

LEARNING REPORT

Examining the Journey and Impact of Pay-as-You-Go (PAYG) for Solar Home Systems

Case study on Smiling Through Light (STL)

Sierra Leone

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Photo credit: Huldah Imah Paul

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ACRONYMS

DTI:	Debt-to-income ratio
FGD:	Focus Group Discussion
PAYG	Pay as You Go
SHSs:	Solar Home Systems
STL:	Smiling Through Light



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EXECUTIVE SUMMARY

- This learning report provides data analysis and insights on the deployment of SHSs using PAYG as a billing method for STL customers in Lunsar, a mining town in north-western Sierra Leone.
- STL staff and customers provided their insights and feedback through interviews and two Focus Group Discussions (FGDs) for in-depth understand of SHSs-PAYG journey with STL in Sierra Leone. One FGD was organised specifically for the participation of STL women customers only. The interviews and FGDs were complimented by a literature review and data analysis of STL documents and client data on Solaris PaygOps platform.
- To purchase STL's SHSs through the PAYG billing method, all STL customers are vetted through STL's PAYG Customer 5Cs credit assessment policy. The 5Cs credit assessment policy is a vetting procedure at the heart of STL's PAYG billing method that effectively screens customers for their credit rating to avoid defaults. All STL customers must score at least 4 out of 5 to purchase a product on a PAYG basis.
- A total of 109 customers were onboarded for STL SHSs PAYG payment method. The data revealed that 42.2% of STL customers were female, mostly small-scale traders, and housewives. This data is significant because it underscores STL's emphasis on particularly tailoring its SHSs distribution programmes to women's energy access through renewable energy appliances.

"My status in my neighbourhood has improved. Children in my neighbourhood come to my home to study every night. My neighbours like and respect me because their children are performing well at school" – STL PAYG customer.

- Most customers were aged between 30-49 years irrespective of their gender. This age category constituted over 75% of the total number of customers. The age range is typical of the working age bracket in Sierra Leone and reflective of the age at which most people in the country tend to own and operate small and medium sized businesses.
- All but one STL customer had access to at least one mobile phone. This is a significant data point for ownership of STL SHSs and for paying through the PAYG billing method, which requires all customers to pay their bills via mobile money. However, the most common form of payment currently is through STL sales agent.
- STL customer relations have improved greatly with the current PAYG billing method. This was evident from the FGDs, with STL customers openly expressing their satisfaction with STL products, as well as their respect for STL sales agents and satisfaction with the PAYG billing method.
- Through the PAYG billing method, STL collects 100% of payments from customers with no default recorded. Therefore, the ability to collect revenue has significantly improved resulting in better working conditions, motivation, and safety at work for STL staff.
- The learnings and recommendations could inform future decisions on financing for social entrepreneurs involved in vending SHSs to improve livelihoods and access to lighting through a sustainable approach in off-grid communities in developing countries.

1.0 INTRODUCTION

1.1 Smiling Through Light (STL):

STL provides clean, reliable, affordable, and sustainable energy through the sale and distribution of solar products in Sierra Leone. STL focuses on clean energy access and works with a network of local women to provide clean, reliable, and sustainable energy through the distribution and sale of solar products targeting last mile communities.

STL has a focus on creating employment and income opportunities, especially for women in their local areas. By working with, and through, a network of local women, STL creates jobs and income generating opportunities, igniting the potential for women to dramatically improve their lives by lifting themselves, and their communities, out of poverty. Female sales agents distribute household solar lamps to individuals, many of them women, who can then benefit from having access to safe, rechargeable sources of lighting. The goal is to dramatically improve the lives, mostly of women, in last mile communities, by using innovative community solutions to solve critical problem associated with low access rates.

1.2 STL grant from School for Social Entrepreneurs:

STL received a grant of £5,000 from the School for Social Entrepreneurs under the Future Fellows Fund to undertake an initial pilot project setting up a Solaris PaygOps system. PaygOps is a fintech/IoT software that connects energy and utility appliances (solar devices, water pumps, cookstoves, smart meters, e-bikes), payment methods (Pay-as-you-go mobile money), to a suite of enterprise applications (SaaS) or to API services which allow for the smooth management of lease financing and field operations, while providing key financial data and metrics to investors and partners.

1.3 PAYG for Solar Home Systems (SHSs) as a billing method:

SHSs are successfully addressing energy access deficits across the world, particularly when combined with PAYG payment models, allowing households to pay for energy services in instalments. PAYG is also known as Pay & Go, Pay Per Usage, Pay Per Use or Pay-As-You-Use. PAYG solar is an inclusive asset financing model that expands basic energy access by enabling poor households to acquire SHSs through flexible, digital payments whilst improving access and transforming lives. PAYG solar financing has electrified the homes of millions of people and transformed households that are not connected to the electricity grid.

PAYG allows a user to scale and customize solutions through digital resources including software packages, data storage and online payment platforms. Resource charges are based on used services rather than for access to broader infrastructure. When deployed with SHSs as a billing method and/or a payment scheme, PAYG eventually transfers ownership of SHSs devices/appliances to the customer over time or becomes permanently unlocked. PAYG pricing models allow users to only pay for what they use. Whilst access is blocked when there is default in payment, the appliance is permanently owned by the customer when they have finished paying for it. This approach has been used by STL to improve its customer relations, revenue collection and turn-over in Lunsar, a mining town in northwestern Sierra Leone. It is anticipated that the learning outcomes from this approach will attract additional financing to diversify STL's SHSs product (devices and appliances) portfolio and expand its customer base.

1.4 Learning Report Objective

This report aims to provide learnings on the use of digital innovation and implementation of PAYG solar systems for STL customer operations in Sierra Leone. It evaluates the individual processes and stages of the customer journey, including the selection criteria, user experience, awareness and understanding of the products and payment system, purchase of appliances, as well as costs and usage. In addition, the report explores the benefits and challenges of the PAYG payment method, as well as some recommendations to improve livelihoods and advance gender inclusion through an efficient and sustainable process.



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2.0 APPROACH

2.1 Literature review of STL documents and data analysis:

STL documents on customer selection criteria were reviewed to gain insights into the processes employed. Data collected from Solaris PaygOps software that monitors all STL products sales/payment SaaS solutions and STL customer details, was analysed. The following stepwise approach was followed:

- i) Review and analysis of STL customer policy, process, and contracts.
- ii) Review and evaluation of data from the Solaris PaygOps platform.

iii) Analysis of data from the Solaris PaygOps platform.

2.2 STL staff interviews:

Interviews were conducted in person and online with the STL team about their experiences of SHSs PAYG. Staff were selected from various administrative/operational roles within the organization:

- i) STL Country Manager, Sierra Leone.
- ii) STL Sales Manager, Lunsar, Sierra Leone.
- iii) STL Founder and Director.
- iv) STL Non-Executive Director.

The interviews provided an objective overview of STL operations and the organizational knowledge management framework with respect to STL customer relations and revenue collection with and without SHSs PAYG billing method. The following categories guided the interview sessions:

- Learning experience (training on the use of PAYG SHS system).
- STL Revenue collection.
- Customer experience.
- Opportunities and challenges of the PAYG SHS system.
- Recommendations.

2.3 Focus group discussions

Two Focus Group Discussions (FGDs) were held with 24 STL customers in Lunsar on 11 February 2023. The first FGD targeted a cross-section of STL customers from all ages, gender, and employment demographics. A total of 13 participants were interviewed in the first group whilst 11 participated in the second which focused specifically on STL women customers. Participants were mostly small-scale businesspeople, teachers, and headteachers, while some were housewives. Most of the participants in the second FGD were small traders selling fish, clothing, and food stuffs in the local market in Lunsar. Discussions were open and general in nature for both FGDs. Participants (STL customers) were encouraged to discuss several issues in an open and frank conversation on issues such as:

- Using the SHS appliances/devices (compared to other products in the market).
- Cost of the products and the payment/billing method (using Solaris PaygOps platform).
- Duration using the SHS appliances (length of time since purchasing the product).
- Functionality of SHS appliances.
- Relationship with STL sales agents.

STL customers detailed their experiences using the PAYG billing system, its advantages and disadvantages, improvements in their households and livelihoods and recommendations for improvement. Women business owners participated in discussions to understand how STL SHSs and the PAYG billing method is improving women's access to energy and how this is positively impacting their households and livelihoods.

3.0 FINDINGS & DISCUSSION

3.1 STL's PAYG Customer 5Cs credit assessment policy:

All STL customers using SHSs through PAYG billing method are vetted through STL's PAYG Customer 5Cs credit assessment policy. This utilizes procedures to establish customer eligibility to purchase STL solar products on a PAYG basis to avoid default (Figure 1). The following are the 5Cs that were used by STL to assess creditworthiness and ability of customers to receive credit:

1. **Character:** This refers to the customer's credit history and track record for repaying debts, i.e., any previous loans, microfinance, term and length of repayment, payment method and any defaults. Such loans may include those with other organisations and/or STL products sold previously on credit.
2. **Capacity/Cash flow:** Customers are required to provide documents and information on any current debts to the area sales manager. Cash flow measures the customer's ability to repay the loan by comparing income against recurring debts and assessing the customer's debt-to-income (DTI) ratio.
3. **Capital/Deposit:** This indicates the customer's commitment and will determine any credit extension possibilities. It refers to any capital/deposit that the customer puts toward a potential loan for SHSs. STL identifies the deposit that must be paid for each product.
4. **Collateral/Guarantor¹:** Customers are required to provide a guarantor, i.e., to give assurance if there is any default on the loan by the customer.
5. **Conditions:** This refers to the condition of the business, use of funds, state of the economy, industry trends and how these factors might affect the customer's future ability to repay the loan. It is important to ensure that the loans can be repaid, and the area sales manager will need to identify the potential risks by reviewing the current financial landscape.

The 5Cs assessment policy helps STL to determine the viability of their potential customer and the loan criteria in an attempt to estimate the chance of the default and consequential risk of financial loss for the business (Figure 1). It also enables STL to develop a specific plan for each customer and provides them with clarity on STL's commercial terms of business (payment terms, warranties, customer agreement & guarantor). The credit score is a numerical expression based on the level of analysis derived from the 5Cs to represent the creditworthiness of a customer.

All STL customers must score at least 4 out of 5 to purchase a product on a PAYG basis. STL emphasizes that, among the 5Cs, a guarantor (item 4) is required as one of the 4 points. STL does not onboard interested buyers for their products through the PAYG billing method when they score 3 points or less. Any customers that have previously purchased products on a credit basis (prior to establishment of the PAYG system) and defaulted will not be allowed to loan any products from STL. Customers that have previously defaulted will only be allowed to purchase products outright with cash. Any STL staff member that makes loans to a defaulted customer is subject to a disciplinary process. However, customers failing to score the mandatory 4 points plus item 4, do have to the option to pay in one installment to purchase the product.

¹ Collateral is not in fact requested of customers, but the term is used for ease of use

5C	QUESTIONS	Yes	No	Evidence / Documents Provided	Score
Character	Have you ever taken out a loan ¹ ?				
	How much was the loan?	SLL			
	How long did you take to pay back? ²				
	Did you default on the loan? ³				
Capacity/ Cashflow	Do you work?				
	What do you do?				
	Monthly salary? How much?	SLL			
	Do you have any current debts?				
	If so, how much?	SLL			
Capital	Are you able to pay a deposit?				
	Evidence of 200,000 SLL to pay?				
Collateral/ Guarantor	Do you have a guarantor?				
	Has agent spoken to the guarantor?				
	Has the guarantor understood their liability?				
Conditions	Are there any current risks?				
	Are the economic conditions good?				
	Other adverse conditions?				
TOTAL Credit Score					/ 5

Figure 1: Example of the 5Cs credit assessment policy framework used for screening customers for the STL PAYG billing method. (Taken from STL Customer 5Cs Credit Assessment Questionnaire)

3.2 STL PAYG customer details on Solaris PaygOps platform:

109 customers were onboarded for the STL SHSs PAYG payment method with all vetted through STL's PAYG Customer 5Cs credit assessment policy. Figure 2 provides STL customer composition from the Solaris PaygOps data computation application. Customer data was disaggregated by gender; 46 customers were female, representing 42.2% of the total number while 63 were male (57.8%).

The proportion of STL female customers is significant given that levels of income generation activities and wealth status in Sierra Leone favors the male population. Financially, most males enjoy a better social standing than females. The gender ratio obtained from the STL Solaris PaygOps data underscores STL's emphasis on tailoring its sales and distribution programmes towards gender inclusion with a particular focus on improving women's access to energy through renewable and clean SHSs.

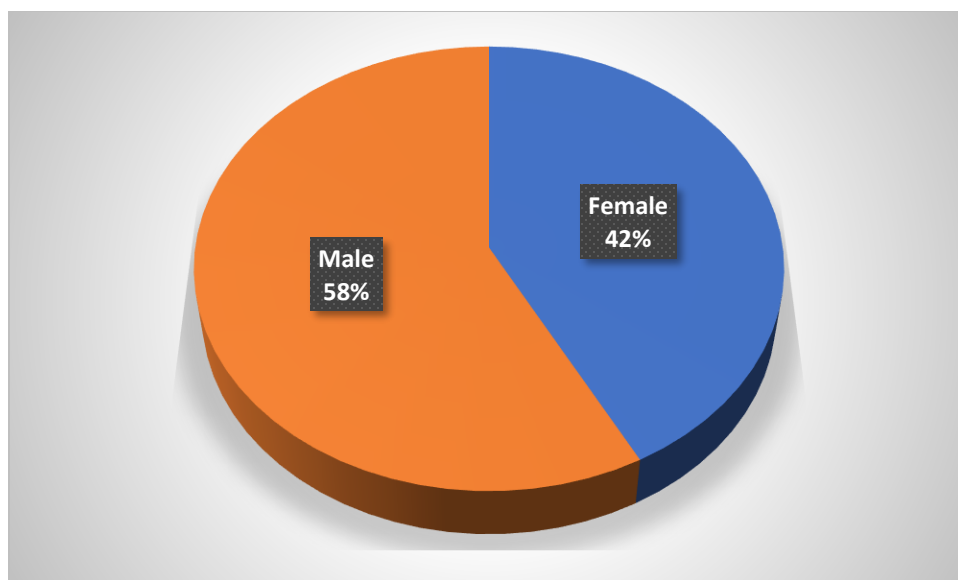


Figure 2. STL customer composition by gender (*source: STL Solaris PaygOps data*)

It is well known that women are disproportionately impacted by energy poverty and face increased health risks from the use of fossil fuels. While evidence suggests that energy access improves women's wellbeing and economic empowerment, it is less clear whether PAYG financing has direct benefits. However, there is no doubt that STL products and the business approach improves their wellbeing and frees up time for additional income generating activities. When women have access to PAYG, it also helps them with lower upfront transaction costs, improved transparency, acquiring an asset that may in turn assist in acquiring future loans (by providing a form of credit history), affords greater access to formal finance, savings, privacy, and female empowerment.

Table 1 details the age composition of STL customers. Most customers were aged between 30-49, irrespective of gender. This age category constituted over 75% of the total number of customers. Approximately 7% of customers were aged below 30 and less than 13% were aged over 50. The age categorization is typical of the employment age composition in Sierra Leone. This is also reflective of the age at which most people in the country own small and medium-sized businesses.

Table 1: Age (years) composition of STL customers using PAYG billing (*source: STL Solaris PaygOps data*)

Age category (years)	Number of customers	Proportion (%) of total
21-29	8	7.3
30-39	50	45.9
40-49	33	30.3
50 +	14	12.8
Customers without age data	4	3.7
Total	109	100

All but one STL customer has access to at least one mobile phone (Figure 3). This is a significant data point even if there was no data on whether the mobile money app was installed on the phones owned by customers. Ownership of STL SHSs and paying through the PAYG billing method enables all customers to pay their bills via the mobile money app. STL customers can either pay through a mobile money agent or through STL sales agents. They can also pay from their phones directly. However, it was noted from the interviews and both FGDs that the most common form of payment currently is through STL sales agents. Some customers indicated that they do not have confidence in paying the bills themselves through the mobile money app.

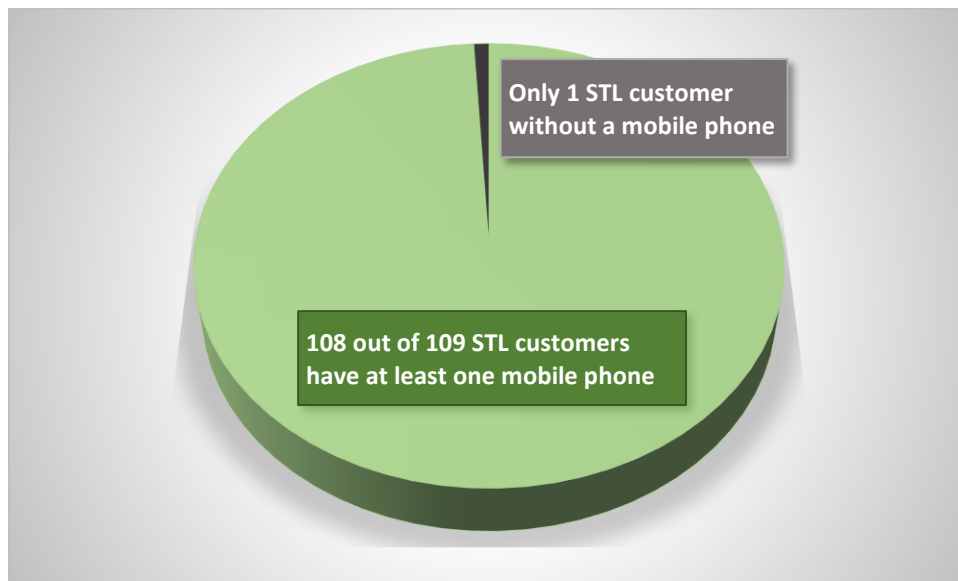


Figure 3. STL customer details on mobile phone ownership (*source: STL Solaris PaygOps data*)

It was acknowledged from the interviews that with an Android phone, STL customers making payment via the mobile money app can have their billing recorded directly on the Solaris PaygOps platform. Although it was not confirmed whether mobile phones owned by STL customers were Android phones, it was clear that currently, STL customers are not using mobile money directly to have their billing reflected on the Solaris PaygOps platform without the intervention of the sales agents. Instead, the billing platform is entirely used and managed by STL staff. After payment is received and acknowledged on the Solaris PaygOps platform by STL staff, the customer is sent a code which they use to activate the functionality of the appliance.

3.3 Improvements in STL customer relations:

As a social enterprise, STL has undertaken measures to maintain a company-wide policy and process of nurturing positive relationships with its customers. However, building strong customer relationships initially presented a major challenge. The initial billing and revenue collection process introduced by selling products on a credit basis (without mobile money) lacked the rigorous customer vetting system used under the current STL PAYG automated system. Further, STL had yet to introduce the Customer 5Cs

credit assessment policy. Without a rigorous vetting process, there was no visibility on customer's ability to repay the credit associated with the products and it was difficult to track and collect payments from customers who defaulted on their loans to STL. It was difficult for STL staff to collect dues for products that had been distributed and even more challenging engaging with customers who saw STL sales agents as annoying and undesirable bill collectors who were intruding into their private lives. STL sales agents were forced to track customers who kept changing addresses while still having functioning STL products in their possession and there was no means to deactivate their SHS appliances.

On the other hand, customer relations have improved greatly with the current PAYG revenue collection system. Customers now have a consistent experience every time they interact with the business, leaving them with a good impression. This was evident from both FGDs, with STL customers openly expressing their satisfaction with STL products, as well as their respect for STL sales agents and satisfaction with the PAYG billing method, which helps them to meet the required monthly payment plan.



Quotes from STL women customers during Focus Group Discussion in Lunsar

Photo credit: Huldah Imah Paul

3.4 Improvements in STL revenue collection and staff working conditions:

Although data for this report did not include actual figures on STL revenue generation and turnover, it was possible to make deductions on improvements in both from interviews with STL staff with following questions: How PAYG system has improved STL revenue collection, financial turnover and STL operations.

STL began operating in 2018. After the initial successes, mainly due to interest from early adopters, there were lots of issues collecting payments from customers in subsequent years. The company recorded no profits and STL eventually lost significant revenue at that time because the billing process was inadequate with difficulties in collecting payments, as detailed above. STL lacked process, policy, and systems to enable it to access finance for operations and growth. However, with the introduction of the PAYG billing method, STL now collects 100% of the revenues due from its PAYG customers with no default recorded to date. Incidents of non-payment have transformed in contrast to the previously adopted credit collection process while the ability to collect revenue in a more timely manner has significantly improved, in turn improving to organisational cash flows and profit margins in 2022/2023 (Table 2).

Table 2: Observed trends in STL revenue collection and inferred profit margin (*source: interviews with STL sales staff*)

STL year of operation	With/without PAYG billing	Reported profit margin.
2018/2019	Without	Marginal profit due mainly to early up-takers
2020/2021	Without	Losses due to high default rates
2022/2023	With	Profits on track with regular cash flow

Furthermore, STL staff expressed their satisfaction and appreciation for the PAYG billing method for the following reasons:

- more paid-up customers which means more profits for STL.
- improvements in revenue generation and turnover.
- stress-free cash flow has improved operations and safety at work.
- salaries are paid on time with improvements in cash flow.
- relationships with customers have improved because the PAYG billing method does not require human contact to remind them to pay their bills.
- billing methodology is cashless – carrying huge amounts of money was a risk but now it is simple and makes work simple and safer.
- knowledge about the PAYG SHS system helps to track customers, revenue generation and the maintenance of regular contact.

4.0 CONCLUSION

This learning report provides data analysis and insights on the deployment of SHSs by STL using PAYG as a billing method for customers. Through the development of this improved process, STL aims to increase jobs and income generating opportunities for women to dramatically improve their lives and livelihoods, lifting themselves, and their communities, out of poverty.

All 109 customers onboarded for STL SHSs through the PAYG payment method were vetted using STL's PAYG Customer 5Cs credit assessment. The vetting procedure has proved very effective, enabling STL to collect 100% of payments from customers without any recorded defaults to date. This remarkably high collection rate has significantly improved cash flows with subsequent increases in profit margins and working conditions for STL staff. In addition, STL customer relations have improved considerably. Although there were more STL male than female customers, the proportion of females is significant given the particulars of income generation activities and the wealth status favoring male dominance in Sierra Leone.

The findings underscore STL's policy on staff recruitment and customer onboarding which emphasizes gender inclusion with a particular focus on female sales agents and customers. The learning presented in this report could inform decisions on financing for social entrepreneurs who are involved in vending SHSs to improve livelihoods and access to sustainable, affordable, and clean energy.

5.0 RECOMMENDATIONS

1. Although almost all STL customers have access to at least one mobile phone, the most common form of payment currently is via STL sales agent. With an Android phone, STL customers should be able to pay their bills via mobile money transfer. This will save STL staff time processing payments. STL could undertake measures to facilitate customer training in online payment methods through mobile money app, in collaboration with mobile telephone companies, offering payment options for SHSs.
2. Customers expressed interest in additional SHSs products. STL could leverage on the improved relationship with its customers to scale and meet the express needs and demands for additional products across the SHS value chain (e.g., upgrading current products, increasing the number of bulbs on current Spark+ products, vending additional products like solar plasma TVs, radios, barbing machines, fans, etc.). This could help in maintaining the current customer base, while trying to explore additional funding to upscale its vending/load scheme operations to attract new customers. With the PAYG billing method and monthly repayment process, SHSs products are sold faster.
3. STL's emphasis on tailoring its SHSs distribution programmes, with a particular focus on women's access to energy through renewable energy products, can be supported with additional funding. STL could use such funds not only to upscale its vending of SHSs products through the PAYG billing method, but also to recruit female sales agents and installers to create more jobs for women and opportunities for them to develop new skills and move into new job markets.

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