

Pakistan Sustainable Energy Series

Leveraging Digital Finance to Scale the Solar Home Systems Market in Pakistan



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EXECUTIVE SUMMARY

Decentralized solar home systems (SHS), coupled with asset finance, can provide affordable and reliable electricity to the off-grid population in Pakistan and can augment the power supply where the grid is available but the supply of electricity is limited. Pakistan ranks high on the metric of market readiness for SHS technology. In addition, the country has all the underlying system requirements to leverage mobile money services (also known as branchless banking services in Pakistan) for growing the local SHS market. In 2021, there were 191 million cellular mobile subscribers providing mobile phone access to 95 percent of the country's households¹. The GSM Association estimates that close to 30 million people, or 14 percent of the total population in Pakistan, is covered by a mobile network before having access to the grid.

This brief analysis was compiled by the World Bank to assess the potential for using mobile money services to scale the SHS market in Pakistan. The report explores the synergy between mobile money and SHS businesses and develops a use case for mobile wallets in SHS business models through a case study of the SHS market in Sindh, Pakistan.

LIMITATIONS OF THE LOCAL SHS BUSINESS MODEL

Most SHS technology companies operating in Sindh have outsourced their entire distribution and financing functions to partner microfinance providers (MFPs)², providing only equipment and limited after-sales support to customers. The partnership between MFP and SHS technology companies in Sindh is proving effective—technology companies have reported double digit growth in sales—but SHS provision is still a niche market lacking scale. Although MFPs are successfully providing a ready sales channel for SHS, payment logistics are still considered a weak link in SHS delivery. SHS companies assign low market growth to a lack of digital financial services (specifically mobile wallets) that enable high payment flexibility and have proven to be critical for SHS success in other markets:

- SHS technology providers and MFPs, particularly local microfinance institutions (MFIs), have different business priorities. Most local MFIs offer SHS as a supplement to their core microfinance products and have no separate allocations for marketing or promoting SHS financing. In addition, the relatively higher interest rates and fees charged by the MFPs are an additional cost that has to be borne by the customer.
- The operations of MFIs are not optimized for the SHS business model. Given the low proliferation of mobile wallets and the cost of providing field agent services in sparsely populated rural Sindh, it is

¹ <https://www.pta.gov.pk/en/telecom-indicators>.

² Microfinance Providers (MFPs) include microfinance banks (MFBs) and non-banking microfinance institutions (MFIs).

³ Mobile money services in Pakistan allow access to financial services through two delivery channels; mobile phones (known as mobile wallet, and mobile account transactions) and over-the-counter (OTC) services (through designated mobile banking agents, or at point-of-sale terminals at retail outlets and service kiosks). Although Sindh has a strong network of OTC mobile money locations, mobile money made directly from mobile wallets are much less common.

next to impossible for local MFIs to provide high payment flexibility to SHS customers, a key factor in the success of the SHS in East Africa. Other operational preferences also play a role; most MFIs rely on outdated management information system (MIS) platforms and manual reporting, which makes critical business functions such as forecasting and trend analysis a huge challenge.

- The MFP industry has been slow in adopting digital finance. In comparison to commercial banks, MFPs have been slow in adopting technology for delivering financial services, focusing instead on providing client-centric services through a network of field agents. The technology requirements and cost structures for utilizing local payment switches play a role. Local MFIs in particular find mobile money services expensive and lack the resources to integrate with local payment networks or mobile wallets.

BARRIERS TO LEVERAGING MOBILE MONEY FOR SHS MARKETS IN PAKISTAN

Millions of people in Pakistan use mobile money payments, but transaction levels and activity rates remain low. To effectively scale the SHS market in Pakistan's context, the use of mobile wallets needs to increase significantly across all target markets. Simultaneously, local microfinance businesses must align their operations with the needs of the SHS market, integrate more technology solutions into business operations, and develop competencies for digitizing loan payments through the use of mobile money. For the microfinance industry, mobile money can minimize the transaction costs of their portfolios while keeping payment friction to a minimum, effectively circumventing the operational limitations that prevent MFIs from extending their portfolios or targeting new markets in Sindh and elsewhere.

To leverage mobile wallets for growing the SHS market in Pakistan, regulators, telecom companies, banks, MFIs, SHS businesses, and other sector stakeholders must collaborate to first address the following barriers that limit mobile wallet uptake in Pakistan:

- **Technology limitations:** Limited access to unstructured supplementary service data (USSD), a communications technology that delivers mobile financial services to low-income customers, is a major factor contributing to slow growth in mobile wallet accounts. To correct this market failure, the State Bank of Pakistan has recently launched the Asaan Mobile Account (AMA) program.
- **The need for roaming agents:** Currently, roaming agents for mobile banking services are not allowed in Pakistan under normal circumstances, which limits the utility of mobile banking for rural populations that rely mostly on over-the-counter (OTC) transactions for cash deposit and withdrawal services.
- **Low digital literacy:** Although the new USSD directive will correct an important market failure limiting the growth of the mobile banking sector, potential customers in rural areas will need significant hand-holding—help with understanding the benefits of the technology and assistance with registering a mobile banking account and learning to use it for simple transactions—before there is large-scale adoption of mobile banking in these areas.
- **Insufficient use cases for low-income customers:** Large-scale adoption of mobile banking in Pakistan therefore requires “push” strategies that incentivize or compel rural populations to adopt mobile banking.

1. INTRODUCTION

Over the past decade, solar home systems (SHS) have emerged as a leading decentralized renewable energy technology for meeting the electricity needs of off-grid populations in developing countries. SHS technology addresses the rural electrification gap without costly extensions in transmission networks, providing an alternative to conventional off-grid energy sources such as kerosene, diesel, and battery-operated torches. While the earliest and largest SHS markets are based in East Africa, SHS provision is now established as a global business with growing markets in West Africa, South and South East Asia, and Latin America. In 2020, the off-grid solar sector as a whole was a US\$1.75 billion annual market, serving 420 million users.⁴ More than 1.6 million SHS of various capacities were sold globally in 2020 and SHS, which currently represent about 17 percent of unit sales in the off-grid lighting and appliances sector, are expected to increasingly drive sector growth in the future.⁵

BACKGROUND

In addition to the falling cost of solar technology and efficiency improvements, the success of SHS businesses is attributed to an adapted asset financing mechanism developed around the financial constraints faced by low-income, rural populations. The financing mechanism is continuously evolving with a variety of business models operating at scale. The prevalent pay-as-you-go (PAYGO) model is based on a pioneering technology that allows customers to make a series of small payments to purchase electricity credits from a PAYGO company instead of paying up front for the SHS unit. Once the electricity credit runs out, the customer can top up the system through a mobile banking transaction or by purchasing scratch cards, pin codes, or other forms of credit bought from a local PAYGO agent.⁶

An alternative to PAYGO relies on conventional microfinance to fund the SHS system. The model is typically operated either independently by a microfinance institution (MFI) or nongovernmental organization (NGO), or as a partnership between an MFI/NGO and an SHS equipment provider. This model is viable in countries where MFIs or local NGOs have a strong presence and close relationships with potential SHS customers in off-grid areas.

While digital payments through mobile banking are not a prerequisite for SHS business models, the ability to send and receive digital payments brings transparency, affordability, and scalability to SHS businesses. In effect, digital payments increase the operational margins of SHS businesses and optimize the overall customer experience. In East Africa, PAYGO companies have leveraged the region's ubiquitous mobile phone networks to ease payment logistics and limit the need for maintaining costly agent networks in rural areas. Without mobile banking, PAYGO businesses would need to invest much more

⁴ GOGLA, ESMAP, and Lighting Global 2020.

⁵ GOGLA 2020.

⁶ GSMA 2016.

in agent networks, making PAYGO more expensive to scale and less affordable to use when customers factor in the cost and time of travelling to an agent to buy prepaid credits.⁷

OBJECTIVES AND SCOPE

The electricity access rate in Pakistan is highly uncertain, with a considerable variation in reported electrification rates. The most recent national standard of living survey estimates that approximately 91 percent of all households had electricity access in 2019, with household electrification rates of 98 percent in urban and 87 percent in rural areas.⁸ In contrast, according to the SE4ALL Global Tracking Framework (GTF) database, only 74 percent of the population had access to electricity in the same year.⁹ Based on more recent figures for domestic electricity connections reported by the National Power Regulatory Authority (NEPRA), 28 million of the country's 35 million households had access to electricity in 2020, setting the national electrification rate at 81 percent.¹⁰

Irrespective of the uncertainty around overall electrification, the gap between urban and rural electricity access, both in terms of grid connections and uninterrupted supply, has been evident for many years. The International Finance Corporation (IFC) estimates that approximately 144 million or 78 percent of the population of Pakistan were either not connected to the electricity grid or experienced more than 12 hours of load shedding per day in 2015. As a result, Pakistanis spend nearly US\$2.3 billion each year on low efficiency lighting solutions, such as kerosene, diesel generators, and battery-powered torches.¹¹

Decentralized SHS technology, coupled with asset finance, can provide affordable and reliable electricity to the off-grid population in Pakistan and can augment the energy supply where the grid is available but the electricity supply is limited. Pakistan ranks high on the metric of market readiness for SHS. For instance, the country received an exceptionally high “demand pillar score” and a relatively high “supply pillar score” (97 and 100, respectively) in the most recent pay-as-you-go Market Attractiveness Index. The demand pillar score represents a weighted average of market size, ability to pay, and willingness to pay. Since a large share of the country's population has experience with credit and kerosene is not subsidized, Pakistan scored exceptionally well on “willingness to pay.”¹²

In addition, the country has all the underlying system requirements to leverage mobile banking for growing the local SHS market. The cellular mobile network in Pakistan has expanded rapidly to provide mobile phone access to 95 percent of households, and the mobile banking industry has grown to 15 financial institutions¹³ with more than 66 million mobile banking accounts registered in the country.¹⁴ The GSMA, the global association for the mobile industry, estimates that close to 30 million people, or 14 percent of the total population in Pakistan, is covered by a mobile network before having access to the grid.¹⁵

⁷ Waldron and Fag 2016.

⁸ “Pakistan Social & Living Standards Measurement Survey (PSLM) 2018–19 National/Provincial (Social Report)” 2019.

⁹ SE4ALL 2019.

¹⁰ NEPRA 2020.

¹¹ “Pakistan Off-Grid Lighting: Consumer Perceptions Study Overview” 2015.

¹² Lighting Global 2019.

¹³ Hassan 2020.

¹⁴ SBP 2021.

¹⁵ GSMA 2017.

This brief analysis was compiled by the World Bank to assess the potential for using mobile banking to scale the SHS market in Pakistan. The findings will support implementation of the Sindh Solar Energy Project by the Government of Sindh,¹⁶ and inform the World Bank's advice to various federal and provincial government agencies on increasing access to electricity. Initial research for the assessment was carried out in 2019 and updated in June 2021 to reflect recent industry developments.

The report explores the synergy between mobile banking services and SHS businesses, and develops a use case for mobile wallets in SHS provision through a case study of the SHS market in Sindh, Pakistan. The report draws heavily on international experience to establish the efficacy of mobile wallets for scaling SHS and addresses the following important knowledge gaps in Pakistan's context: To what extent are mobile banking in general and mobile wallets in particular used to collect SHS financing payments in Pakistan?¹⁷ Are there any immediate barriers that curtail or limit the use of mobile wallets by both technology companies and microfinance providers (MFPs) involved in SHS delivery and how can these be addressed?¹⁸ As a corollary, the report also documents the incidence of both mobile wallet and over-the-counter (OTC) transactions and barriers that are limiting the overall growth in mobile wallets.

¹⁶ This project is financed by the World Bank and was approved in 2018. Further details are available on the World Bank website. <https://projects.worldbank.org/en/projects-operations/project-detail/P159712>.

¹⁷ Mobile money (also known as Branchless Banking or mobile payment) services in Pakistan are delivered through two channels; a partially digital transaction facilitated by a physical agent of the branchless banking company (known as an over the counter or OTC transaction) or a fully digital transaction known as a mobile wallet or m-wallet transaction.

¹⁸ The primary research in this report relies on interviews with SHS technology providers only. All information related to MFPs and their experience with digital financial technologies relies on secondary sources only.

2. THE ROLE OF DIGITAL FINANCE IN DRIVING SHS SERVICES—KEY TAKEAWAYS FROM SHS MARKETS IN DEVELOPING COUNTRIES

Digital finance technologies such as mobile banking have the potential to transform business operations across most industries by easing payment logistics, reducing transaction costs, and providing access to new markets. In East Africa, pay-as-you-go (PAYGO) companies have established an entire business model that relies on mobile banking to provide asset financing on highly flexible terms to low-income solar home system (SHS) customers. The asset financing model for SHS, in both the PAYGO and MFI adaptations has been replicated globally with different outcomes. Lessons drawn from these global experiences underscore the significance of mobile banking for scaling SHS businesses.

MOBILE WALLETS PLAY A KEY ROLE IN MAKING SHS UNITS AFFORDABLE AND CONVENIENT

To improve the affordability of SHS units, PAYGO businesses in East Africa (M-KOPA, Felix International, Off-grid Electric, Azuri, and BBox) employ financing mechanisms adapted to rural income patterns in their host markets. Although PAYGO companies use both mobile wallets and OTC transactions to receive payments from customers, mobile wallets offer a degree of flexibility that is highly valued by financially constrained customers with little income stability. Compared to OTC transactions, mobile wallets give customers more control over their SHS usage and payments, reducing payment friction and improving the overall customer experience.¹⁹

OTC PAYMENTS THROUGH AGENT NETWORKS LIMIT THE EFFECTIVENESS AND SCALABILITY OF SHS BUSINESSES

In regions with intermittent or low mobile network coverage and a low proliferation of mobile wallet accounts, PAYGO companies typically sell off-network hardware embedded with a microcontroller to enable/disable usage based on a code that customers manually enter into the device through a product-integrated keypad (Azuri Technologies, Off-Grid: Electric, Quetsol, Simpa Networks, Sun Transfer) or a handheld, infrared remote control unit (Fenix International, Lumeter). Much like prepaid mobile phone credit, PAYGO customers make an OTC transaction with a company appointed agent in their area to purchase energy credits in the form of the 12 digit code.²⁰

¹⁹ Waldron and Faq 2016.

²⁰ Winiecki and Kumar 2014.

Since the off-network system does not rely on a mobile signal to operate, this PAYGO model and the associated OTC payment validation method offer several advantages, particularly in areas with a weak mobile network and low use of mobile money. However, the high cost of maintaining agent networks in remote areas and the resulting high price charged to customers are major disadvantages of this system. Beyond cost, OTC payments through an agent increase payment friction and impact the customer experience. Payment logistics can also be a significant hurdle for customers—some rural customers need to walk many kilometers every time they want to make a payment—and this can often be a major reason why customers fall behind or halt payments entirely.^{21, 22}

THE ADOPTION OF MOBILE WALLETS IN EAST AFRICA WAS ACCELERATED BY PAYGO COMPANIES

According to a Consultive Group to Assist the Poor (CGAP) survey of leading East African PAYGO solar companies, 30 to 50 percent of PAYGO customers use mobile money for the first time to access PAYGO energy services. PAYGO providers in East Africa have developed capacities to improve digital literacy in their target markets, raised consumer awareness about the use and benefits of mobile wallets, actively assisted customers to register for mobile wallets, and trained them in their use. As a result, PAYGO solar companies are now among the largest bill-pay recipients on mobile money platforms in Kenya, Uganda, and Ghana.²³

HIGH TRANSACTION FEES ON MOBILE BANKING SERVICES REDUCE THE AFFORDABILITY OF PAYGO

Mobile money payments are not free and have been shown to impact the affordability of PAYGO products in markets where transaction fees charged by network operators are high. In some markets, the cost of using mobile payment for PAYGO can increase the cost of an SHS system by up to 20 percent. Mobile money service providers are working to reduce these fees; for instance M-Pesa has removed fees on small transactions through its M-Pesa Kadogo Initiative.²⁴

MOBILE MONEY HAS THE HIGHEST SYNERGY WITH ON-NETWORK PAYGO

Most PAYGO companies in the fast SHS markets in East Africa use the region's extensive mobile network coverage to deploy on-network PAYGO systems. The synergy between digital finance and SHSs is relatively high in these markets. The ability to remotely control and monitor the PAYGO hardware, coupled with mobile wallets, has enabled PAYGO companies to effectively integrate consumer finance into their business models and rapidly achieve scale. Customers can make instant payments through mobile money platforms backed by telecom companies (M-Pesa, MTN Mobile Money, Orange Money, Tigo Cash) or commercial banks (MasterPass). When the payment is received by the PAYGO provider, the system is automatically unlocked using the Global System for Mobile Communications (GSM)-enabled technology (also known as the machine to machine or M2M technology) embedded in the system, and

²¹ Waldron and Fag 2016.

²² Allet and Wildberger 2018.

²³ Waldron and Fag 2016.

²⁴ Harrison and Adams 2017.

the device remains unlocked for a certain time depending on the amount of payment.²⁵ Together with GSM-enabled devices that can be turned off remotely, small value digital payments are considered a key attribute of the PAYGO business model deployed in East African countries.

UNEVEN DEVELOPMENT OF MOBILE NETWORKS AND MOBILE MONEY SERVICES LIMITS THE GROWTH OF SHS MARKETS IN WEST AFRICA

In West Africa, digital finance is still at an early stage of development and PAYGO providers are rare. Few customers in the region subscribe to mobile wallets and OTC agents are geographically dispersed and not proficient enough with payment processes to assist customers. Insufficient network coverage, complicated and network-specific payment procedures, and a lack of interoperability are also common issues in the region.²⁶

PAYGO AND MFI MODELS LEVERAGE MOBILE WALLETS IN SIMILAR WAYS

SHS providers see various advantages in building partnerships with financial service providers, such as MFIs and there is a growing demand for rural MFIs to provide end-user finance in the SHS industry. In this model, referred to as the two-hand model, MFIs provide financing for SHS units and leverage their field networks to manage loan repayments and facilitate product marketing and distribution.²⁷ By using mobile wallets for loan disbursement and repayment, MFIs and PAYGO providers derive similar benefits from the flexibility and convenience provided by mobile banking.

Bangladesh is a key MFI-led market for SHS sales, where more than 4.1 million systems have been deployed to date, providing electricity services to over 14 percent of the country's population.²⁸ The country's largest SHS provider, Grameen Shakti, ran a pilot between 2016 and 2018 to offer automated payment services to 1.6 million Grameen Shakti customers living in remote areas and is reportedly developing its own mobile banking service to facilitate Grameen Shakti customers.²⁹

²⁵ Maggioni 2019.

²⁶ Allet and Wildberger 2018.

²⁷ Allet and Wildberger 2018.

²⁸ Cabraal et al. 2021.

²⁹ Khanam 2020.

3. MOBILE BANKING IN PAKISTAN

Mobile banking (also called branchless banking and mobile financial services) represents an alternative to conventional banking transactions through brick-and-mortar bank branches. Instead, mobile banking allows access to financial services through delivery channels such as mobile phones (known as mobile money, mobile wallet, and mobile account transactions) and over-the-counter (OTC) services through designated mobile banking agents, or at point-of-sale terminals at retail outlets and service kiosks.

The first mobile banking service in Pakistan was launched in 2009 as an OTC service offered under the Easypaisa brand by Telenor, a leading telecom company. The service was advertised as an effective way to send or receive money and pay utility bills and became instantly popular with rural households who derive substantial income from remittances.³⁰ In 2010, Telenor added a “mobile wallet” service to its Easypaisa mobile banking suite. Since then the industry has grown to 15 financial institutions³¹ offering mobile money services in Pakistan through more than 72 million registered mobile money accounts.³²

MARKET DYNAMICS

Over the last decade, mobile banking companies in Pakistan have leveraged growing cellular mobile coverage and mobile phone proliferation to establish mobile banking networks throughout the country. The cellular network in Pakistan had more than 167.3 million subscribers in 2020, with mobile phone access available to 95 percent of the country’s households. More than 68 percent of the population had 4G coverage during the same year.³³ Although nearly one-half of the country’s adult population has a cell phone,³⁴ only 38 percent have access to a smartphone and the accompanying mobile internet service needed to have internet access on their mobile devices.³⁵

Transaction Volumes

Millions of people in Pakistan use mobile banking payments, but transaction levels and activity rates remain low. Although mobile money accounts registered year on year (YoY) growth of nearly 25 percent in Q1, FY21, mobile payments through OTC and mobile wallets are mostly used for one-off transactions rather than a default mode of payment. During Q1, FY21, there were over 221,525 active branchless banking agents in Pakistan serving nearly 67 million accounts. Of these, only about 43 million or 64 percent were active accounts with total deposits of Pakistan rupees (PKR) 56 billion, a small fraction of the nearly PKR 18 trillion held in total bank deposits in Pakistan during the same period. The average

³⁰ GSMA 2017.

³¹ Hassan 2020.

³² SBP 2021.

³³ “Pakistan Telecommunication Authority Annual Report 2020” 2020.

³⁴ “Pakistan Telecommunication Authority Annual Report 2020” 2020.

³⁵ Hassan 2020.

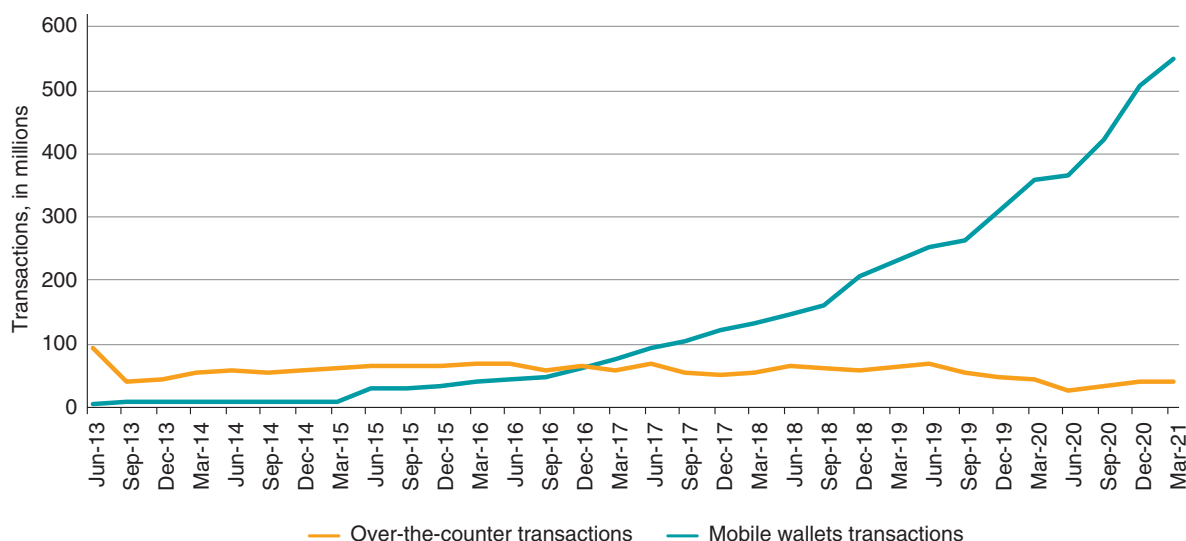
mobile banking transaction was just over PKR 3,000, with 594 million transactions during the quarter. The total volume of transactions processed by the mobile banking network in Q1, FY21 was PKR 1.8 trillion.³⁶

Transaction Channels

Although the strategic focus on OTC services resulted in the rapid uptake of mobile banking across Pakistan, the popularity of OTC proved to be sticky for many years. Even after the launch of mobile wallets, few mobile banking customers used the new service, opting instead for the more familiar OTC channel. The OTC transactions created a dependence on the agent network, reducing incentives for the customers to improve their digital literacy for using mobile wallets. For nearly a decade, OTC was the dominant mode for mobile banking, and only in 2017 did mobile wallet transactions finally begin to outpace OTC transactions (see figure 3.1).

In Q1, FY21 mobile wallet transactions accounted for over 93 percent of the volume of mobile banking with a combined value of PKR 1.3 trillion.³⁷

FIGURE 3.1: MOBILE MONEY TRANSACTIONS IN PAKISTAN BY TRANSACTION CHANNEL (Q2, FY13 TO Q1, FY21)



Besides the initial sticky popularity of OTC, local regulations inadvertently promoted a closed mobile banking network that impacted the growth of mobile wallets by creating high barriers to entry and allowing incumbents to form monopolies. Limited access to unstructured supplementary service data (USSD) technology, lack of interoperability, and the cost of setting up OTC agent networks have all discouraged potential market entrants, including many leading banks in Pakistan, from launching mobile banking services. The consequent lack of competition has impacted both the quality and cost of service for the end user.

³⁶ SBP 2021.

³⁷ SBP 2021.

Transaction Categories

Mobile banking companies offer a range of basic and advanced services, including various types of fund transfers (between mobile wallets, person to person, and mobile wallet to person, etc.), bulk payments (for instance from the government to a person), and cash deposits and withdrawals (the savings feature). In Q1, FY21 a total of PKR 1.86 trillion was processed through different types of mobile banking transactions (see figure 3.2).

Approximately PKR 533.6 billion were transferred between mobile wallets, the largest transaction category by volume in this period, followed by PKR 445 billion transacted in cash deposits and cash withdrawals. Mobile phone top ups were the most popular transaction category by volume, recording

FIGURE 3.2: VALUE OF MOBILE MONEY TRANSACTIONS IN PAKISTAN BY TRANSACTION CHANNEL (Q1, FY21)

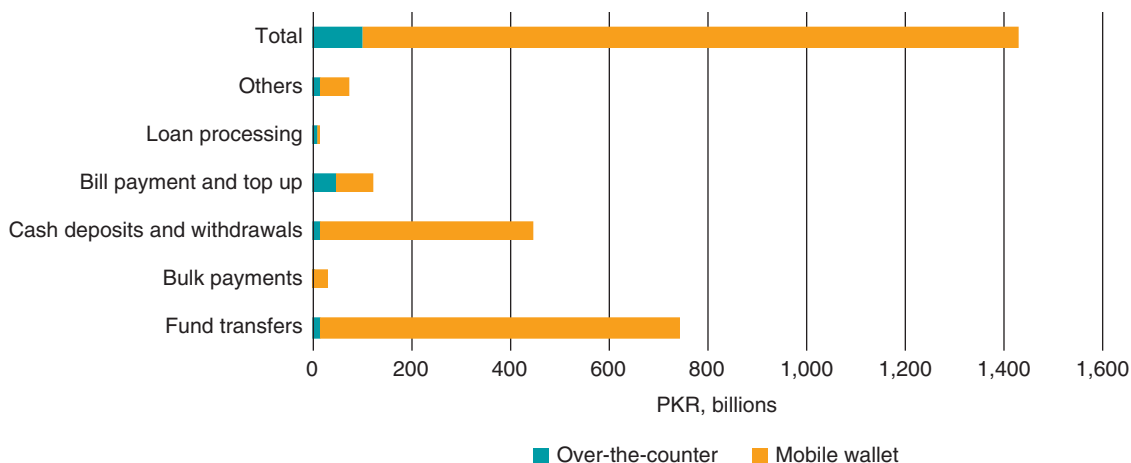
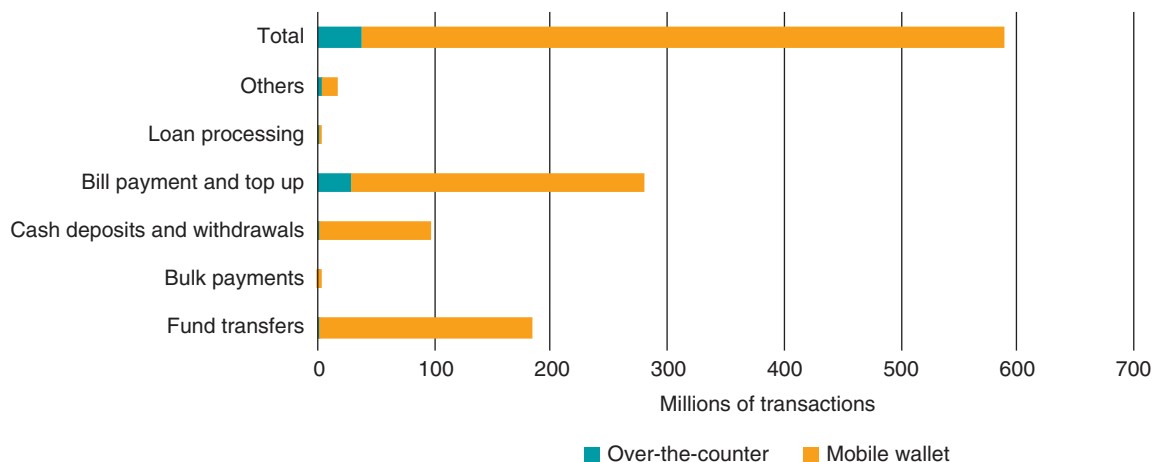


FIGURE 3.3: VOLUME OF MOBILE MONEY TRANSACTIONS IN PAKISTAN BY TRANSACTION CHANNEL (Q1, FY21)



214 million transactions in Q1, FY21, while utility bill payment was the most common type of OTC transaction with 29.3 million uses.³⁸ (See figure 3.3.)

Transaction Costs

The mobile banking market is dominated by banks and telecom companies competing in a closed system with considerably high levels of transaction pricing for mobile banking services, especially compared to the cost of similar transactions through conventional banking. Prices range from 3.5 percent for larger transactions to as high as 13.0 percent of the transaction amount a customer is processing through mobile banking. To illustrate the pricing difference: Customers with conventional bank accounts can withdraw PKR 5,000 from an ATM at their bank at no cost or pay a flat fee of PKR 15 to use the ATM at another bank. When a Telenor Easypaisa account is used to withdraw the same amount through an Easypaisa agent, the service costs PKR 100. The cost is even higher for a funds transfer to another account. Transferring PKR 5,000 from one bank account to another costs around PKR 108, but transferring the same amount of money from a mobile wallet will cost PKR 270 per transaction, or more than double the cost of the service through a conventional bank account.³⁹

Mobile banking services are often endorsed as a tool for improving financial inclusion among the unbanked in Pakistan. However, at current pricing, those that can least afford to have a bank account face mobile banking transaction costs several times higher than individuals who can afford a conventional bank account. Recent studies show that more than 70 percent of the adult population in Pakistan is aware of at least one mobile money brand but only 11 percent have used the service at least once.⁴⁰ Transaction costs are one of the most important factors limiting the spread of mobile banking in the country.

OPENING THE SYSTEM TO COMPETITION: RECENT REGULATORY DEVELOPMENTS

Currently, USSD is the best available communications technology to deliver mobile financial services to low-income customers. Alternatives such as mobile applications require a smartphone and internet access, conditions that preclude a majority of low-income customers, and Short Message Service (SMS) lacks the security and user experience benefits provided by USSD.⁴¹

In Pakistan, where telecom companies not only compete in the provision of mobile banking services but also control a key input (access to the communications infrastructure, specifically USSD), access to USSD technology has been a regulatory concern for several years. Essentially a market failure, the limited access to USSD technology has discouraged new companies from entering the market and prevented telecom mobile banking companies from reaching scale. As a result, customers have lost out on the potential benefits of competition such as lower prices, increased customer choice, improved service levels, and product innovation.

The State Bank of Pakistan (SBP) and the Pakistan Telecommunications Authority (PTA) have been collaborating since 2012 to address the issues around interoperability and USSD access. In 2021, SBP

³⁸ SBP 2021.

³⁹ Hassan 2020.

⁴⁰ "Pakistan Microfinance Review 2019" 2019.

⁴¹ Hanouch 2015.

launched the Asaan Mobile Account (AMA) making interoperability mandatory for all mobile banking service providers. The unified, interoperable network, powered by a third-party service provider (TPSP), will create a single system of USSD codes through which both customers and branchless banking agents will be able to conduct transactions through any branchless banking account. Mobile phone users will be able to link their existing branchless banking accounts to the unified USSD platform. If a customer switches over to a smartphone, the system will provide an application-based mobile banking interface with USSD enablement at the backend instead of the internet.⁴²

The SBP has mandated that all mobile banking companies, including commercial banks and or telecom company-backed microfinance banks (MFBs) with licenses for mobile banking operations, open up their entire agent network to this interoperable AMA network, compelling each company to share its network with their competitors. This system will provide new market entrants with instant access to mobile banking agents throughout the country, reducing barriers to entry, and customers will also be able to carry out OTC transactions with any agent regardless of which company their mobile banking account is registered with. The USSD technology also has other benefits; USSD uses the same interface as the SMS service on a standard phone, providing a nearly identical customer experience to sending or receiving an SMS, a service that most low-income mobile users in Pakistan are already familiar with.

Similarly, Raast, another recent initiative by SBP, will provide an instant end-to-end payment system that enables interoperable, real-time digital payments at low cost. Designed as a payment infrastructure with application programming interface based connectivity, Raast provides the underlying system needed by banks, fintechs, e-commerce platforms and utility companies to deliver payments and other types of financial services. Raast, which is linked to a user's mobile phone number, is intended to address many of the prevailing challenges associated with fund transfers through conventional banks (for instance, account-to-account intra-operability, differing fee structures and complicated transfer processes), branchless banks, and electronic money institutions, or EMIs (including interoperability and access to USSD technology).

SBP hopes that by opening up and facilitating mobile money services through interventions such as Raast and AMA more companies will be encouraged to offer mobile money solutions, forcing competition and lowering transaction costs.

⁴² Hassan 2020.

4. LEVERAGING MOBILE MONEY TO GROW SHS MARKETS IN PAKISTAN: A CASE STUDY OF SINDH

Sindh is Pakistan's second largest province by population, comprising 8 million households and 48 million residents. Although Sindh is considered the most industrialized region in Pakistan, the electrification rate in the province is less than 24% outside the K-electric jurisdictions.⁴³ In Sindh's rural districts, where nearly one-half of the provincial population resides, electrification rates are among the lowest in the country, and a substantial number of people have no access to grid supplied electricity. The electrification rate in Tharparkar, for instance, was only 35 percent in 2020.

Low population densities in rural Sindh and the resultant per capita cost of extending the grid to sparsely populated rural areas make grid extensions particularly challenging. In 2017, the average population density in Sindh was 340 persons per square kilometer, with large variations among Sindh's 29 districts; Tharparkar, Sujawal, Jamshoro, and Thatta had the lowest population densities ranging from only 88 in Tharparkar to 114 in Thatta. The most sparsely populated regions in Sindh are also among the least developed, regularly receiving some of the lowest standard of living scores in Pakistan.

In contrast to the general lack of economic development in rural Sindh, the cellular mobile network in the province covers all districts and enabled mobile phone usage for more than 90 percent of provincial households in 2020. The lowest mobile phone access rate is reported in Dadu district, where only 70 percent of households have access to mobile phones. In 2020, the individual mobile ownership rate in Sindh was 49 percent compared to 45 percent for Pakistan.⁴⁴

THE PAYGO EXPERIENCE IN SINDH

At first glance, rural Sindh provides all the enabling conditions to support growth in digitally enabled SHS businesses: excellent solar irradiation levels, high demand for rural electrification, access to cellular mobile service, existing SHS technology providers, and a strong OTC mobile banking network.⁴⁵ However, SHS businesses in general and the pay-as-you-go (PAYGO) model in particular have struggled to take hold in the province. One of the earliest PAYGO ventures in Sindh was implemented in 2014 by Easypaisa. Funded by the Mobile for Development (M4D) Utilities program of GSMA, the pilot was designed to explore synergies between energy access products such as SHS units and Easypaisa's mobile banking services.⁴⁶ The pilot tested multiple versions of the PAYGO business model, including

⁴³ K-Electric is the only private sector utility in Pakistan and serves Karachi, Dhabeji and Gharo in Sindh province, and Uthal, Vinder and Bela in Balochistan.

⁴⁴ "Pakistan Social & Living Standards Measurement Survey (PSLM) 2018-19 National /Provincial (Social Report)" 2019.

⁴⁵ Mobile money services in Pakistan allow access to financial services through two delivery channels; mobile phones (known as mobile wallet, and mobile account transactions) and over-the-counter (OTC) services (through designated mobile banking agents, or at point-of-sale terminals at retail outlets and service kiosks). Although Sindh has a strong network of OTC mobile money locations, mobile money made directly from mobile wallets are much less common.

⁴⁶ GSMA 2019.

on and off network systems offered through both lease-to-own and rental (also known as “energy-as-a service”) adaptations.

Easypaisa partnered with Roshan Energy and Brightlight Pakistan to implement the pilot. The two companies were expected to provide the SHS technology in addition to establishing and managing sales and distribution in the pilot markets and providing warranties and after-sales service to customers. Roshan and Brightlight were given the option to recruit Telenor franchisees and Easypaisa agents to participate in distribution and sales; however, participation in the program was voluntary and franchisees or agents were under no compulsion to sell SHS products. Easypaisa was responsible for training any franchisees and agents that opted to join the pilot. In markets where the technology partners could not find an agent or franchisee willing to join the program, the companies had to independently hire and train sales staff to support the distribution function.

Financing for the SHS was available from Telenor Microfinance Bank and Roshan Energy. Both the lease-to-own (Roshan Energy) and rental SHS customers (Brightlight Pakistan) were expected to make payments using Easypaisa mobile money or over-the-counter (OTC) services. Roshan Pakistan customers also had the option to make payments to Roshan’s field agents.

Although the pilot quickly exceeded sales targets, Roshan and Brightlight could not maintain sales momentum beyond the pilot phase. In a post-pilot appraisal, Easypaisa acknowledged multiple barriers to scaling mobile-enabled PAYGO, including the lack of reliable mobile coverage, low proliferation of mobile wallets, and technology trepidation among the mostly low-income target customers. Affordability of the SHS units was also cited as a major hindrance.⁴⁷ In addition to these issues the post-project appraisal also provides evidence of the following factors that potentially undermined the commercial viability of the program.

- **The OTC agent network was not an effective distribution or sales channel.** The pilot was designed to leverage the mobile money provider’s franchisee and OTC agent networks and mobile money services. However, this overestimated the willingness and ability of franchisees and OTC agents to join the program and effectively market or sell SHS products and services. Even though SHS sales presented an additional revenue stream, less than one percent of franchisees signed up as SHS vendors. The incentive structure could have contributed to the low interest. In several parts of the pilot market, franchisees and agents were responsible for installing the SHS at the customer’s premises, providing maintenance services, and following up with the customer on scheduled payments. It isn’t clear if the incentive structure for the agents was adequate to compensate for all of these additional tasks that would essentially alter the agent business model, extending business operations well beyond the agent’s shop or kiosk.
- **Payment logistics were not optimized for the target market.** Despite a push to have customers adopt mobile wallets, the OTC services remained popular throughout the project period, adding to the cost of payment logistics and increasing payment friction—agents frequently punched in the wrong merchant identification number when processing SHS payments. To address this problem, Easypaisa developed a dedicated, USSD-based menu option to assist agents in processing SHS payments. Easypaisa tried to improve the adoption of mobile wallets by developing a new mobile app for SHS customers; however, the app failed to gain traction due to a relatively low smartphone penetration among SHS customers in the project locations.

⁴⁷ GSMA.

RISE OF THE MICROFINANCE LED BUSINESS MODEL

Beyond weaknesses in the enabling environment such as a general lack of financial literacy and low proliferation of smartphones in rural Sindh, the Easypaisa PAYGO experience highlights two important factors that are fundamental to the viability of SHS businesses: establishing effective distribution channels and keeping payment friction to a minimum. Successful SHS companies in East Africa leverage the region's mobile network to provide customers in low density rural markets with the facility to make SHS payments directly through their mobile phones and at their own convenience. For low-income SHS customers with little income stability, this level of payment flexibility is a key selling point. In sparsely populated rural Sindh, establishing frictionless payment logistics is equally important but prohibitively expensive, and risky for technology companies, especially when they lack the local knowledge to effectively assess credit risk.

To circumvent the issues around product distribution and payment logistics, the local SHS market has settled on a business model that relies on partnering with a microfinance institution (MFI) or a nongovernmental organization (NGO) to market analogue SHS systems. Unlike PAYGO, analogue SHS units function offline and do not have the technology to support the prepaid energy payment mechanism. Instead, customers receive asset financing through the partner MFI and repay the loan in installments either to field agents or through a digital payment made using a mobile money or branchless banking account. Most SHS technology companies operating in Sindh have outsourced the entire distribution and financing functions to partner MFIs, providing only equipment and limited after-sales support to customers.

The MFI-led model is also receiving more attention globally because integrating consumer finance into the PAYGO business makes it capital intensive and complex. PAYGO companies in difficult markets, where competition is high or the regulatory environment is not supportive, often find themselves struggling to access financing. This disadvantage threatens the long-term sustainability of PAYGO business models and has resulted in the insolvency of high-profile SHS companies such as Mobisol and Solarkiosk.⁴⁸ The MFI-led model addresses the financing constraints of PAYGO businesses. Bangladesh is a leading MFI-led SHS market where more than 4.1 million SHS units were sold in the 15 years between 2003 and 2018, providing electricity services to 20 million people or about 14 percent of the Bangladesh population.⁴⁹

LIMITATIONS OF THE LOCAL SHS BUSINESS MODEL

Local MFIs have a strong presence in rural Sindh and collectively deploy a wide network of field agents that possess the local knowledge and relationships to assist in credit scoring and manage collections. The partnership between MFIs and SHS technology companies in Sindh is proving effective—technology companies have reported double digit growth in sales—but SHS are still a niche market lacking scale. Technology companies assign low market growth to weaknesses in the MFI-led SHS model operating in Sindh described below (see Appendix A for a list of SHS companies interviewed for this report):

■ SHS technology providers and MFIs have opposing business priorities

Unlike Bangladesh, where SHS provision has become a core business area for MFIs, including Grameen Bank through the Grameen Shakti initiative, SHS are not a priority business for MFIs in Sindh. Most local

⁴⁸ Wiemann and Lecoque 2019.

⁴⁹ Cabraal et al. 2021.

MFIs offer an SHS as a supplement to their core microfinance products and have no separate allocations for marketing or promoting SHS financing and the cost of financing is apparently relatively high.

- The operations of the MFI industry are not optimized for the SHS business model

Field agent networks are instrumental to the business operations of local MFIs. In addition to marketing and risk assessment, MFIs rely on these networks to collect loan payments and follow up on delayed repayments. The reliance on agents for payment collections appears to factor into the reluctance of MFIs to expand their SHS portfolio, especially if they are not convinced of the potential market and scale SHS sales can achieve. Given the low proliferation of mobile wallets and the cost of providing field agent services in sparsely populated rural Sindh, it is next to impossible for local MFIs to provide high payment flexibility to SHS customers, a key factor in the success of SHS in East Africa.

Other operational preferences also play a role; most MFIs rely on outdated management information system (MIS) platforms and manual reporting, which make critical business functions like forecasting and trend analysis a huge challenge. To effectively scale their SHS product offering, MFIs would need to revamp business and technical operations throughout the value chain by, for instance, making better use of business process operation technologies.

- The MFP industry has been slow in adopting digital finance

Although larger microfinance providers (MFPs) including Khushaali and First Microfinance Bank have recently established digital units to increase loan processing and collection through mobile money services, most MFIs in Pakistan operate at a regional scale with limited resources and have been slow in adopting technology for delivering financial services. Instead, regional MFI's focus on providing client-centric services through a network of field agents. The high operational costs associated with managing an agent network mean that expanding to new markets or providing new services can be a risky undertaking for MFPs. Although mobile money services offer a solution to this problem, MFIs continue to use field agents more frequently than digital payment services.

The technology requirements and cost structures for utilizing local payment switches play a role—most MFIs find mobile banking services expensive and lack the resources to integrate with local payment networks or mobile wallets.⁵⁰ A digital platform called 'Munsalik', launched recently by the Pakistan Microfinance Network (PMN) is expected to address this issue by helping digitalize Pakistan's microfinance industry. Munsalik is designed to digitalize both the internal operations of an MFP and provide middleware to connect MFPs with the country's digital financial infrastructure.

BARRIERS TO LEVERAGING MOBILE MONEY FOR SHS MARKETS IN PAKISTAN

The main advantage of SHS business models is that they reduce investment barriers for customers through flexible payment schemes. Successful PAYGO companies in East Africa leverage mobile network coverage to process payments through mobile wallets and implement payment enforcement through Global System for Mobile Communications (GSM) connected, on-network devices. In the MFI-led SHS sector in Bangladesh, the use of mobile wallets for SHS payments is low, but companies can still provide

⁵⁰ Chishti, Mansoor, and Malik 2018.

a fairly high level of payment flexibility given the high population density in the country. In addition, the SHS model in Bangladesh is characterized by high levels of customer service, including regular after-sales support and a unit buy-back program, in case grid-supplied electricity becomes available in a customer's location.

Even though the market in Pakistan has commonalities with both regions, the market conditions are not identical to either Bangladesh or East Africa. MFIs have a strong rural presence in Pakistan; however, population densities in off-grid areas are comparatively lower than densely populated Bangladesh. This makes the operations of MFIs more complex and costly in Pakistan, and offering high levels of payment flexibility through the MFI agent network is nearly impossible. Instead, MFIs in Pakistan could follow the example of PAYGO companies in East Africa and leverage the country's extensive cellular mobile network and widely available mobile banking services to implement payment flexibility through mobile wallets. However, to make mobile wallets ubiquitous in the MFI industry (and as a result in SHS delivery) the State Bank of Pakistan (SBP), the Pakistan Telecommunications Authority (PTA), and other sector stakeholders must first collaborate to address multiple systemic barriers that limit the use of mobile wallets in Pakistan.

Technology Limitations

In Pakistan, limited access to unstructured supplementary service data (USSD), a communications technology to deliver mobile financial services to low-income customers, is a major factor contributing to slow growth in mobile wallet accounts. As already noted, the Asaan Mobile Account (AMA) program launched in 2021 aims to improve the uptake of mobile wallets, particularly among rural mobile phone users without the financial means to afford a smartphone or a data package. In addition the launch of Raast, an end-to-end digital payment system, by the SBP is expected to bring convenience and competition to mobile money services, creating opportunity for MFIs, SHS companies, and other businesses that collect small periodic payments from customers as part of their operations.

The Need for Roaming Agents

Popular in countries such as Kenya, roaming agents are a particularly useful facility for rural mobile banking customers that allows mobile banking companies to offer cash-in (deposits) and cash-out (withdrawals) features at the customer's doorstep through a network of roaming mobile banking agents. Currently, roaming agents for mobile banking services are not allowed in Pakistan under normal circumstances, which limits the utility of mobile banking for rural populations that rely mostly on OTC for cash deposit and withdrawal services. Allowing the facility in Pakistan could address mobility limitations faced by rural populations, a major bottleneck in access to mobile banking services, and encourage additional use cases for mobile wallets.⁵¹

Low Digital Literacy

Although the new USSD directive will correct an important market failure limiting the growth of the mobile banking sector, potential customers in rural areas will need significant hand-holding—help with understanding the benefits of the technology and assistance with registering a mobile banking account and learning to use it for simple transactions—before there is large-scale adoption of mobile banking in

⁵¹ Karandaaz 2019.

these areas. Organizations that maintain networks of field agents and interact closely with rural populations through their business operations, such as rural MFIs, the Pakistan Post, and telecom companies, are particularly well placed to provide this support. As many as 30 to 50 percent of PAYGO customers outside of Kenya were new to mobile money and opened a mobile account in order to purchase a digitally financed energy solution.⁵²

Insufficient Use Cases for Low Income Customers

Mobile money surveys in Pakistan point to a lack of perceived value in mobile money accounts. Most Pakistanis have never felt the need to use mobile wallets and consider mobile money accounts unnecessary. The surveys also show that a majority of people who do not have a mobile wallet depend on remittances as a primary or secondary source of income.⁵³ Large-scale adoption of mobile money in Pakistan therefore requires “push” strategies that incentivize rural populations to adopt mobile money services. For instance, where feasible, disbursements against publicly funded income support programs, such as the Benazir Income Support Program (BISP), pension payments by public sector organizations, and payments against agricultural subsidies or support processes, could be linked to mobile wallets with cash-in and cash-out facilities provided through multiple channels that are within easy reach of rural populations.

⁵² Harrison and Adams 2017.

⁵³ Kantar 2021.

5. CONCLUSIONS

In Sindh and elsewhere in Pakistan, companies that provide solar home systems (SHS) are successfully leveraging the strong presence of microfinance institutions (MFIs) in rural areas to distribute and finance SHS products in off-grid areas with low population densities. Given the wide rural networks managed by local MFIs, this model is well suited to the Pakistan market. MFIs also provide access to finance, a major weakness of the pay-as-you-go (PAYGO) system, especially in markets where competition is exceptionally high or the regulatory system is unsupportive. However, SHS remain a niche business in the country owing to the limitations faced by MFIs in deploying digital finance and other business automation technologies, and the operational constraints inherent in local microfinance processes.

Mobile banking, specifically mobile wallets, have played an instrumental role in scaling PAYGO businesses and are increasingly finding utility in MFI-led markets, such as in Bangladesh. Mobile wallet services present an opportunity for MFIs in Pakistan to scale their SHS businesses and realize operational efficiencies in their wider portfolios. However, the following barriers that limit the growth of mobile wallets in Pakistan need to be addressed before mobile wallet use can be leveraged to scale the SHS market in Pakistan:

- To effectively scale SHS in Pakistan's context, the use of mobile wallets needs to increase significantly across all target markets.
- Simultaneously, local microfinance businesses must align their operations with the needs of the SHS market, integrate more technology solutions into business operations, and develop competencies for digitizing loan payments through the use of mobile money. For the microfinance industry, mobile money can minimize the transaction cost of their portfolios while keeping payment friction to a minimum, effectively circumventing the operational limitations that prevent MFIs from extending their portfolios or targeting new markets in Sindh and elsewhere.
- Given the low proliferation of mobile money in rural markets, the government and other stakeholders, including telecom companies, MFIs, and SHS businesses, must collaborate to address the issues around mobile money uptake identified in Section 4 and create more demand for mobile money.

In addition to interventions for increasing the growth of mobile banking and adapting business processes within the MFI industry, SHS affordability in Pakistan will also need to be addressed for the market to achieve scale. Even with the availability of asset financing through MFIs, the technology remains too expensive for most rural customers and must be subsidized through partial grants and low interest loans. Based on the experience of Bangladesh, SHS businesses typically become self-sustaining once the market achieves scale, at which point subsidies can be phased out and eventually withdrawn. In the future, on- and off-network digital SHS installations could be integrated into the local model to leverage the digital payment enforcement features of PAYGO systems. Eventually SHS could not only provide electricity in off-grid areas but also augment grid supply, reducing the need for subsidies on grid-supplied electricity.



APPENDIX A. LIST OF SHS COMPANIES INTERVIEWED FOR THE REPORT

- Greenlight Planet
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Unit 101
Chicago, IL 60606
Contact: Mr. Raḡa Zubair, Partnerships Consultant for South Asia and the Middle East
- Harness Energy Pakistan
17-D Architects Engineers Housing Society
Lahore, Pakistan
Contact: Mr. Muhammad Shehreyar, Founder and CEO
- EcoEnergy Solution Pvt. Limited
1405 Dilkusha Forum
Tariq Road
Karachi, Pakistan
Contact: Jeremy Higgs, Director of Operations and Co-founder

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