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# Examining PAYGo Solar Through a Gender Lens: An Exploratory Study

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# Disclaimer

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# Executive Summary

## **PAYGo solar could improve women's energy access and financial inclusion**

PAYGo solar is an inclusive asset financing model that expands basic energy access by enabling poor households to acquire solar home systems through flexible, digital payments tied to use. The types of assets powered by PAYGo solar have expanded to include a wide variety of domestic household appliances like lamps, mobile charging stations, multilight systems, cookstoves, refrigerators, water pumps etc.

Since women disproportionately bear the costs of energy poverty, face heightened health risks from use of unclean sources of fuel, and spend much of their time on drudgery, these assets could improve their wellbeing, and free up time for income generating activities.

When women have access to PAYGo, it also helps them generate digital data trails of their transaction history, acquire an asset that may be collateralized for future loans, and provide an on-ramp to greater access to formal finance.

## **Literature on the impacts of PAYGo solar on women is scant**

Despite the growing popularity of the PAYGo model, which now serves over 100 million people, evidence of impacts, especially sex- disaggregated impacts, is scant, diffuse and anecdotal, and remains insufficiently documented. The lack of sex disaggregated data contributes to this knowledge gap. PAYGo providers do not report any sex disaggregated data about differential levels of access men and women have, to PAYGo solar. However, anecdotal evidence finds that only 25 percent of all registered PAYGo customers are women, which suggests that they may not have equitable access, which might prevent them from fully realizing the benefits of PAYGo solar.

## **CGAP has developed a preliminary Theory of Change for women's access to PAYGo solar financing**

The experience of grid electrification and its transformative impacts on women enables us to hypothesize the various pathways of impact that PAYGo solar led electrification may have, noting that PAYGo solar is comparatively limited in the types of devices it can power, and is likely to lead to much more modest, but nonetheless meaningful impacts. This theory of change can help inform future research and gather impact evidence.

# Executive Summary (Contd...)

## Consultations with sector experts and practitioners reveal many gender-based barriers to women's access to PAYGo

In addition to the lack of sex disaggregated data and impact research, we also find that in practice, women face significant gender-based barriers in becoming customers of PAYGo solar, across the value chain.

Lack of IDs, inability to afford the down payment on devices, decreased ownership or use of mobile phones and other digital technologies, decreased digital financial literacy and restrictive social norms around women's use and control over resources impose barriers on women to obtain PAYGo financing.

On the supply and distribution side, PAYGo providers do not seem to have a gender targeted sales strategy, and they don't treat women customers as a distinct customer category even though they have unique product preferences, risk appetites, repayment and default rates. Further, the sales workforce of PAYGo providers tend to be overwhelmingly male, who likely lack the tools and incentives to reach out to potential female customers.

Furthermore, PAYGo products tend to be marketed as modern technologies that can transform lifestyles and enhance social status, with lesser emphasis on how they can solve women's energy needs, which may make them more appealing to women.

## Implications for providers, researchers, practitioners and funders

Providers need to collect and report sex disaggregated data on their customer characteristics and behaviors, to help design solutions to reach more women customers and support further impact research.

Women's financial inclusion practitioners and researchers have a role in developing learning agendas and undertaking increased research to address these knowledge gaps, and in helping PAYGo providers embed a gender lens in their operations.

Finally, funders have an important role in supporting both providers and researchers, to better understand how PAYGo solar can improve women's wellbeing.

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## SECTION I

The potential for  
PAYGo solar  
models to  
improve women's  
energy access  
and financial  
inclusion



Photo Credit: Sujan Sarkar, CGAP Photo Contest, 2017

# The Pay-as-You-Go (PAYGo) Solar Model

PAYGo is a **lease-to-own asset financing model** that combines digital payments and remote lockout technology to provide flexible financing to customers, **spreading the cost of devices over time**:

- Generally, a customer pays 10- 20% of the value of an asset as a down payment
- Each lease payment unlocks a certain number of days of usage, allowing customers flexibility to cope with irregular cashflows and unexpected shocks
- If customers miss a payment the device is remotely locked. Unlike traditional financing there are typically no late fees or penalties
- Ownership is transferred to the customer upon full payment of the outstanding balance

Source: Sotiriou et al (2018)



Photo Credit: Nicolas Réméné, Communication for Development Ltd, 2020

# PAYGo solar has made great strides in energy access

*Within a decade, PAYGo solar has rapidly evolved from a nascent idea to a mature model which has improved energy access for over 103 million people*

- Globally, more than 37 million units of devices have been sold since 2017
- 80% of the market for off-grid solar devices is in Africa, home to two-thirds of the world's population with no electricity access
- Providers offer a variety of solar powered products with potential to improve quality of life and livelihoods for low-income borrowers

Portable solar lamps with mobile charging



Photo Credit: ovSolar

Solar home systems and multilight systems



Photo Credit: Sun King (Greenlight Planet)

Solar cookstoves



Photo Credit: Biolite

Solar powered fan



Photo Credit: Solwarway

Solar refrigerators



Photo Credit: M-KOPA

Solar water pump



Photo Credit: Futurepump

Solar irrigation units



Photo Credit: SunCulture

Sources: GOGLA (2020), World Development Indicators, 2016

# PAYGo solar is also an inclusive financing model with potential to increase access to formal finance

- Often, low-income households don't have access to credit because they **lack credit histories** and a **collateral**. Through **PAYGo solar**, not only do they **gain access to an asset** that may be collateralized, but they also **generate a digital data trail** of their repayment transaction histories
- **Flexible repayment schedules** are **well suited to the needs of low-income borrowers** who tend to have small and irregular incomes, and expands access those who couldn't have otherwise afforded the asset
- **Tying repayments to use**, the model can also **protect borrowers** from penalties, fees, over indebtedness, and predatory lending practices

**Women carry the double burden of insufficient access to energy and finance.**

**This has consequences for their time use, health, economic and social status, and often keeps them in poverty.**



Photo Credit: Loc Mai, CGAP Photo Contest, 2015

# Energy poverty disproportionately affects women and girls

*One billion people still don't have access to electricity and 40 percent of world population continues to depend on locally sourced biomass like wood, charcoal or animal waste for basic energy needs*



Photo Credit: Antonio Renuncio, CGAP Photo Contest, 2016

Women are the **primary producers and consumers** of energy within households:

- They spend significantly **more time and manual effort** collecting and cleaning household fuel
- They face **heightened health risks** from indoor air pollution, using unclean sources of fuel for cooking, lighting or heating
- Domestic chores and drudgery leave women **little time to pursue income generating opportunities**

*Sources:* Clean Cooking Alliance (2015), SEWA (2014), Matinga (2014, 2010), Charmes in Kohlin (2011), World Bank (2011), Global Health Observatory Data Repository, WHO (2014), Sutapa Agrawal (2012), Duflo (2012), UNDESA (2010), ENERGIA (2006), Barnes & Sen (2004), Biran (2004)

# Gender gaps in financial inclusion remain persistent

*Women's increased access to and active usage of financial services is integral to inclusive economic growth and poverty reduction*

- Globally, only 65% women have access to an account compared to 72% men. This **gap has remained unchanged since 2011**, despite significant progress in access for women
- **Increased access hasn't translated into usage.** Men account for nearly 65% of all customers, 80% of loan volumes and 75% of deposits at financial institutions
- A growing body of evidence documents **gender-based barriers to women's financial inclusion**, including intra household dynamics, social norms, legal and regulatory barriers, and inappropriately designed or distributed financial services

Sources: Global Findex (2018), Global Banking Alliance for Women (2018), Holloway et al, IPA(2017), Burjorjee et al, CGAP (2017)



Photo Credit: Zakir Chowdhury, CGAP Photo Contest, 2013

**PAYGo Solar  
financing has the  
potential to be a  
pathway to women's  
empowerment  
through last mile off-  
grid energy access  
and financial  
inclusion**



Photo Credit: Nicolas Réminé, Communication for Development Ltd., 2020

## SECTION II

# The State of Impact Literature on PAYGo Solar, Evidence Gaps, And a Theory Of Change



Photo Credit: Natalie Brown, CGAP Photo Contest, 2018

# There is surprisingly little impact evidence for PAYGO financed off-grid solar devices

*Even as PAYGo solar grows rapidly, emerging as a viable model to help poor people take their first step up in the 'energy ladder' towards energy access, evidence of impact, especially sex disaggregated impacts, is sparse*

There is emerging evidence that poor people value off-grid solar devices and are willing to sign up for PAYGO financing to acquire these devices. Yet, **little is known about the impacts of such access.**

Further, **we do not know the differential levels of access** male and female customers have, or the **sex disaggregated impacts** of PAYGo adoption. **This knowledge gap is critical** given that we know women and their energy needs are central to **inclusive last mile energy access.**



Photo Credit: Alison Wright, CGAP Photo Contest, 2018

# Available evidence on impacts of PAYGo access on women is scant, diffuse and largely anecdotal

*Existing studies on PAYGo focus on adoption of solar lamps and solar home systems. Literature on cookstove adoption (increasingly sold in the PAYGo model), doesn't consider the effects of financing on impacts from use*

Few existing studies point to **impacts of off-grid solar devices on time-use** of women:

- Access to solar lamps **increased the likelihood of women working** outside the household by 5 percentage points. They experienced a total increase of 40mins of paid and 24mins of unpaid work per day
- Access to solar lamps and solar home systems helped women **perceive flexibility** in when they could perform domestic chores, cooking or childcare
- It also enabled some women to **start new businesses** using off-grid solar devices, such as charging people to watch TV series at their homes, phone charging, selling home cooked food or making textiles

Evidence from cookstove adoption literature reports **modest improvements in women's health**:

- Improved biomass cook stoves can **decrease respiratory and ocular symptoms** such as cough, phlegm, wheezing and conjunctivitis among women
- Improved cookstoves **decrease indoor air pollution** in households, and decrease self reported symptoms of related sickness

Sources: Aevarsdottir et al (2017), Ashden et al (2020), Thakur et al (2018), Thomas et al (2015)

# Lack of sex disaggregated data contributes to knowledge gaps on PAYGo Solar's impacts on women

- Currently, PAYGo providers **do not report** any sex disaggregated data on customer access or impacts
- We **do not know how many women customers and beneficiaries** PAYGo solar products serve, or whether such data is being collected
- Anecdotal data suggests that **only 25 percent of registered PAYGo customers are women**, which implies that they face significant barriers to access



Photo Credit: AM Ahad, CGAP Photo Contest, 2014

Source: (PAYGo providers and sector experts in discussion with the author, November 2020), GOGLA (2018)

# However, evidence from grid electrification literature suggests energy access can have greater, transformative impacts on women

Access to conventional, **grid electricity** increases/ improves:

- Women's likelihood of taking up employment outside their homes, especially in non-farm jobs
- Women's labor productivity and the number of hours of paid work
- Women's hourly wages
- Children's school enrolment, weekly study time and schooling outcomes



Photo Credit: Boris Balabanov / World Bank

Sources: Barron and Torrero (2014), Grogen and Sadanand (2013), Rathi and Vermak (2018), Dasso and Fernandez (2015), Khandker et al (2014)

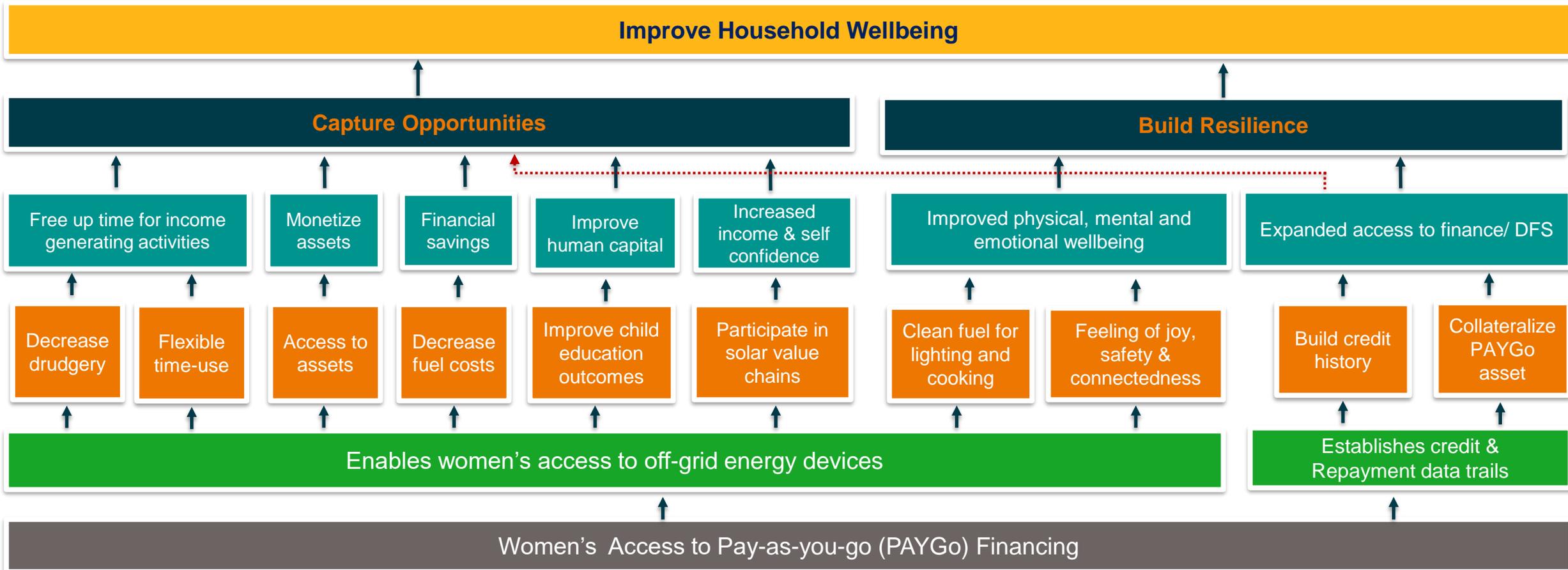
This provides a framework to examine whether PAYGo solar led energy access can benefit women in similar ways and hypothesize several pathways of impact.



Photo Credit: Sudipto Das, CGAP Photo Contest, 2017

# How may PAYGo access benefit women? A Theory of Change

*PAYGo financing for off-grid solar devices can be a conduit for achieving the twin goals of last mile energy access and financial inclusion of women in low-income households, which ultimately improves their quality of life and livelihoods*



# Moving from hypotheses towards evidence

- Despite the many significant pathways of impact identified in the theory of change, **existing research is too limited** to ascertain whether the PAYGo model meets women's energy needs and improves their wellbeing
- The experience of grid-electrification is a good starting point, but **potential impacts** of PAYGo solar on women **must be hypothesized with caution**
- **Off-grid solar is limited in the types of devices it can power** (usually, low wattage domestic appliances) and not comparable to electricity from grid access. This means that it is **likely to yield only modest impacts** (but nonetheless important and meaningful)



Photo Credit: Hailey Tucker, CGAP Photo Contest, 2016

# Moving from hypotheses towards evidence (Contd...)

- Further, existing research **does not consider how the cost of financing might influence the impacts from** women's access to off-grid energy devices
- While the PAYGo solar model offers benefits of flexibility and convenience in payments, **interest costs can easily add up, and make it expensive**, especially for women from low-income households, eroding any income or savings gain



Photo Credit: (Nicolas Réméné via Communication for Development Ltd., 2020)

# Research should also consider the barriers that prevent women from accessing PAYGo solar, and consequently benefitting from their use

CGAP's consultation with sector experts helped identify several gender-based barriers women face in accessing PAYGo solar, throughout the product value chain. More research is needed to better understand these barriers.



## Barriers To Financing

1. Women are unable to afford down payment on the device
2. Women are more likely not have IDs required to purchase the device
3. Women lag men in the use of digital technologies and digital financial literacy
4. Restrictive social norms around women's ownership of assets, savings, handling of money etc.



## Barriers Around Distribution

1. Providers lack gender targeted business strategies. Although women are a customer segment with distinct energy needs and repayment behaviors, providers don't seem to treat them as such
2. PAYGo providers have a disproportionately male sales workforce, who may be unable to reach women customers
3. Sales agents likely don't have incentives aligned with targeting women customers, who may be more risk averse, and hesitant to sign up for PAYGo financing
4. PAYGo solar devices tend to be marketed as modern technologies that 'transform lifestyle', with lesser emphasis on how they can alleviate women's constraints and meet their energy needs



## Barriers To Impact

1. Intra household dynamics determine how a PAYGo device is used, and by whom. Research suggests households often pay for PAYGo devices by reducing women's household budgets and purchasing power. Consequently, impacts on women may be low, even if there are gains at the household level
2. Since most PAYGo solar devices tend to be low power devices, they are likely to lead to modest impacts which may only be detected at scale, in large sample studies

## SECTION III

# Implications for providers, researchers, practitioners and funders



Photo Credit: Pranay Kantal, CGAP Photo Contest, 2016

# Next steps: What does this mean for providers?

*Off-grid energy access solutions like PAYGo solar needn't be gender neutral. Providers must intentionally apply a gender lens to their business models and examine whether they are gender sensitive. This begins with good data.*

- Providers should collect sex disaggregated data about the characteristics and behaviors of their customers, such as take up rates, frequency and amount of repayment, default rates, preferred choice of product, channel of delivery etc.
  - This will help quantify current levels of access women customers of PAYGo have, across markets, product categories, and delivery channels, and help identify existing barriers to access
  - This data can also inform potential solutions to improve access for women customers and support future research on sex disaggregated impacts
- Providers should collect sex disaggregated data about the characteristics, behaviors and performance of their sales agents
  - Research on agent banking finds that customers exhibit strong homophily i.e., prefer to interact with agents of their own gender
  - To examine this in the context of PAYGo, it is important to understand how the gender of sales agents may either enable or deter women's access to PAYGo

Source: Chamboko et al (2020)

# Next steps: What does this mean for practitioners and researchers?

*Even as PAYGo solar transitions into an established business model and an investable asset class, questions around the model's fit in the 'energy ladder' for last mile access loom large. Impact research can provide answers.*

- Financial inclusion practitioners should socialize knowledge gaps and develop learning agendas around PAYGo's impacts on women. This will help inform future impact research on PAYGo access.
  - Practitioners should consider designing toolkits and frameworks for PAYGo providers to help them embed a gender lens in their operations and design gender sensitive business strategies
  - Finally, practitioners should also consider developing evaluative frameworks to measure progress on gender mainstreaming in PAYGo solar, to provide guidance to funders.
- Researchers should undertake rigorous evaluations of off-grid solar access, especially paying attention to the role of financing models like PAYGo, and document both overall and sex disaggregated impacts.
  - This will not only help identify pathways to women's empowerment through energy and financial access, but also expand the impact evidence base in PAYGo solar and catalyze gender smart investments in the sector.

# Next steps: What does this mean for funders?

*Gender mainstreaming doesn't emerge as a priority when most PAYGo providers are optimizing their business models, discovering paths profitability. Dedicated funding can encourage providers and researchers to consider it in earnest.*

- Funders should increase support to providers to establish systems and resources that can create and analyze gender data in the PAYGo solar sector
- Funders should increase support to researchers to study and document the impacts of PAYGo, including sex disaggregated impacts
- Finally, funders should also increase their adoption of 'gender-smart investing' practices i.e., integrating gender analysis in their investment and evaluation process, in the off-grid energy access sector



Photo Credit: Van Bang Vo, CGAP Photo Contest, 2013

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