LESSONS LEARNT | KENYA

CLEAN CAPTIVE INSTALLATIONS FOR INDUSTRIAL CLIENTS IN SUB-SAHARA AFRICA

LESSONS LEARNT FROM THE IMPLEMENTATION OF PILOT PROJECTS IN KENYA

APRIL 2023

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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Authors

Yamini Jain (FS-UNEP Collaborating Centre)

Carolina Merighi (UNEP)

Editors

Francoise d'Estais (UNEP)

Tobias Panofen (FS-UNEP Collaborating Centre)

Tracy Kimathi (Tree.Sea_mals)

Beatrice Songkok (OFGEN)

Claudia Rothe (Ecoligo)

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.

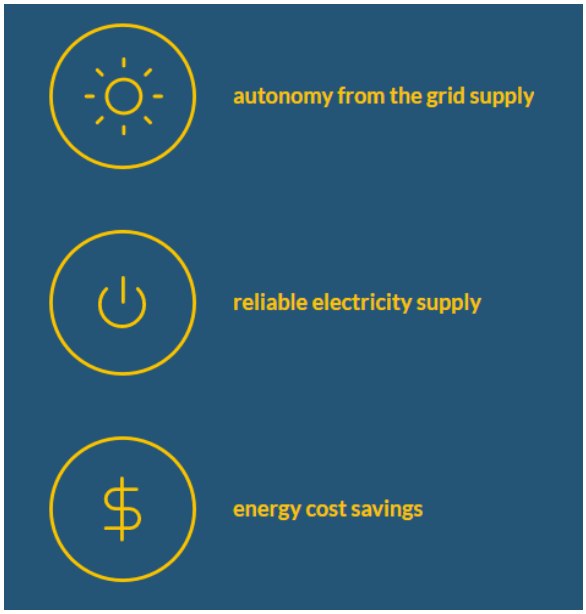
Renewable energy captive installations alleviate the pressure to generate electricity from national grids and reduce commercial & industrial clients' needs to rely on private supplementary fossil-fueled generators, which are expensive to run. These clean captive installations are frequently referred 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 the 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 Kenya 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 explaning the application process, eligibility criteria, selection criteria and timelines. For Kenya the call for proposal was held on the 15 and 16 September 2020.

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 Kenya, OFGEN, Tree.Sea_mals (TSm), and Ecoligo were selected. Once pilot projects became operational, the financial and economic viability was monitored and proven.

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.

CONTACT DETAILS

For more information about the project contact:
- *Meseret Teklemariam, UNEP Africa Office at meseret.zemedkun@un.org*
- *Francoise d'Estais, UNEP Economy Division at francoise.destais@un.org*
- *Tobias Panofen, UNEP-FS Collaborating Centre at t.panofen@fs.de*

For more information about the pilots contact:
- *Tracy Kimathi,* Tree.Sea_mals *at tracy@baridi.co.ke*
- *Jibril Omar, OFGEN at jibril.omar@ofgen.africa*
- *Claudia Rothe, Ecoligo at claudia.rothe@ecoligo.com*

SUPPORTED PILOT PROJECTS IN KENYA

Pilot projects that have received financial support from 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, three of which are located in Kenya. 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 Kenya, following a competitive call for proposal, the following three pilots were selected:

OFGEN: Under type 2 grant funding (financing vehicle/instrument) OFGEN[1] was supported to establish a special purpose vehicle (SPV) that raises financing in local currency for the development of captive solar power plants for companies in the commercial & industrial (C&I) sector in Kenya.

TREE_SEA.MALS (TSm): Under type 1 grant funding (transaction costs/advisory), TSM[2] was supported in order to prove the business model for solar-powered cold rooms for commercial urban meat markets in Kenya. The solar-powered cold room facilities reduce post-slaughter loss of meat, yielding economic benefits to vendors.

ECOLIGO: Under type 2 grant funding (financing vehicle/instrument), Ecoligo[3] was supported to set up an SPV to implement a blended portfolio finance approach for C&I solar projects. The funding for the SPV will be provided by both junior unsecured crowd-investors and senior secured institutional lenders. For this pilot project, Ecoligo proposes to target medium sized solar projects (500kWp – 2MW), which are typically too small for institutional investors but too big for only crowd investors.

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[1] *Ofgen is a leading solar PV company that has been licensed by the Energy and Petroleum Regulatory Authority of Kenya (EPRA) to develop, construct, own, operate and maintain solar energy power plants.*

[2] *Tree_Sea.mals, also known as TSm, primary focus is on providing African-based communities with solar energy solutions. TSm has been working towards reducing post-meat harvest losses through their innovative solar PV cooling solutions, which they started developing in 2020. Before that, they had already established themselves as a leader in nano-grid projects.*

[3] *Ecoligo provides fully-financed solar-as-a-service solutions to C&I businesses in Kenya. With a focus on sustainability and impact, this company's innovative approach involves crowdinvestors who finance clean energy solutions for their clients.*

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 Kenya'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, TSm has installed a freezer and a chiller at Burma, a well-known meat market in Nairobi. Ecoligo has developed a 720 kWp system for Fresha Dairies in Githunguri, and OFGEN has developed a 540 kWp system with a 700 kWh battery storage for New KCC in Sotik. Notably, the unintentional emphasis on the food processing sector reflects that the need of reliable and affordable souce of energy in this sector is not met through the national grid. Use of solar PV in the food processing industry contributes significantly to the country's food security and enables more efficient and sustainable operations. This is also helping to reduce greenhouse gas emissions, create new income-generating opportunities, generate jobs, stimulate economic growth, and contribute to a more sustainable future.

LESSONS LEARNT IN KENYA

The valuable lessons learnt from the implementation of pilot projects in Kenya comes from the published material, experience and lessons learned from the existing pilot projects developed under the CICSA project. These pilot 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.

Strong Drivers for Captive Solar Energy Systems in Kenya

Favorable market conditions have paved the way for the adoption of captive solar photovoltaic (PV) systems in Kenya. With low reliability of the grid and frequent load shedding, coupled with rising costs of grid electricity and diesel fuel used for back-up generators, businesses are turning to solar PV projects as a reliable alternative. As of 2019, in total, Kenyan commercial, industrial and institutional users have installed more than 100 solar PV captive plants (27-plus MW combined)[4]. Captive solar PV projects with and without battery storage have already been installed in grid connected regions, with a growing number of hybrid battery[5] installations as the cost of batteries continues to decrease. The installation of hybrid solar PV and battery has become increasingly cost-effective, making it a more feasible option than diesel generators over the 10–20-year lifetime of the equipment. This has resulted in an increase in demand for such installations, creating favorable market conditions for suppliers and service providers alike. With this trend set to continue, the future looks bright for the captive solar PV industry in Kenya.

Kenyan Captive Solar Market is Competitive

The Kenyan captive market for solar PV in the current landscape is currently highly competitive, offering industrial users a cost-competitive solution for their electricity needs. This is in contrast to grid tariffs, which can fluctuate based on utility revenue requirements and political goals to promote economic growth. The high level of competition in the captive market means that captive power plants with levelized costs below US$0.11 per kilowatt-hour (kWh) will likely be most attractive, as compared to current grid tarrif of approx. US$0.14 per kWh, to industrial users who operate six or seven days per week on 2022-23 electricity tariffs. However, it's worth noting that new developments may affect this landscape in the future. For instance, 60 of the largest industrial customers may receive dedicated electricity supply, while new special economic zones are being developed. As such, it's essential for businesses to keep an eye on these developments and stay informed about their options in order to make the most informed decisions about their electricity needs.

[4] *Kenya Country Study 2020*

[5] *A hybrid solar system is a renewable energy system that is grid-tied and includes battery storage. The system uses solar panels to produce energy during the day, while the batteries store excess energy for use later at night when there is no sunlight.*

Significant room for innovation in the Kenyan market

The Kenyan market has significant room for innovation for captive solar PV installations and the CICSA grant is leading the way with its selected pilot projects. Grant support was awarded to different pilot projects that aimed to demonstrate the feasibility of innovative technologies and financing methods in captive solar PV market. These initatives have shown promising results in terms of improving energy access, reducing carbon emissions and creating new business models. The success of these pilot projects has paved the way for more investments in renewable energy solutions that can bring positive economic and social impacts to Kenya. The innovation points captured in the pilot projects supported by CICSA grant include:

- TSm's proprietary asset management software, WINGU, which enabled the company to effectively monitor their solar-powered refrigeration units.
- Demonstration of financial viability of OFGEN's power purchase agreement (PPA) contract denominated in Kenyan shilling (KES).
- Ecoligo's blended portfolio finance approach, whereby projects were financed through a combination of senior debt and crowd investment.

As the demand for clean energy continues to grow, there is a need for more innovative approaches that can address the challenges faced by the country's energy sector. With the support of CICSA, Kenya has been leading the way in the adoption of captive solar projects across Sub-Sahara Africa. Considered the most innovative established market for captive installations, the country has made tremendous strides in this space. The success of this endeavor can be attributed to a number of factors, including the use of innovative technologies and financing approaches. The CICSA pilots in Kenya have been particularly instrumental in demonstrating the potential of these methods to drive adoption.

The CICSA pilots in Kenya have thus served as a valuable demonstration of innovative solutions that can drive the adoption of captive solar projects in the Kenya.

Investment readiness is improving yet remains a challenge

The cost of financing renewable energy has declined in recent years, making it more accessible and affordable for a wider range of actors. Despite the progress in financing for renewable energy, challenges remain, including limited access to finance especially for small-scale projects. Several challenges such as limited market for PPAs, high perceived risk, inadequate infrastructure and lack of skilled personnel are some of the factors contributing to the difficulty in attracting private capital to the sector. However, with the right regulatory frameworks, innovative financing structures, and strong project fundamentals, it is possible to overcome these challenges. Investment readiness is also criticial in attracting private capital. A solid track record of successful projects can instill confidence in potential investors and reduce their perceived risk. This includes a clear and stable offtake agreement, demonstrated financial viability and an experienced project developer with a track record of success. Public and private stakeholders must work collaborately to address these challenges and create an enabling environment that encourages private investment in the renewable energy sector.

Innovative Financing structures are emerging and are driving investment readiness

Innovative financing structures are emerging, 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. These financing mechanism can increase liquidity, attract a wider range of investors, and mitigate risk. Ecoligo's Blended Portfolio Finance Instrument is an excellent example of how such innovative financing structures can work. The instrument combined junior unsecured crowd-investors and senior secured institutional lenders, enabling Ecoligo to launch larger projects and implement them more quickly. The cofinancing arrangement with Oikocredit provided Ecoligo with the senior debt required to launch the EUR 5 million project. These structures are creating exciting opportunities for investors and project developers alike, making it easier to mobilize private capital for sustainable energy projects. As the demand for renewable energy investment continues to grow, innovative financing structures will play an increasingly important role in meeting this demand.

Financing and business models can significantly impact sustainability of captive installations

New financing and business models are developing, enhancing the captive installation market. Captive solar projects require significant upfront investment, and financing and business models significantly impact the sustainability of the captive installation project.

With the availability of various financing models in the country including asset finance with local lenders, Rent-to-Own, Build-Own-Operate-Transfer (BOOT), operating lease, and Power Purchase Agreements (PPAs), the financial sector is opening up to such projects. However, commercial banks in Kenya initially viewed captive solar technologies as high risk. With initial support from development finance institutions and government initiatives such as tax incentives, commercial investors are getting experience with the technology and are increasingly investing in these projects.

The market growth has pushed the uptake of blended finance to project financing structures, for example Ecoligo's Blended Portfolio Finance Instrument addresses financing gaps in the medium sized solar PV market (500kWp-4MWp) in Kenya which has historically been too small for institutional investors and too large for crowd funding. The facility allows institutional debt providers to lend alongside retail investors, to finance larger projects with a long development cycle while creating direct impact investment opportunities for retail investors.

Furthermore, a number of specialized solar PV financing firms (e.g. Mirova SunFunder, SolarRise Africa, Crossboundary Energy) also entered the market several years back to address the lack of financing from commercial banks at the time, with many still actively investing in projects.

OFGEN used the grant to demonstrate the financial viability of a power purchase agreement (PPA) contract denominated in Kenyan shilling (KES). It has successfully developed a financial modelling tool for KES-denominated PPAs that enables its sales team to easily assess customer demand and set a KES tariff specific to that customer. By providing a KES tariff, the customer has been able to better project its energy-related forex costs based on a fixed annual escalation as to opposed to monthly market forex rates that are difficult to predict. This, along with the hybrid battery system, has significantly reduce the monthly electricity and diesel costs of the offtaker by 30% with minimizing its reliance on diesel gensets.

Careful consideration of financing and business models is key to ensuring the long-term viability of captive solar installations. As new models emerge, it is important to continue evaluating them for their potential benefits and drawbacks. This helps stakeholders make informed decisions about which model is most suitable for their specific needs.

Local currency contracts help reduce currency risk for customers but access to local financing remains challenging

Local currency contracts can mitigate currency risks for the customer especially for businesses operating in volatile economies. Several projects in Kenya experienced the depreciation of the shilling against the USD leading to significant challenges during execution. OFGEN has recognised the importance of leveraging local currency to reduce project risks. The company's decision to develop a PPA pipeline equivalent to KES 2 billion has proven beneficial in reducing currency risk for their customers through local currency contracts. OFGEN's approach has helped to reduce perceived risk and makes the investment more sustainable in the long run. However, the company faced challenges in attracting local investors that can provide affordable local financing, whereby local investors demand rates competing with infrastructure bonds and T-bills. Despite this, the project has demonstrated financial viability of local currency contracts with two successfully implemented sites and aims to attract more local financing. Access to affordable local financing remains a key challenge for project developers in Kenya. However, the situation is expected to change as more and more projects demonstrate financial viability and reduce percieived risks.

Remain technology neutral and take advantage of technology advancements

Project developers benefit from remaining technology-neutral by focusing on the end goal of providing cost-effective and sustainable solar energy to their customers, rather than being tied to specific technologies. This can be achieved by adopting a flexible and adaptable approach to technology, which allows developers to take advantage of the latest advancements in the field. For instance, TSm showed the benefits of staying flexible with technology advancements when they switched from using chemical battery storage to new thermal storage technology for their cold rooms, which helped them save 37% on CAPEX costs. This project also leveraged grant funding to develop an asset management software with enhanced monitoring and security features.

Need for training local staff and technology service support

Proper maintenance and operations of solar captive installations are crucial for their long-term performance and sustainability. However, challenges related to skilled labor availability and quality of maintenance services can affect the efficient operation of solar captive installations. Original Equipment Manufacturers (OEMs) often have limited and slow response times for local service support in Africa for imported equipment like batteries, solar panels, and inverters, highlighting the need to train local engineering teams in collaboration with OEMs. This can enable hands on knowledge transfer improving customer service and equipment operation over its lifetime.

Local partnerships and community engagement are critical for success

Working with local partners and engaging with the local community can help ensure the success of a captive solar project. This includes ensuring that the project meets the needs of its local end-customers and that there is buy-in and support from the community.

Particularly in projects like cold chain services that Tree.Sea_mals (TSm) offers, engagement with the community becomes especially important considering the solar-powered chiller and freezer units are located in a meat market whereby farmers come to use the cold chain services on a daily basis. Through consumer engagement, TSm has realized many benefits including: better site selection strategies, validation of location with the target market, and strategic use of data. Local partnerships with the Nairobi City County also proved to be beneficial as seeing the success of the first two TSm units, the local government is interested in a partnership with TSm.

Through these projects, the importance of community participation and stakeholder engagement has been emphasized, leading to a greater understanding of local needs and challenges. Additionally, the projects have highlighted the need for flexibility and adaptability in project design and implementation, as well as the importance of monitoring and evaluation to measure impact and make necessary adjustments. Overall, the knowledge gained from these pilot projects will serve as a valuable resource for future development efforts in Kenya and beyond.

Shared vision for stakeholders

To achieve a future with clean captive installations, stakeholders in the sector must work together towards a shared vision. This requires policymakers, regulators, utilities and technology providers to collaborate effectively and coordinate their efforts. By doing so, they can ensure that the transformation process is successful and leads to a more sustainable future for all. Innovation and growth will also be key factors in this process, presenting an opportunity for the sector to thrive. It is crucial that all parties involved are willing to work towards this common goal, as a shared vision is essential for success. With a commitment to collaboration and innovation, the potential for clean captive installations is vast, and stakeholders must take advantage of this opportunity for the benefit of all.

Scope for reforming existing policies

Kenya's institutional and regulatory framework for energy is well established, and includes provisions tailored to captive power projects in the country. Although the rules and requirements are generally clear, some grey areas persist with regard to private power supply to end users under contract. For example, Kenya introduced its Feed-in-Tariffs Policy in 2008 to promote investment in renewable energy technologies. In theory, the Feed-in-Tariffs Policy is an option for clean captive installations in industry. In practice, however the PPA process is lengthy, time consuming and not necessarily standardized (for example, the tariff might have to be negotiated), and the single buyer (KPLC) does not give priority to small PPAs. Some existing captive feed-in tariff projects took 1-2 years to secure a PPA. Low feed-in-tariffs can deter companies as the avoided retail cost of grid power might provide better financial returns than the negotiated feed-in tariff.

Flagship projects as proof of concept

Executing flagship projects is a crucial element in proving the economic and financial viability of clean captive installations for C&I in Kenya. The CICSA project proved that clean captive installations for C&I could be both economically and financially viable. In addition to executing these flagship projects, awareness raising is equally essential in addressing gaps and barriers that may hinder the success of such initiatives. Such content not only educates but also inspires stakeholders to support and invest in sustainable energy solutions. Executing flagship projects and communication play key roles in driving change and innovation for clean captive installations for C&I in Kenya.

CASE STUDY- TREE.SEA_MALS (TSM)

CICSA supported Tree_Sea.mals (TSm) to establish and prove the business model for solar-powered cold rooms in commercial urban meat markets in Kenya. TSm successfully implemented the project with two active units of cold storage systems. The company's innovative solution and collaborative despite its small size has shown tremendous impact in the real economy of the country. TSm is on a path of expansion exploring new territories and business models in the solar-powered cold storage market.

1. CONTEXT

In the context of Kenya's meat industry, it is concerning to note that a significant portion of localy sourced meat goes to waste due to inadequate storage facilities. According to the Kenya Markets Trust, the estimated national general trade of small stock beef is 1,900,443 MT per month (valued at KSH 2,527 billion) (approx. USD 18 billion). However, this figure is undermined by the fact that 1,500 tonnes of meat produced locally in Kenya goes bad within just two months of production. This loss of produce and devastation of livelihoods in the semi-arid East African region is further exacerbated by locust infestation and droughts. Unfortunately, farmers who lack access to storage facilities often fail to sell their meat on time, leading to spoilage. As such, it is essential to invest in storage infrastructure as part of efforts to enhance Kenya's food security and reduce food waste.

2. COMPANY

Tree_Sea.mals Limited (TSm) is an eco-based organization which was incoprated in 2018 with a focus on developing projects that utilize renewable resources for the benefit of African-based services. TSm's principal activity is providing communities sustainable energy solutions tailored to their energy needs. While TSm had previously worked on Nano-grid projects, they pivoted their business strategy in 2020 to focus on other off-grid energy sector projects such as solutions to reduce post-meat harvest losses through solar PV cooling solutions. In 2018, CEO Tracy Kimathi, was awarded the prestigious Tony Elumelu Foundation Award and has also received other prominent awards from the Invest2Impact 2Xcatalyse, the Africa Prize for Engineering Innovation Shortlist, and is an MIT Solve Finalist for TSm outstanding leadership role in promoting sustainable energy practices across Africa.

3. PROJECT

BURMA MARKET

Many meat markets in Kenya do not have cold storage facilities due to potentially expensive and intermittent electricity access. This can lead to a short lifespan for meat products after

slaughter, and can lead to spoilage if they are not sold sufficiently quickly. Burma market, situated in Nairobi, has emerged as the go-to destination for meat lovers in the city. This middle-segment commercial meat market that boasts a weekly supply between 2,400 to 3,000 cattle carcasses from several Laisami trade groups in Northern Kenya. It is the largest retail outlet to Butcheries who are responsible for sourcing 93% of total meat purchases in households. TSm identified this market as the perfect location for their pilot cold-storage unit. The aim was to reduce post-slaughter meat loss experienced by farmers. With its strategic location and vast customer base, Burma proved to be an excellent choice for TSm to prove their business concept. The solar-powered cold room facilities not only reduce the post-slaughter meat loss but also make it possible for farmers to store their produce for longer periods, enabling them to sell at their convenience. In summery, Burma market is not just a meat market, but it has become a hub of innovation and technology that benefits both the farmers and consumers alike.

THE SOLUTION

TSm developed two cold-chain storage units in the Burma market: a 3.18kWp Chiller with a 12kWh battery and 12 cubic meters volume, and a 6.58kWp Freezer with a 15kWh battery and 15 cubic meter volume. These are testament to the company's innovative solutions for product preservation that offers efficient storage options for perishable goods. TSm uses a unique Pay-As-You-Store mobile money revenue model to enable customers to preserve their products without worrying about upfront costs. The project was funded through a mix of donors grant with hardware related grants accounting for 58% and service-related ones for 42%.

Figure 1: Unit 1 Solar-powered Chiller

Figure 2: Unit 2 Solar-powered Freezer

A significant aspect of this solution is **WINGU** - an asset management IoT feature for Pay-Store applications that monitors energy consumption, event data, and product inventory. This innovative feature ensures that customers have complete visibility and control over their stored products.

WINGU offers an array of features that can help optimize energy usage and reduce operating costs. One of the standout features is the real-time monitoring of power consumption data from refrigeration units. By integrating with weather and meteo data sources, WINGU is able to provide clients with up-to-date information on temperature and weather conditions that can impact refrigeration unit performance. This allows clients to make informed decisions about their supply chain management, ensuring that products are kept at optimal temperatures throughout the entire journey. Furthermore, WINGU's real-time monitoring of door openings allows clients to identify and address issues such as unauthorized access or inefficiencies in the refrigeration system. This one-stop-shop also includes a Pay-Store revenue system with customized point-of-sale (POS) setup, enabling all customer payments for the cooling service to be automatically recorded and archived in the system. WINGU's cutting-edge technology provides a comprehensive solution that streamlines previously tedious tasks into manageable processes that not only save time but also improve efficiency.

CHALLENGES

Challenges are an inevitable part of pilot implementation. TSm too faced and overcame few challenges during the Burma pilot implementation. The main challenges included:

- Enforcing no cash payment rule: TSm accepts digital-only payments and the executive team had a difficult time enforcing this rule to both the clients and its operation staff. The company used a stricter policy and educated the operating staff to mitigate this issue. Furthermore, company's WINGU asset management platform eased

reconciliation procedures.

- Expert & Equipment unavailabity during technical failures: The slow response to equipment breakdown from EPC partners posed as major challenge to TSm and the company had to switch to suppliers with readily available technicians. Mitigation also included training of internal operators for emergency shut down procedures.

- Financing challenge: As TSm aims to scale its operations and extend its impact to more communities, securing adequate financing is crucial Currently, TSm faced financing-related challenges for expansion and replication activities. To address this challenge, TSm is actively undertaking investment readiness support activities. This involves preparing and positioning the company to be attractive to potential investors. This includes developing comprehensive business plans, financial projections, and other documentation to showcase the viability and sustainability of TSm's business model. Additionally, TSm is engaging in due diligence activities with post-concept public funds such as the Africa Enterprise Challenge Fund (AECF) and the Global Challenges Research Fund (GCRF). By being investment-ready, TSm aims to demonstrate to potential investors that it has a well-thought-out strategy and is poised for growth and replication.

SUCCESSES

- Site identification: TSm scoped and identified 30 sites from a 4 month internal research activity in partnership with Esri East Africa[6]. The objectives included: a) identifying key indicators of a high value market; b) conducting feasibility studies on meat stock volumes, wastage levels and locations across Kenya; and c) collection of data on supply and demand balances in the market.

- Community Engagement: TSm conducted detailed market stakeholder involvement i.e. interviews, MOU's, panel discussions in 6 viable cold-chain sites in Kenya and materialised report documents for all six.

- Legal Advisory: TSm developed crucial templates that are key to executive business ownership including stall lease agreements, EPC & Supplier agreements, aligning shareholder agreements and structures and registration of WINGU asset management

[6] *Esri Eastern Africa is the Regional point of presence for Environmental Systems Research Institute (Esri) for Kenya, Uganda, Tanzania, Ethiopia, Eritrea and Djibouti. Esri Inc develops geographic information systems (GIS) solutions that function as an integral component in nearly every type of organization, in both public and private sectors.*

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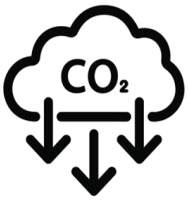
- Research & Development: Due to high cost of battery storage (Lithium-Ion) of TSm's original solar cold room equipment, the company invested in a more affordable alternative source of back-up in the form of thermal storage. Switching from expensive chemical storage to affordable thermal storage helped cut CAPEX cost down by 37% and thus highly influenced project's payback. The company was able to secure an exclusivity agreement within the East African region.

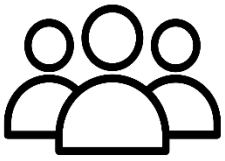
- Business Planning & Financial Forecast: TSm has seen increasing interest of commercial investors in its portfolio and the company has researched on expansion of business models encompassing Pay Store and Lease Own business models, development of pitch decks and financial forecasts, technology sizing and pricing, establishing internal credit assessment manuals, among others. This further contributes to investment readiness of the company.

4. IMPACT

Reduced spoilage of 314,581 kg of meat produce



2,445 kg CO2 Equivalent Avoided



6 personnel added
50% female team
80% below 35 years

24.06% cost savings

5. CONCLUSION

The Lessons Learnt from the implementation of pilot projects in Kenya has build 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-Sahara Africa. Pilots play a crucial role in highlitings 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 streghten, harmonize, and build upon existing knowledge. This will help ensure that clean captive installations can be scaled up efficiently while miniminzing risk.

In conculsion, 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 Kenya. 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

CLEAN CAPTIVE INSTALLATIONS FOR INDUSTRIAL CLIENTS IN SUB-SAHARA AFRICA

Supported by:

Federal Ministry for Economic Affairs and Climate Action

IKI INTERNATIONAL CLIMATE INITIATIVE

on the basis of a decision by the German Bundestag