activities, in Kenya, Ghana, Nigeria and South Africa.

Under component 1, scoping missions were held in partner countries to meet with key public stakeholders and to build and strengthen awareness raising of clean captive installations for the commercial and industrial sector. The collected stakeholders' views included gaps and needs of the sector, current trends and potential synergies between stakeholder activities and the project. The scoping missions in Ghana were held between 16-20 September 2019.

The project has published country studies on clean captive installations market in the four partner countries Kenya, Ghana, Nigeria and South Africa. The reports dive into each country's electricity market, policy and regulatory framework, tariffs and market potential for clean captive installations, with a strong focus on finance.

Under component 2, economic and financial tools for assessing suitable financing structures of clean captive installations have been developed and published.

Under component 3, open call for proposals and country studies were launched through dedicated webinars in partner countries. A framework document was presented and published explaining the application process, eligibility criteria, selection criteria and timelines. For Ghana the call for proposal was held on 23-24 March 2021.

During the selection process, an evaluation committee reviewed, scored, and shortlisted the projects for the open call for proposal for pilot projects in partner countries. The selection involved a thorough due diligence process.

A total of six pilot projects received grant funding from CICSA. For Ghana, the CHAG Solar Pilot Project was selected. The pilot projects were then monitored to prove the financial and economic viability.

All documents and resources related to Components 1-3 can be found on the project website (https://www.captiverenewables-africa.org/).

This publication is part of Component 4 and serves for knowledge dissemination and outreach. This report series condenses the results of the project in the four partner countries and includes one case study per country.

The project's direct outcome is to support private industrial and financial sector stakeholders in developing successful pilot projects, demonstrating the captive renewable energy business model, and raising peer awareness in the partner countries. The tools developed during the lifetime of the project, and the results of the pilot projects are disseminated to encourage replication of the captive clean energy generation installations business model in the partner countries (intermediate state) and beyond, to other countries of the region. The successful

replication of the captive renewable energy business model in various industries and the availability of financing options in the partner countries are expected to result in decreased industrial greenhouse gas (GHG) emissions and enhanced economic development due to more affordable and reliable energy supply. This will ultimately lead the partner countries to advance towards a low-emission development pathway. The ease of replication, combined with the wide applicability of the business models across selected countries and the region, is expected to drive large-scale replication of the model.

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SUPPORTED PILOT PROJECTS IN GHANA

Pilot projects that have received financial support have played a crucial role in demonstrating the economic and financial viability of captive solar PV installations. CICSA has provided financial support in the form of results-based grants to six pilots, one of which is located in Ghana. These grants aim to share the costs of one of the following types of solar PV installations:

1. **Transaction costs** including advisory services attributable to a captive solar PV plant at a site with a total installed capacity not exceeding 1 MWp (Type 1 project); or
2. Costs associated with creating a **financing vehicle or a financing instrument** dedicated to captive solar PV projects (Type 2 project); or
3. **Capacity building, trainings or certification initiatives** of scope, with a specific focus on captive solar PV financing (Type 3 project).

In Ghana, following a competitive call for proposal, the following pilot was selected:

Stella Futura Limited: Under type 1 grant funding (transaction costs/advisory), Stella Futura Limited1 was supported to establish a special purpose vehicle (SPV) that will finance the development of captive solar power plants for private hospitals within the Christian Health Association of Ghana (CHAG) and to create a sustainable business model by incorporating Distributed Renewable Energy Certificate (DREC) to monetize the carbon emission reductions.

While CICSA's primary focus has been on establishing the business case for clean captive installations, it has also provided support for ground PV captive installations. CICSA is actively promoting the use of renewable energy in Ghana's commercial and industrial sectors by offering financing and technical assistance. Solar energy is being utilized for various applications, such as powering production equipment, lighting, and cooling systems. Among the grant recipients of CICSA, Stella Futura Limited used an innovative leasing model with a blend of funding to finance solar PV for healthcare facilities in the country. The healthcare industry in Ghana relies heavily on diesel gensets to supplement electricity from the unreliable grid creating an opportunity for more affordable and reliable captive solar PV solutions that help to ultimately enable better service and care provided to patients. CICSA's efforts on this and other projects are also helping to reduce greenhouse gas emissions, create new income-generating opportunities, generate jobs, stimulate economic growth, and contribute to a more sustainable future.

[1] *Stella Futura Limited is an EPC Solar Company based in Accra, Ghana providing custom built renewable energy solutions for clients across the African continent. The company was founded in December 2018, with support provided by their parent company in Sweden, Stella Futura AB. The company has experience with both solar PV and battery storage technologies and is also proactively targeting hospitals and healthcare provider clients in Ghana.*

CASE STUDY- CHAG SOLAR PILOT PROJECT

1. CONTEXT

In Ghana, the healthcare sector faces significant challenges due to unreliable power supply. While 65% of health centres and hospitals have access to the national grid, they require backup diesel generators due to low reliability of the grid. The remaining 35% lack any form of backup power. Ghana also has one of the highest average electricity tariffs among comparable developing countries, which increases costs for businesses and consumers. This along with expensive diesel gensets result in high operating costs, with electricity expenses accounting for an average of 30% of total expenditures for hospitals and health care centres.

Furthermore, many healthcare institutions in Ghana have limited access to financing, particularly those in rural areas. This can make it difficult for them to invest in the infrastructure needed to access a reliable electricity supply. Ghana lacks a developed banking system that supports renewable energy and provides financing for healthcare solar projects. Currently, commercial bank lending is lacking to help health care institutions with feasible loans to invest in reliable and safe energy solutions. The interest rates offered are exceedingly high, typically ranging from 26% to 29%. Consequently, the healthcare sector is forced to rely on subpar energy solutions for their facilities, such as a combination of grid and diesel generators or solely diesel generators. These clean energy options often entail steep upfront costs, which hinder hospitals from investing in new, clean equipment and personnel. Moreover, the tariffs on clean energy solutions may not be attractive enough, failing to provide the necessary incentives for hospitals and healthcare institutions to shift to clean energy solutions.

2. COMPANY

Stella Futura, incorporated in 2018, is a solar energy company providing grid-tied and off-grid tailor-made renewable energy solutions to commercial and industrial clients. It also invests in social impact projects in urban and rural areas of Ghana. Based out of Accra in Ghana, Stella Futura operates across Sub-Saharan Africa, with active development in Somalia, Kenya, Ethiopia, Uganda, Benin and Togo. The company has experience with both solar PV and battery storage technologies and is also proactively targeting hospitals and healthcare provider clients in Ghana.

3. PROJECT

Christian Health Association of Ghana (CHAG)

The Christian Health Association of Ghana (CHAG) is a Network organisation of 374 health facilities and health training institutions owned by 34 different Christian Church

Denominations. CHAG provides health care to the most vulnerable and underprivileged population groups in all 16 Regions of Ghana, particularly in the most remote areas. These healthcare facilities could all potentially benefit from a captive solar power plant. Stella Futura Limited identified a few CHAG healthcare facilities for its pilot solar project.

When correctly sized, captive solar power plants often reduce monthly electricity costs for customers and can improve reliability on sunny days in a way that is less expensive, quieter, and cleaner than diesel generators.

THE SOLUTION

Stella Futura Limited established an SPV (Stella Solar Assets) to finance the development of captive solar power plants for hospitals within the Christian Health Association of Ghana (CHAG). The objective of the pilot project is to establish a proof of concept for affordable, reliable, and clean energy access to healthcare facilities in rural and peri-urban locations as part of Stella Futura's Solarization of Africa's Healthcare Systems (SAHS) initiative.

The grant supported the upfront costs for project development, financial and legal advisory costs, pipeline building and technical assessments for a pilot of three hospitals, thereby unlocking the project's feasibility for implementation and reducing overall project costs. In addition to the first three sites, Stella Futura received commitment for two additional sites, bringing the total to five healthcare facilities in the CHAG network. Out of the five facilities, two have solar installed, two have signed contracts with solar implementation due by June 2023, and one is pending contract signature.

In the pilot phase, Stella Futura has successfully installed rooftop solar PV systems at two hospitals: Holy Family (117.7 kWp) and St. Mary's (104.5 kWp). Stella signed a Conditional Sales Agreement (CSA) with the hospitals under which hospitals will make monthly payments for the solar energy. This implies that the SPV will maintain the solar assets on its balance sheet and receive a monthly payment for a contract period of 15 years. Post the completion of the tenor period, the asset ownership will be transferred to the hospitals for $1. These CSAs are denominated in local currency eliminating the foreign exchange risks for the hospitals. Stella has already signed CSAs with two additional hospitals, St Joseph's (8.25 kWp) and St Mathew's (8.18kWp/26KWh), and has identified a first scale-up pipeline of 25 hospitals with cumulative capacity of 4MWp. The proof of concept establishes a case for funding to scale-up Stella's SAHS program to 350+ facilities with a total capacity of 31MWp over 4 years within CHAG, and to other public and private facilities in Ghana.

Figure 1: St Mary's Hospital, Drobo, Bono Region, Ghana

Figure 2: Holy Family Hospital, Berekum, Bono Region, Ghana

Additionally, Stella has partners with PowerTrust[2] to incorporate Distributed Renewable Energy Certificate (DREC) which uses the electricity generated by small-scale distributed renewable energy assets and the D-REC digital MRV platform to track, verify and package this electricity into a certificate that can then be sold to corporations around the world and monetized. Powertrust will monitor through Odyssey[3] energy tool and carbon credits would be issued at the end of every quarter.

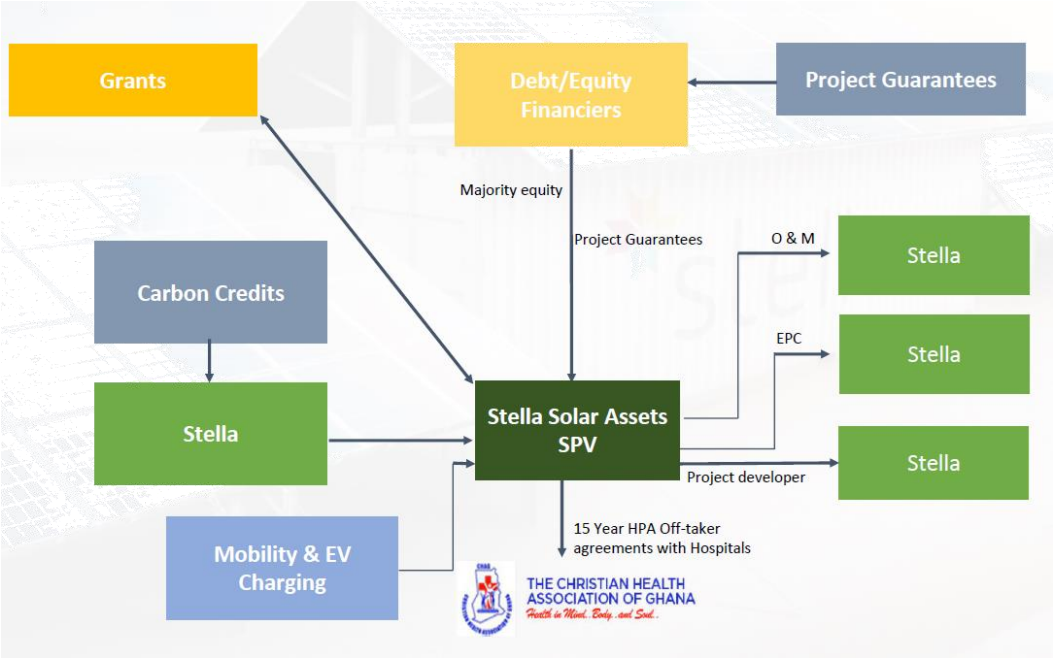

Figure 3: Financing and Contracting structure of Stella Solar Assets

CHALLENGES

Challenges are an inevitable part of pilot implementation. Stella Future Limited had to deal with and overcome a few challenges during the pilot including:

- Lack of awareness and confidence in solar technology: Adoption of solar technology in Ghana is very low with penetration rate of less than 1%. There is inadequate knowledge regarding the use, importance and environmental benefits that are

[2] *Powertrust sources, certifies and delivers distributed renewable energy projects in emerging markets on behalf of global corporations with net zero targets. Using the new D-REC global standard, Powertrust, certifies and validates the electricity generation, and then delivers the D-RECs alongside a suite of analytical tools to help with sustainability accounting and stakeholder engagement.*

[3] *Odyssey is an investment and asset management platform for distributed infrastructure.*

derivable from solar energy. As a result, there was a noticeable lack of confidence and trust in the technology during the project's development stage. This necessitated numerous virtual and in-person meetings to provide information, address concerns, and educate healthcare facilities on solar technology.

- Delays due to slow decision-making by customer: As the solar project sponsors and umbrella organization, CHAG has the decision-making influence on the implementation of the solar project. However, such religious organizations (Catholic, Presbyterian, Methodist, etc) have bureaucratic structures with a complex organization that has multi-layered systems and processes. This led to significant delays in the start of the project due to working with multiple decision makers at the CHAG national executive level and the religious group level with varying priorities and processes. Stella had to continuously connect with religious bodies directly in order to dialogue, address concerns and seek quick decision making to start the pilot. The signature for first two hospitals took considerable time, however, once the relationship with CHAG was established, other hospitals followed suit and Stella now has a healthy pipeline of interested hospitals.

- Managing currency exposure risk: Originally, the contracts were structured in USD and that comes with an inherent foreign exchange risk for the customer. When coupled with the lack of confidence discussed above, the risk was deemed too high by the CHAG and Stella had to restructure the contract in local currency.

- Financing setback: Stella Futura had initially partnered with a foreign private investor to create the SPV, however before the implementation, the investor exited due to the pilot ticket size of the transaction (first two hospitals) not meeting the minimum threshold of the investor. The private investor has a good relationship with Stella, has partnered with the company in other projects and is interested to finance the scale-up for the CHAG project when the volumes get larger. Stella then established its own SPV to finance the project with a blend of grants, equity and zero-interest debt.

SUCCESSES

This project directly created an opportunity for rural health facilities that would not have access to affordable financing to benefit from clean and reliable energy. This proof of concept also strengthens the case for scaling-up funding of Stella's SAHS program to 350+ facilities within the CHAG, and to other public and private facilities in Ghana. Other successes of the project to date include:

- Successful implementation of the pilot sites in rural Ghana: Stella has successfully installed rooftop solar PV systems at two hospitals, Holy Family (117.7 kWp) and St. Mary's (104.5 kWp). St. Mary's has seen its weekly diesel purchase reduce by 50% on

average since the commissioning of their solar PV installation. Performance of the system is optimized with over 60% day-time solar coverage of the facility's energy demand and 20% solar coverage over a 24-hour period. Stella also has signed contracts with two more hospitals with implementation due by June 2023.

- Pipeline development: Stella Futura has identified a total pipeline of 31MWp for solar PV projects in the healthcare industry across Ghana. The company expects to leverage the learnings from Ghana to expand its SAHS initiative to other countries in the region such as Benin and Togo, where CHAG-related organizations have been identified.

- Incorporation of D-RECs: Stella Futura's partnership with PowerTrust enables hospitals to monetize their solar energy generation. The value of the D-RECs to Stella Futura's SAHS initiative is to make healthcare projects, that hitherto would not be viable due to economic barriers, become financially feasible., In effect, hospitals have the ability to sell their solar energy generation via PowerTrust to corporate entities that want to offset their greenhouse gas emissions. This transaction is executed via a D-REC instrument issued by PowerTrust and allows Stella Futura to price the expected monetized credits, resulting into reduced monthly payments to the benefit of hospital facilities. Currently, Stella is pre-financing the carbon credits which brings some uncertainty with it. To mitigate this, Stella is looking into carbon insurance whereby the insurer can supply the carbon credits if the solar system fails to perform as expected.

- Successful financing of the pilot: Stella has demonstrated how blended financing model can enable rural healthcare facilities to gain access to cheaper financing for clean energy, with the added advantage of repayment in local currency to eliminate currency risks associated with USD contracts. As seen in Figure 4, 49% of the total project cost (including project development and advisory phase) was financed through a mix of private debt, equity and grants.

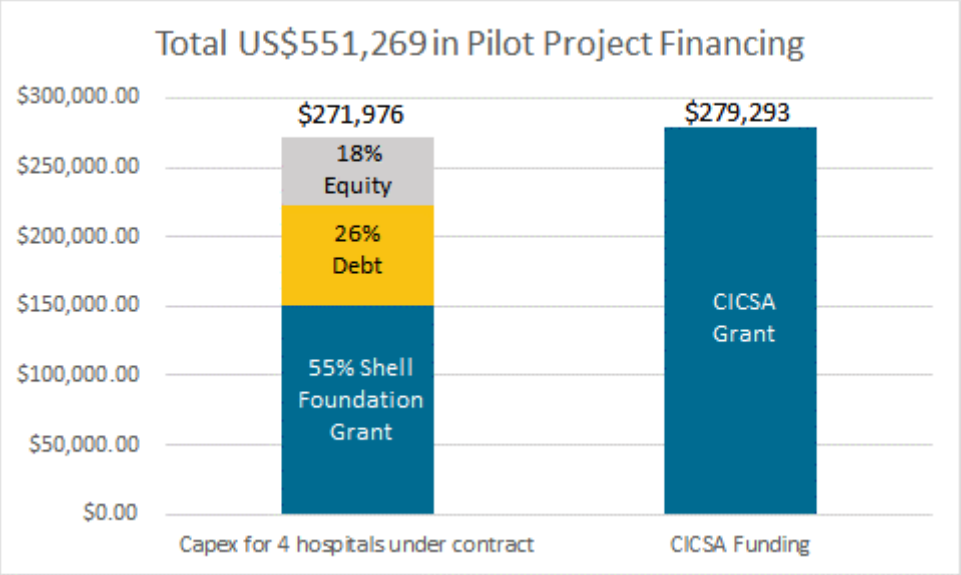

Figure 4: Stella Futura secured US$551,269 in total Pilot Project Financing

- Women empowerment: Stella's initiative called "Women on the Roofs" aims to drive gender equality in the solar industry by increasing female participation in the design, installation, and maintenance activities of Stella's projects. Currently, Stella has reported 44% of women contributing to installation of Stella Energy Systems. The target mix is enforced within all aspects of Stella's sub-contracting models.

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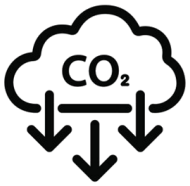
Figure 5: Women on the Roofs Initiative

4. IMPACT

Improved reliability of electricity at hospitals on sunny days



CO2 emission reduction
Achieved: ~7,653kg[4]
Estimated: ~155tonnes/year[5]

20 temporary jobs created
3 permanent jobs
6 females/minorities employed

Estimated >20% cost savings for healthcare facilities on energy bills

[4] *Calculated for St. Mary's hospital for the period beginning at the start of operations on 13 March 2023 until 08 May 2023*

[5] *Estimated for 4 contracted hospitals*

LESSONS LEARNT IN GHANA

The valuable lessons learnt from the implementation of the pilot project in Ghana builds on the published material and experience from the other pilot projects developed under the CICSA project. Such projects have been instrumental in building a strong foundation for proving the economic and financial viability of clean captive installations (CCI) for the industrial and commercial sector (C&I).

A key objective of CICSA is to maximize the potential of scaling pilot results. However, achieving this objective requires identifying opportunities and overcoming various barriers. Market conditions can either support or hinder innovation, while technical barriers such as compatibility issues between systems can limit the scalability of pilot results. Economic barriers, such as limited access to financing or high implementation costs, can also pose challenges to scaling up. Regulatory barriers, which involve compliance with laws and regulations, can impede progress as well. Additionally, social barriers such as resistance from stakeholders or cultural differences can present significant challenges.

To overcome these barriers and successfully scale pilot results, it is important to address them proactively and develop comprehensive lessons learnt that account for each one as found below.

These lessons help to identify challenges and opportunities, allowing for more effective and efficient implementation of future projects. As a result, policy makers, financiers, technology providers and local stakeholders are able to make data-driven decisions that ensure optimal results in their respective fields. It is clear that the success of these pilot projects has paved the way to advance more impactful interventions in the future.

Ghana's Power Sector Faces Several Challenges

Ghana has made improvements to energy security and energy access in recent years, but the electricity generation mix still relies primarily on fossil fuels (~60% of installed capacity as of 2021[6]). Importing natural gas supply for electricity generation has also faced challenges in the past which reduces the availability of fossil fueled plants resulting in less reliable and more expensive electricity tariffs for customers. In addition, high distribution losses, customer non-payment, and an inefficient build of new power projects where generating capacity currently exceeds peak demand has made electricity tariffs in Ghana one of the most expensive amongst similar middle-income countries.

The high frequency of electricity outages, particularly in rural areas, in the country has also incentivized many customers to install diesel generators for back-up, which has a low upfront cost but high ongoing diesel fuel costs depending on how frequently its used. A World Bank and Private Enterprise Foundation study from 2016 found that over half (53%) of the manufacturing firms surveyed in Ghana own or shared a diesel generator. The low reliability of power supply from the grid also has an impact on business operations during outages from reduced revenue and higher costs from diesel fuel for those that rely on a back-up generator[7].

Strong Drivers for Captive Solar PV in Ghana

Key drivers for captive solar PV in Ghana include the high cost of electricity and low reliability of the grid requiring many customers to install backup generators. Most back-up generators require diesel fuel to operate which is expensive, noisy, and produces harmful emissions for people and the environment. As such, captive solar power plants are a good alternative to reduce dependence on diesel generators. Solar PV is competitive for many establishments that operate during daytime business hours and some that can afford a back-up battery use it as back-up instead of a generator to be recharged during sunny times of the day. Batteries are still expensive for many customers, however, resulting in many continuing to operate in hybrid mode switching from, solar PV energy, the grid, and back-up diesel generation when needed.

The industrial sector accounted for about 30% of the country's demand as of 2019, which is the second-largest electricity demand by end-used sector just below demand from the residential customers. Captive solar power plants can be a viable and more sustainable substitute for diesel generators used by the industrial sector and other customer groups.

[6] *IRENA Ghana Country Report: https://www.irena.org/-/media/Files/IRENA/Agency/Statistics/Statistical_Profiles/Africa/Ghana_Africa_RE_SP.pdf*

[7] *See Ghana Country Study. 2021*

Ghanaian Captive Solar Market is Competitive for many C&I Customers

The high cost of electricity in Ghana means the monthly costs associated with financing solar PV are competitive with grid tariffs for many customers, offering some industrial users a cost-competitive solution for their electricity needs. For C&I customers (non-residential) in Ghana, energy tariffs range from 10-16 UScents/kWh (109-173 GHp/kWh)[8] according to the country's Public Utilities Regulatory Commission published tariffs for the first quarter in 2023. Therefore, captive solar PV projects with a levelized cost of energy less than 10-16 UScents/kWh would be competitive for both commercial and industrial customers in Ghana. The devaluation of the Ghanaian cedi over the past year has made solar PV equipment (which is mostly imported) more expensive in US dollar terms relative to the local electricity tariffs, however this tariff is still favorable for some customers depending on their electricity demand and profile.

Ghana's financial sector is diverse and competitive, but the lack of experience many banks have with renewable energy projects leads to higher risk profiles and interest rates associated with these projects. Some development agencies and development finance institutions have tried to address this with programs like credit lines offered to local banks to reduce lending rates and increase tenors. The increasing presence of established private financiers and ESCO firms that provide financing for captive solar projects has also helped addressed the financing gaps from the commercial banking sector in Ghana.[9]

Opportunity exists for innovative technical solutions in Ghana

The CCI grant was designed to showcase the feasibility of innovative technologies and financing methods that could be applied to the captive solar market. This pilot aimed to establish a proof of concept for affordable and clean energy to healthcare facilities in rural and peri-urban locations in Ghana.

The technology depends on a hybrid design that maximizes the use of solar PV during sunny times of the day and can also switch between both grid and back-up power to ensure an overall improvement in energy reliability and affordability. Batteries are still expensive for many customers in Ghana, so there is still room for further innovation to offer better financing terms and reduce battery technology costs to make them more affordable, which can further offset the local dependence on diesel generators. In the absence of a battery storage, Stella Futura uses hybrid controllers[10] to minimize the use of diesel fuel when there is a power cut.

[8] *Using a 11.0137 GHC/US$ Central Bank of Ghana exchange rate for March 2023, and Public Utilities Regulatory Commission Source: https://www.purc.com.gh/attachment/705636-20230124100135.pdf*

[9] *See Ghana Country Study. 2021*

[10] *Hybrid power systems controllers coordinate and dispatch both renewable and non-renewable generation. The controllers manage enabling technologies automatically, creating reliable power and saving diesel fuel.*

Innovative financing tools and carbon financing are emerging in Ghana

Innovative financing structures are also emerging in the country, which can help with the investment readiness and help mobilize private capital for solar projects. Securitization, green bonds, and blended finance are a few examples of these structures. The financial innovation from this project stems from the blended finance approach using private debt, equity and grants. Stella is also incorporating Distributed Renewable Energy Certificate (DREC) which uses the electricity generated by small-scale distributed renewable energy assets and the D-REC digital MRV platform to track, verify and package this electricity into a certificate that can then be sold to corporations around the world and monetized. Renewable energy certifications are aiding in the creation of a worldwide renewable energy marketplace for project developers, corporations, and climate investors by harnessing the advantages linked with decentralized renewable energy.

Mobilizing commercial investment remains a challenge especially for small projects

The CICSA grant provided funding for upfront project development, technical assessments, advisory and feasibility studies on the pilot project. However, accessing finance for capital expenditures remained difficult as mobilizing private investment for small solar projects in Ghana is challenging due to high perceived risk, small ticket sizes, limited access to financing, lack of technical expertise, and limited government support. Stella's private investor exited from pilot program part way through due to the small ticket size and associated low investment requirement. Stella remained flexible and funded the project partly with its own equity to implement the project upon Empowers exit. Figure 4 provides more detail on the total project financing for the pilot project and includes the Capex breakdown for four of the projects under contract.

Setting up of innovative solutions and financing structures involves high costs for legal and advisory which can be very prohibitively high and companies like Stella Futura struggle to raise capital for this purpose. Interventions like CICSA can help establish proof of concept for such impact-driven and innovative projects.

Financing and business models can impact affordability for customers

Captive solar projects require significant upfront investment so getting the financing and business model right is key to ensure a project provides reliable and affordable energy for the customer. Stella Futura Limited leveraged blended finance and used an innovative leasing model to enable the rooftop solar PV installations for the healthcare facilities. Stella Futura Limited's business model used a contract denominated in local currency allowing the customer to make monthly payments in cedis with a 15-year conditional sale agreement. The financing structure and business model used help lower the cost burden and risk for healthcare facilities to make the projects viable.

Local training, partnerships and stakeholder engagement are critical for success and can facilitate scale-up

Working with local partners and engaging with the local customers can help ensure the success of a captive solar project. For example, the low penetration of (less than 1%) solar technology in Ghana and minimal success stories specifically for healthcare facilities prior to the pilot contributed to the low customer confidence in the technology. Therefore, multiple virtual and in-person meetings to train the healthcare facilities and answer questions on solar technology were required for local staff to gain confidence with solar technology. The signature for first two hospitals took considerable time and effort, however, once the relationship with CHAG was established, other hospitals followed suit and Stella now has a healthy pipeline of interested hospitals. CHAG with its wide nation-wide network of health facilities offers a huge opportunity for scaling-up the pilot project.

In addition, engagement with broader stakeholders in the industry can also inform and shape opportunities for success. For example, international donors, local financiers, the Christian Health Association of Ghana (CHAG), various religious bodies, and healthcare workers have all been engaged and will continue to for the expansion of this initiative. This project is there an example of a successful collaboration across multiple stakeholder groups.

Reduce currency for customers risk with local financing

Currency risk is a serious challenge in Africa and Ghana experienced a steep depreciation of the local currency against USD mid-way through the project. Project contracts then had to be restructured in local currency for off-taker acceptance as USD lease terms created a major financial risk to the healthcare facilities. Hospitals and other customers prefer a local currency contract since their revenue is in local currency and they aren't well positioned to manage expenses in USD that fluctuate with currency depreciation. These local currency contracts then shift the currency risk to the financier who can mitigate the risk with an annual escalation rate on payments and/or optimistic exchange rate forecasts.

Need for more enabling policies, regulations and awareness building for captive solar market

Ghana's institutional and regulatory framework for the power sector is recent and still evolving. The country's regulatory environment generally supports captive solar installations, but there are still regulatory challenges that need to be addressed. The Energy Commission of Ghana has issued regulations that govern the development, installation, and operation of renewable energy systems, including captive solar installations. These regulations outline the technical standards and requirements for renewable energy systems, as well as the procedures for obtaining the necessary permits and approvals. However, there are still regulatory challenges that need to be addressed. For example, the regulatory framework for net metering, which allows businesses and individuals to sell excess electricity generated by their renewable energy systems back to the grid, has recently been developed in Ghana. It is yet to be seen if the implementation can help businesses and organizations to monetize their excess solar energy. There is a need for awareness building to promote the net-metering scheme to increase participation.

In 2014, Ghana faced an energy crisis of power shortages. In response, the government over contracted power generation but the demand for electricity did not go up at the anticipated rate due to tariff increases and slow economic growth and Ghana ended up producing excess capacity. To avoid a financial crisis, Ghana's government suspended the issue of new licenses and permits to grid-connected solar PV PPAs, which also included captive generation contracts. This limited the growth of captive solar adoption. Recently, the government has resumed the issuance of new licenses and permits, and this should help drive up the uptake of solar if another suspension does not take place.

Additionally, the limitations on tenure of commercial (<500kWp) lease-to-own contracts places a burden on off-takers and affects the viability of the investment. Lease-to-own contracts are capped at 12 years by Energy Commission, with the possibility of reducing it further to 7 years. Unlike traditional equipment leasing, shorter solar-as-a-service lease contracts imply the commercial client makes higher payments over a shorter duration, which equates to a higher price/kWh compared to the grid tariff to yield no savings. For this reason, financing of solar in the commercial sector (schools, hospitals, small cap industry) tends to be unattractive for investment by financiers; compared to the appetite for solar investments in the industrial sector that are eligible for 15 or 20-year PPA (Power Purchase Agreement) contracts.

Another challenge is the lack of standardized contracts and financing mechanisms for captive solar installations. This can make it difficult for businesses and organizations to secure financing for their projects, as many investors may be hesitant to invest without standardized contracts and financing options. In summary, while Ghana's regulatory environment generally supports captive solar installations, there are still regulatory challenges that need to be addressed, such as the development of net metering regulations, streamlining of regulatory processes, and standardization of contracts and financing mechanisms.

In Ghana, the lack of awareness was a key obstacle faced by the pilot project. The regulatory bodies and the ministry can invest in awareness campaigns to build recognition on the benefits of using solar power systems.

CONCLUSION

The Lessons Learnt from the implementation of pilot project in Ghana have built upon the published material, experience and lessons learned from the existing pilot projects developed under the CICSA project.

Scaling up the deployment of clean captive installations is crucial to meeting climate goals and realizing the energy transformation potential of sub-Saharan Africa. Pilots play a crucial role in highlighting the challenges and success factors for planning, implementing, and disseminating results from pilot projects.

As the document has shown, the market has the potential to progress with all the market, regulatory or social drivers working together, but to realize the full extent of its potential, proactive interventions are necessary. This can include more mature policies and regulations, as well as well-designed market mechanisms and institutions. However, it is up to countries to take the lead with clear policies and strategies that prioritize clean energy and climate goals.

Scaling pilots knowledge is a powerful tool in accelerating deployment. By sharing best practices and lessons learnt from successful pilot projects, stakeholders can collaborate and support each other in their efforts to build a robust and sustainable clean captive market. To achieve this, it is essential to strengthen, harmonize, and build upon existing knowledge. This will help ensure that clean captive installations can be scaled up efficiently while minimizing risk.

In conclusion, accelerating deployment through pilots and scaling across different contexts is key to unlocking the full potential of clean captive installations for the commercial and industrial sector in Ghana. While there may be challenges ahead, with proactive interventions and collaboration among stakeholders, we can work towards a more sustainable future powered by clean energy.

CICSA

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