

# FMO's Contribution to the Off-Grid Electricity Sector

Review 2014 – 2020

**Final Report**

**April 2022**

*Picture credit: Taken by Opmeer Reports and commissioned by FMO.  
This was Edward Kashmiri, a d.light customer living in Kajiado, on the outskirts of Nairobi*

Provided by a consortium led by



# Acknowledgements

## Acknowledgements & disclaimer:

This project was commissioned and financed by the Dutch development bank FMO. The views expressed in this report are purely those of the authors and may not in any circumstances be regarded as stating an official position of FMO.

## Report Commissioner:



FMO is the Dutch entrepreneurial development bank. FMO was founded in 1970 and is a public-private partnership, with 51% of shares held by the Dutch State and 49% held by commercial banks, trade unions and other members of the private sector.

## Report authors:



Greencroft Economics is a boutique economic consultancy founded in June 2019 to advise public and private sector clients on sustainable and inclusive socioeconomic development in emerging economies. Its core focus is on the role of access to basic services, infrastructure, and global value chains as drivers of economic activity while creating opportunities for vulnerable communities. Its work bridges the gap between economic theory and practical application to provide actionable insights to clients, founded on rigorous analytics.

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# ACRONYMS

Abbrev.	Full Description
<b>ACPF</b>	Access to Clean Power Fund
<b>AEF</b>	Access to Energy Fund
<b>B2B</b>	Business-to-business
<b>B2C</b>	Business-to-customer
<b>BP</b>	Building Prospects
<b>CD</b>	Capacity development
<b>CO<sub>2</sub></b>	Carbon dioxide
<b>CPP</b>	Customer protection principles
<b>DFI</b>	Development finance institution
<b>EAF</b>	Energy Access Fund
<b>EARF</b>	Energy Access Relief Fund
<b>EEGF</b>	Energy Entrepreneurs Growth Fund
<b>ESG</b>	Environmental and social governance

Abbrev.	Full Description
<b>FMO-A</b>	FMO balance sheet (own funds)
<b>IDCOL</b>	Infrastructure Development Company Limited (Bangladesh)
<b>IDF</b>	Infrastructure Development Fund
<b>MFI</b>	Multilateral finance institution
<b>MW</b>	Megawatt
<b>PAYGo</b>	Pay as you go
<b>PEII</b>	Pioneer Energy Investment Initiative
<b>SAS</b>	Standalone solar system
<b>SDG</b>	Sustainable Development Goal
<b>SHS</b>	Solar home system
<b>TA</b>	Technical assistance
<b>TOC</b>	Theory of Change
<b>Wp</b>	Watt peak

# AT A GLANCE

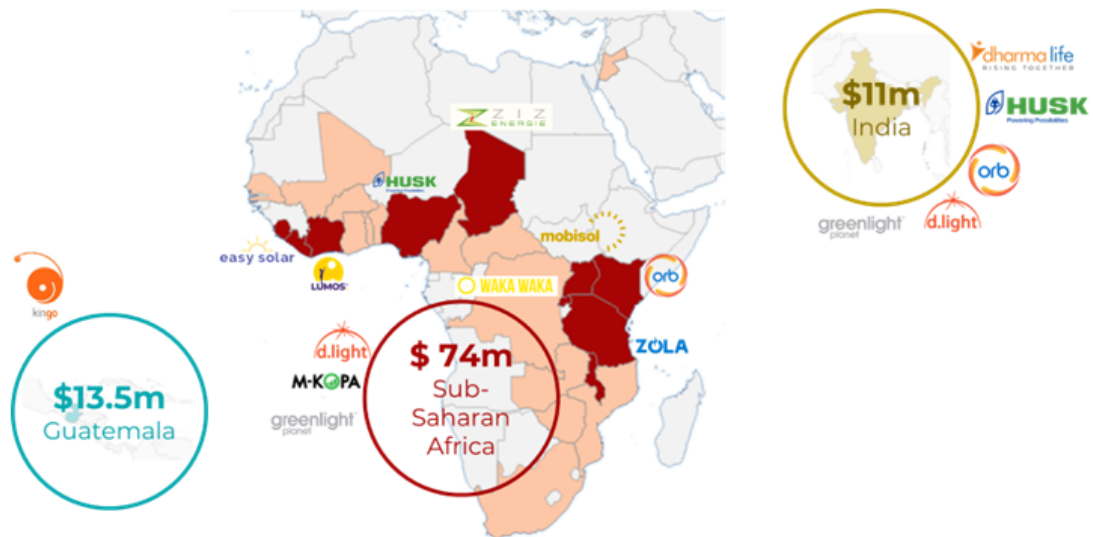
**\$ 170 million investments committed to the off-grid energy sector since 2014**

**\$ 170 million** committed

**19 investments** – direct and through funds – working with SHS, mini-grids, productive use and rooftop solar

<p><b>\$99m</b> Direct Investments</p>	
	<p><b>\$71m</b> Funds</p>

**\$99m direct investments spanning Sub-Saharan Africa, South Asia, and Latin America**



**40 million people with clean and modern energy access from FMO direct investees**

**\$ 99 million** direct investments

**13 direct investees** providing standalone solar and mini-grid connections



**40 million people** reached with clean energy technologies

	19.9 m people using pico lights
	7.3m people using larger lighting systems
	8.2m people using multi-light & charging
	1.4m using a small SHS providing full Tier 1
	3.7m using medium SHS at partial Tier 2
	0.5m with a larger SHS reaching full Tier 2

# Executive Summary

**This report presents an independent review of FMO's investments and broader role in supporting the off-grid electricity sector since 2014.** Over the past decade, FMO has financed over 20 off-grid electricity transactions, with most funding sourced from concessional Dutch government funds, in a few instances leveraging FMO's own balance sheet. The purpose of this review is to draw and share learnings of this experience, seeking to support companies to achieve impact while driving progress towards commercial success.

## The off-grid electricity sector has stabilized in the last five years

**Since 2015, annual unit sales of standalone solar systems have stabilised at around eight million units, while investment has plateaued at around US\$ 300 million each year.** After rapid growth in unit sales and investment volumes between 2010 and 2015, the global market for solar lanterns and solar home systems has been remarkably stable since 2015. However, there has been significant evolution in the types of products and the range of companies active in the market. While the early 2010s saw the emergence and dominance of 1<sup>st</sup> generation companies – typically vertically integrated multinationals – in more recent years, specialised providers, focussing on part(s) of the value chain, have emerged and are showing signs of success. There has also been an increasing shift towards the PAYGo business model, particularly in East and West Africa. Even as some markets in South Asia have passed their peak, many markets across Southeast Asia, West Africa and Southern Africa are continuing to grow. In parallel, there has been a marked transition of finance from equity to debt, and a widening of the investor base to include strategic corporates and commercial banks.

## FMO has been a leading investor supporting a diverse range of direct investees and specialised funds

**FMO is one of the largest investors in the sector in terms of financing volume, alongside other DFIs such as CDC and Norfund.** From 2010 to 2018, of all investors in the sector, FMO committed the most finance in off-grid electricity ventures and contributed to capitalising six of the specialised equity and credit funds that now account for a significant share of capital committed. Through 19 investments between 2014 and 2020, FMO has supported a diverse range of investees with ticket sizes ranging from a few hundred thousand dollars in convertible grants up to over US\$ 15 million typically as senior loans.

**FMO's strategy has evolved to balance supporting successful commercialisation with promoting innovation and delivering impact, while ensuring additionality of funds deployed.** Its first forays into the off-grid electricity sector starting in 2014 were high risk – reflective of a sector with limited track record. Between 2016 and 2019, as the sector matured, FMO financed several of the now well-established companies – with varying degrees of success in terms of commercial outcomes. In this phase of investment, FMO was proactive in increasing the sophistication of financing products and supported a variety of first-of-a-kind transactions, such as the first major receivables debt facility with M-Kopa in 2019, local currency facilities, and direct lending to local operating companies (such as Lumos Cote d'Ivoire, and Zola Electric Tanzania). Since late 2019, FMO has leveraged this experience and shown flexibility to respond to feedback from other investors and from investees. This has led it to taking on highly additional, riskier, investments in small early-stage ventures, while also supporting consolidation for established companies accessing

commercial capital, by, for example, showing a willingness to purchase secondary shares alongside strategic corporate investors.

**Dutch government funds have provided the majority (81%) of FMO commitments to the off-grid electricity sector.** The Access to Energy Fund (AEF) is the main source of FMO's committed funding, with Building Prospects (BP) and MASSIF also supporting some transactions. The use of these funds reflects the lack of a clear blueprint for, or evidence of, profitability in the sector as a whole; there are very few companies that have sustained positive profit for multiple years. The sector still faces a challenge in reaching commercial sustainability while also maximising impact, especially when it comes to reaching remote and vulnerable customers who are also the least commercially viable.

**Access to finance from FMO has been crucial in providing investees with both the volume and the type of finance needed to realise their impact and commercial ambitions.** FMO has contributed to closing transactions that would not otherwise have been viable, including developing proof of concept for new financing products for the sector. FMO's commercial acumen, due diligence and expertise is highly valued by investees and co-investors. Similarly, its willingness to invest at a relatively early stage, to stay involved and support investees through difficult periods, and to provide a bridge to help investees close subsequent funding rounds, in some case including commercial investment, are also perceived favourably.

**FMO is highly valued as a flexible investor and for the dedication and commitment of investment officers.** FMO investment officers bring many years of experience to transactions, take the time to understand the client business in detail, and tend to stay committed to transactions and client relationships for a prolonged period. This results in a deep understanding of the investee business context and a willingness and ability to show flexibility to make deals happen and then work together to make them a success.

**As it has gained experience in the sector, FMO has increasingly provided bespoke capacity development to its investees and has contributed to wider sector initiatives.** Capacity development has often focussed on key areas of comparative specialisation in FMO, such as credit risk management, customer protection principles (CPPs), and environmental and social governance (ESG). FMO has also contributed to supporting key industry initiatives, such as GOGLA's industry-wide CPPs in 2018-19, broader funding to support GOGLA's activities as the voice of the industry, and grant funding for seed finance initiatives such as Acumen's PEII, and delivery of public health solutions in response to COVID-19. Despite this, and while FMO's non-financial support to clients is valued, its contributions as a financier are perceived to be much more important, and it is perhaps not as proactive as other investors and development partners in terms of catalysing wider sector initiatives.

## FMO's direct investments have contributed to reaching 40 million people with access to clean and modern energy solutions

**Most people reached by FMO investees are using products which enable partial Tier 1 energy access.** Of the total 40 million people reached, 35 million are below or around the threshold of Tier 1 energy access, while just five million have access to a system that would provide full Tier 1 energy access for the whole household. Based on the FMO's share of capital in each investee over the period of investment, FMO's US\$ 99 million of direct investments in SHS providers and mini-grid operators had enabled an additional 2.9 million people to gain access to energy.

**This extra energy access reach delivers important welfare benefits and quantifiable economic, social, and environmental benefits.** The main impact of reaching 40 million people is in the access

to energy itself and the welfare improvement this delivers for end users through access to a range of associated products and services, such as lighting, radio, TVs etc. Furthermore, based on GOGLA's standardised impact metrics, FMO's investees are estimated to have contributed 9 million tonnes of CO<sub>2</sub> emissions avoided, added 167 MW of renewable energy capacity, delivered cash savings to households worth around US\$ 1.2 billion dollars, and supported income-generating activities worth around US\$ 730 million to households and businesses.

**FMO has also helped capitalise six sector funds which have, in turn, supported a diverse portfolio of companies reaching many millions more people.** The funds have delivered a range of impacts through around 50 companies across their respective portfolios, offering a wide range of energy-related products spanning solar home systems, mini-grids, commercial & industrial, and productive use of energy technologies.

## Lessons learned and optimising the FMO role in future

**Not all investments have been successful – and learning the lessons from these challenges has helped FMO improve how it supports off-grid electricity ventures.** For example, two of the 11 FMO solar home system investees have effectively been written off, with WakaWaka winding up operations in Rwanda, and Mobisol filing for insolvency before being acquired by Engie in 2019. Most companies across the sector are still struggling to reach profitability even after many years of experience and investment. Despite this, as the financing space has become more crowded in recent years, there is a potential risk of crowding out some commercial investment as FMO competes with other investors to provide capital to the same small number of companies, including, sometimes, competing with the specialised sector funds that it has helped to capitalise.

**We draw three main conclusions from FMO's experience investing in the sector:**

**#1: Off-grid electricity providers must identify their specialisation in the value chain to achieve commercial success.** Cash sales alone are unlikely to achieve profitability as they compete in a rapidly commoditised and price sensitive market, while projections of market potential for larger size systems often prove optimistic. The PAYGo business model can unlock a wider market for higher-margin products and services but is not a panacea. There is no single blueprint to achieving commercial success; companies may need to diversify to specialise in different business models to maintain their individual value-offering.

**#2: Companies must be able to flexibly respond to customer demands and move into adjacent product markets.** PAYGo offers a route to potentially more attractive commercial product and customer segments but will nonetheless require continuous innovation and a focus on identifying and consolidating commercially viable customer segments. Companies will need to continue to innovate and offer high-value products, leveraging established distribution networks set up to provide energy access products. To become and remain commercially viable companies will need to have the flexibility to add new products and services to their offering – in many cases moving beyond a pure energy access focus.

**#3: The role of DFIs and the broader financing landscape must evolve and reflect the conditions in different market contexts.** There remains a tension between investors who seek a return on their finance and expect companies to be profitable, while also driving impact-oriented companies serving the most needy populations. Financing structures will need to adapt to suit market segments that are not – nor likely to become – commercially viable. The use of concessional government funds will continue to be essential to deliver impact to these market segments. Nonetheless, there are now some relatively mature and well-capitalised companies where DFIs risk crowding out commercial investors and should be moving to junior positions/ exiting.



**Building on these lessons, and building on its position as a leading DFI in the off-grid electricity sector, FMO could further optimise its role in the following five ways:**

- Where providing equity to new investees, be innovative and flexible, joining early rounds and staying in to bring the investee through to commercial scale, bridging the pioneer gap, including continuing to offer small-ticket direct equity investments.
- With existing equity investees, support consolidation and provide a balance to investment from strategic corporates, including a willingness to purchase secondary shares and enable the exit of early-stage investors.
- For debt provision to established and well-capitalised companies, seek to catalyse local commercial banks including by supporting local currency facilities, and by taking on junior positions to help leverage local commercial banks taking senior positions.
- Take a flexible stance on energy access impacts, enabling companies to innovate and balance impact with commercial success, allowing companies to diversify their product and service offering to seek profitability and meet customer demands, including if this means companies don't only provide access to energy.
- Use targeted technical assistance to help businesses continue to improve governance and credit management through core business support. FMO can also use its technical assistance in supporting companies so that, as they add new products and services to their offering, they retain a strong impact focus.

**FMO's strategy will need to evolve flexibly as the sector faces an uncertain future.** FMO will need to continue to balance three core objectives: impact for end users, commercialisation of investees, and promoting innovation. As many regions are likely to face a challenging macroeconomic operating environment in the coming years, it will be important to maximise the sector's impact potential and ensure historic impacts do not roll back, including by (1) continuing to support access to relatively smaller entry-level solar products, and (2) being pragmatic in considering impacts beyond energy access, as companies diversify their product offering. Innovative approaches to unlocking commercial lending should still be explored where market conditions allow for it, particular in relatively more mature markets and with well-established companies.

# 1. Introduction

**FMO commissioned Greencroft Economics to review its investments and wider contributions to the off-grid energy sector since 2014.** This is the first comprehensive review of FMO's role in the off-grid energy sector, building on the impact evaluation of FMO's investment in Orb Energy's expansion into Kenya,<sup>1</sup> and on evaluations of the FMO's use of Dutch government funds which, as explained below, account for the majority of FMO investment in off-grid energy ventures.

**Over the past decade, FMO has deployed Dutch government funds and the FMO-A balance sheet to finance off-grid energy ventures.** In the period covered by this review, FMO financed 19 investments in off-grid electricity ventures,<sup>2</sup> with the majority of finance sourced through funds managed on behalf of the Dutch government. The most important of these funds has been the Access to Energy Fund (AEF), with further funding provided by the Building Prospects (BP) fund, MASSIF, and the recently established Ventures fund. In a few instances, these funds have invested alongside FMO's own funds (FMO-A).

**The core purpose of this review is to share learnings from a decade's experience investing in the sector.** This includes summarising FMO's experience in achieving impact for end users and for commercial success and drawing recommendations for how the FMO can continue to deliver results while furthering its additionality as a DFI and catalysing other investors.

**The investments included in this review span standalone solar providers, mini-grid developers, and specialised sector funds.** The FMO portfolio reviewed comprises 19 investees of which 11 are standalone solar providers with a core focus on solar lanterns and solar home systems, two are mini-grid developers and six are specialised sector funds. While many of the FMO investees have retained a firm focus on off-grid energy provision, some have diversified into other market segments and technologies, in particular commercial and industrial (C&I) solar, and, in some cases, a broader range of off-grid appliances and consumer finance services. The review also covers 15 capacity development initiatives – of which 10 were provided to active investees and five were contributions to wider sector initiatives.

**The main sources of information for this review have been internal FMO reporting, interviews with FMO investees, a comprehensive set of sales data and impact calculations, discussion with other sector experts and literature review.** We have drawn extensively on FMO internal reporting documentation, including the Funding Proposals (FP) and annual Client Credit Reviews (CCR) for each transaction, including where there may have been more than one round of investment. Following a detailed review of this documentation, we developed a scorecard for each investee, which served to structure questions to probe (1) the commercial journey of each investee, (2) the FMO contribution through both financial and non-financial support, and (3) impact achieved. We then carried out 34 semi-structured interviews with the respective FMO investment officers, FMO investee contacts, and sector experts including co-investors.<sup>3</sup> To generate the impact estimates presented in Section 5 we compiled sales data from each client and used GOGLA's standardised impact metrics to convert sales volumes into impacts, supplemented by impact reporting provided directly by the FMO investees. Finally, we also draw on the wider sector literature to situate the FMO role in the context of the evolution of the off-grid energy sector since 2014.

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<sup>1</sup> Trinomics (2018) "Market potential and development impacts of off-grid solar in Kenya – Impact evaluation Orb Energy Kenya", [Link](#)

<sup>2</sup> Note: this review covers off-grid electricity solutions, and not on wider off-grid energy solutions (such as clean cooking)

<sup>3</sup> A full list of interviews is provided in Annex 2

**To analyse the extent of and contribution of the FMO role to each investee, we carried out a structured review of each investment to draw insights on the portfolio across three thematic areas.** The objective of this analysis was to draw specific lessons learned on the role FMO has played through its portfolio of investments and capacity development initiatives – not to revisit the original rationale and justification of each individual transaction. The insights from this analysis form the backbone of the description of the FMO role in Section 4, and of the lessons learned presented in Section 6. The three themes analysed are:

- **The client operating context**, in terms of (1) the maturity of the developer at the point of FMO's first investment, (2) the stage of operations of the specific product lines / activities / business unit which FMO was financing, (3) the maturity of the technology and business models being introduced in the context of the markets the investee was operating in, and (4) the broader national market context and readiness for investment.
- **The role of FMO's financial and non-financial contribution**, in terms of (1) providing finance at a volume that would otherwise not have been viable for the investee, and/or (2) supporting the provision of a financial product that was relatively new and innovative and otherwise would not have been available, and (3) the overall extent of the FMO's involvement through non-financial support in contributing to the success of the company.
- **Outcomes achieved**, in terms of (1) commercial transition and success of the investee, and (2) impact in terms of reach and depth of impact on end users.

**The remainder of this report is structured as follows:**

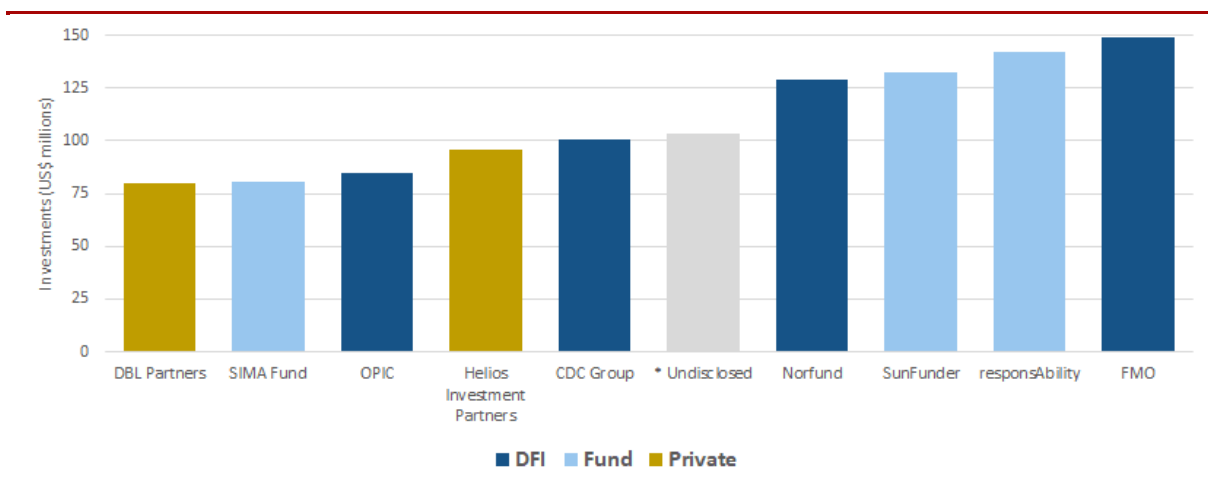
- **Section 2** introduces the FMO's activity in the off-grid electricity sector since 2014.
- **Section 3** sets out how the off-grid energy sector has evolved and situates the FMO's role as an investor in the broader sector context.
- **Section 4** describes how the FMO role has evolved since its first investment in 2014, through various types of investment and through wider contributions in supporting the performance of off-grid energy companies.
- **Section 5** captures the FMO contribution to the performance of companies in the sector, and to impact achieved for end user households and businesses.
- **Section 6** summarises the lessons learned from almost a decade of investing in off-grid energy ventures.
- **Section 7** recommends ways in which the FMO contribution to the sector can be optimised and informs the development of the FMO's future strategy for the off-grid energy sector.

## 2. Overview of FMO’s activity in off-grid electricity

**This section provides a brief overview of FMO’s investments and capacity development activities in the off-grid electricity sector since 2014.** It provides context on the FMO role to set up the discussion of broader sector trends – and the part played by FMO in these trends – in Section 3, followed by a more detailed analysis of FMO’s contribution to the sector in Section 4.

**Alongside CDC and Norfund, FMO is one of the leading DFI’s investing in the off-grid electricity sector.** From 2010 to 2018, FMO recorded the largest volume of investment to off-grid energy companies (Figure 1),<sup>4</sup> FMO investment has also contributed to capitalising the specialised equity and credit funds that have also grown to account for a significant share of capital committed – capitalising, for example, the responsAbility Energy Access Fund (EAF), the SIMA I fund, and SunFunder’s Beyond the Grid Fund among others.

**Figure 1: FMO’s has been the largest direct investor in standalone solar between 2010-2018 and has also helped capitalise several of the major specialised sector funds**



Source: based on Wood Mackenzie and E4I (2019): “Strategic investments in off grid energy access”

Note: there may be overlap and therefore potential duplication in the figures cited – for example while the FMO has invested directly in off-grid ventures, it has also helped capitalise many of the specialised sector funds including responsAbility, SunFunder, SIMA etc.

**FMO has supported a diverse range of transactions in the sector, in 11 standalone solar providers, two mini-grid companies and six specialised sector funds.** As shown in Figure 4, the direct investment transaction sizes range from just a few hundred thousand dollars, usually as a convertible grant or convertible loan to younger companies, to over US\$12 million tickets typically to either relatively well established 1<sup>st</sup> generation companies or as contributions to the specialised sector funds.<sup>5</sup> In recent years, the FMO investment strategy has shifted to explore opportunities within a growing ecosystem of mini-grid providers, although this review only covers the two first such investments; Husk Power, a relatively well-established and well-capitalised mini-grid owner and operator active in India, Tanzania and Nigeria, and a smaller initial transaction with ZIZ Energie, a privately-owned energy provider in Chad.

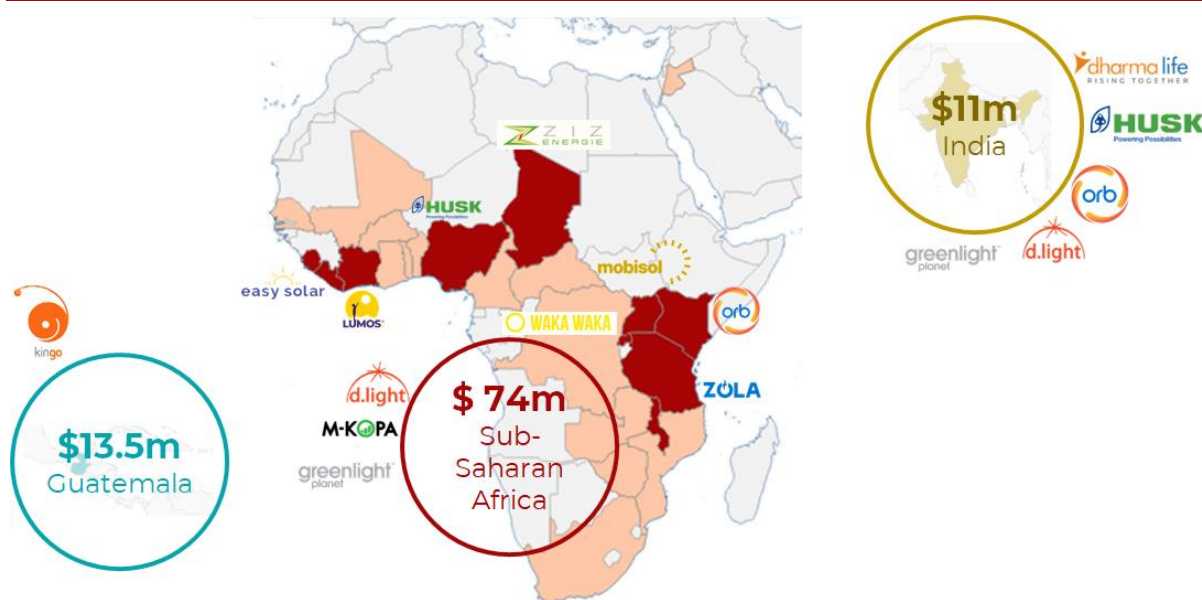
<sup>4</sup> Wood Mackenzie and E4I (2019): “Strategic investments in off grid energy access”

<sup>5</sup> We follow the industry convention of defining 1<sup>st</sup> generation companies as entities founded in the early stages of the sector – i.e. between 2007 and 2012 – that have dominated unit sales volumes and investment volumes. They typically offer PAYGo and participate in multiple segments of the value chain including last mile distribution, retail, and finance – and often manufacture their own branded hardware.

**As it has gained experience in the sector, FMO has increasingly provided bespoke capacity development to its investees and has contributed to wider sector initiatives.** Capacity development has often focussed on credit risk management and customer protection principles (CPPs), including supporting GOGLA to develop industry wide CPPs in 2018-19.<sup>6</sup>

**The majority of FMO direct investment has gone to companies active primarily in Sub-Saharan Africa and especially East Africa.** This relative concentration of investment reflects both (1) the broader sector trends and market maturity over the period since 2014, and (2) the priorities of the Dutch Ministry of Foreign Affairs concerning the government funds should be deployed, with, in particular, the AEF heavily focussed on Sub-Saharan Africa. Recently there has been a ramp up in investments in investees active in West Africa – such as Lumos Cote d’Ivoire, Easy Solar in Sierra Leone and Liberia, and ZIZ Energie in Chad. FMO has also invested in companies operating in India such as Orb, Dharma Life, and Husk Power, while some of the larger investees operate across both South Asia and Sub-Saharan Africa (e.g. Greenlight Planet and d.light).

**Figure 2: FMO has invested in a wide range of direct investees and funds spanning much of Sub-Saharan Africa and South Asia**



Source: Greencroft Economics analysis of data provided by FMO

Notes: [1] the light red shade denotes the coverage of the portfolios of Funds that FMO has contributed to

[2] The totals presented do not include the US\$ 71m invested through funds (with portfolios spanning multiple countries / regions)

**FMO has capitalised six of the major specialised equity and credit funds in the sector.** These funds offer specialised financing products, often at smaller ticket sizes and to a wider portfolio of companies than a single direct investor would be able to provide. The funds FMO has capitalised include both the first significant global debt fund (responsAbility Energy Access Fund (EAF) – later relaunched as the Access to Clean Power Fund (ACPF)) and the first equity fund dedicated to energy access investments (Energy Access Ventures Fund). Recently, FMO co-led establishment of the Energy Entrepreneurs Growth Fund (EEGF), providing a flexible offering of debt and equity,

<sup>6</sup> <https://www.gogla.org/consumer-protection>

targeting 2<sup>nd</sup> generation companies.<sup>7</sup> FMO also supported establishment of the Energy Access Relief Fund (EARF) in response to COVID-19.

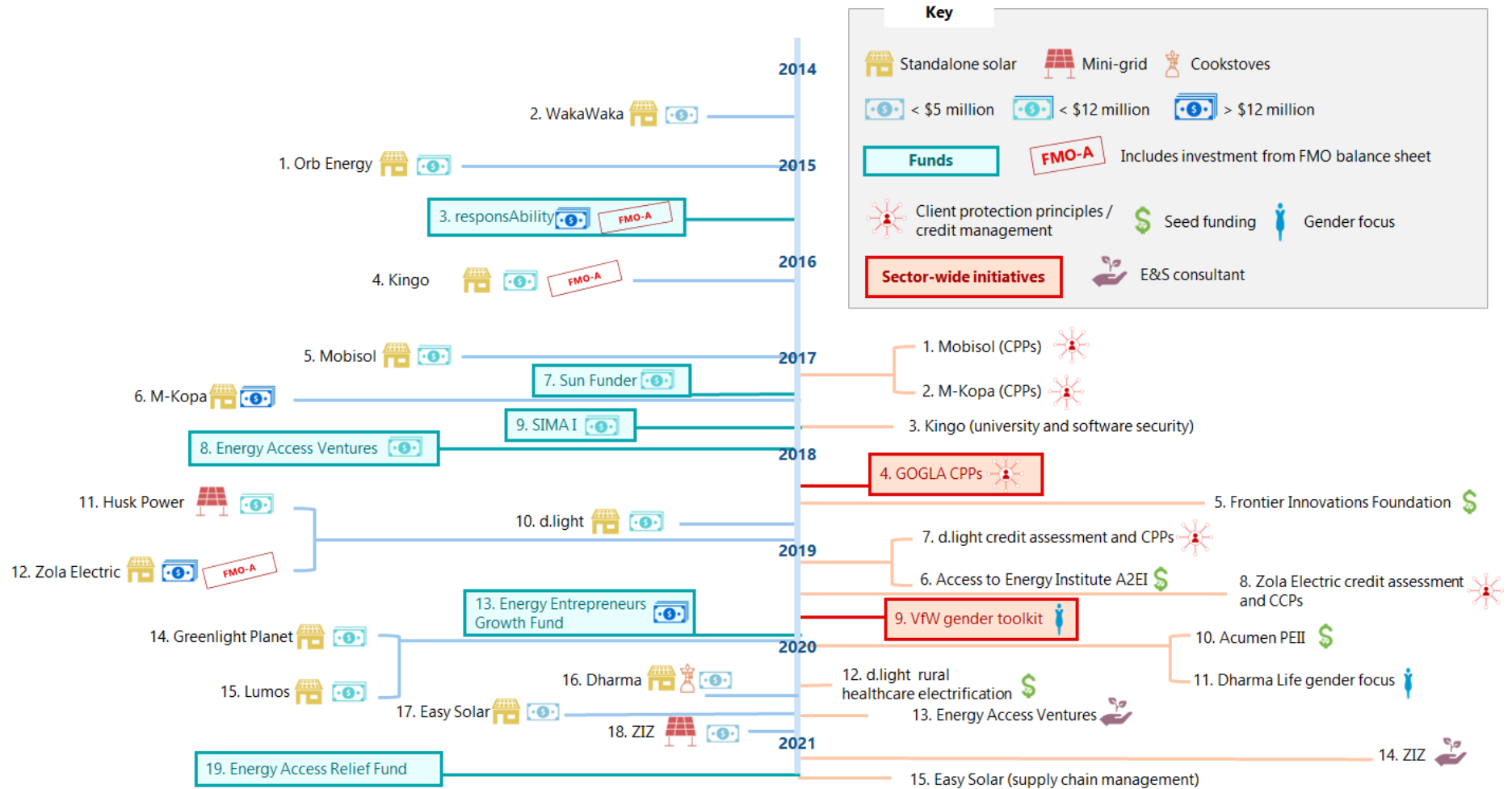
**Figure 3: Around 40% of FMO funding for the off-grid sector has been channelled through funds**



Source: Greencroft Economics analysis of data provided by FMO

<sup>7</sup> By 2<sup>nd</sup> generation companies we mean relatively younger OGS companies with less than a decade's experience and often specialised in only some parts of the value chain working in partnership with either upstream hardware manufacturers and/pr downstream last mile distributors.

**Figure 4: FMO's off-grid electricity investments and capacity development initiatives since 2014**



Source: Greencroft Economics

### 3. Overview of the off-grid solar sector 2014-2021

**This section summarises off-grid electricity sector trends between 2014-2021 to contextualise the FMO's role in the sector.** It draws heavily on published literature, in particular the bi-annual Lighting Global Market Trends Reports and periodic GOGLA sales and investment trend publications. While the focus is on how the sector as a whole has developed, some of the visualisations include the contribution of FMO to these broader sector trends to carry through the introduction to the FMO role from Section 2 and to set up analysis of the FMO contribution to the sector in Section 4.

#### 3.1. Unit sales of standalone solar systems have stabilised since 2010

**Between 2010 – 2015, unit sales rocketed to reach over eight million units per year.**<sup>8</sup> The annual sales of quality-verified, branded, solar lanterns and solar home systems grew rapidly as the first generation of solar lantern and solar home system providers took products to market at scale.<sup>9</sup> This period saw high sales in key markets in East Africa – in particular Kenya, Tanzania, Uganda and Rwanda – and in large South Asian markets such as India and Bangladesh. Vertically integrated companies dominated sales, especially in African markets, providing a one-stop-shop service of branded hardware with integrated software systems and various forms of mobile and digital payment collection services.

**Since 2015 annual sales volumes have stabilised with a dip in 2020 as the COVID-19 pandemic impacts began to be felt.** This stabilisation masks significant regional variation, as described further below, with some markets showing signs of decline while other regions continue to offer high growth opportunities. In general, there has been a shift towards a higher share of relatively larger products such as basic and medium size solar home systems, facilitated by the rise of the PAYGo business model. Nonetheless, around two-thirds of sales are of pico lighting systems smaller than 3 Wp, with a roughly equal split between multi-light systems (3-10 Wp) and solar home systems (11+ Wp) comprising the remaining third of the market.<sup>10</sup>

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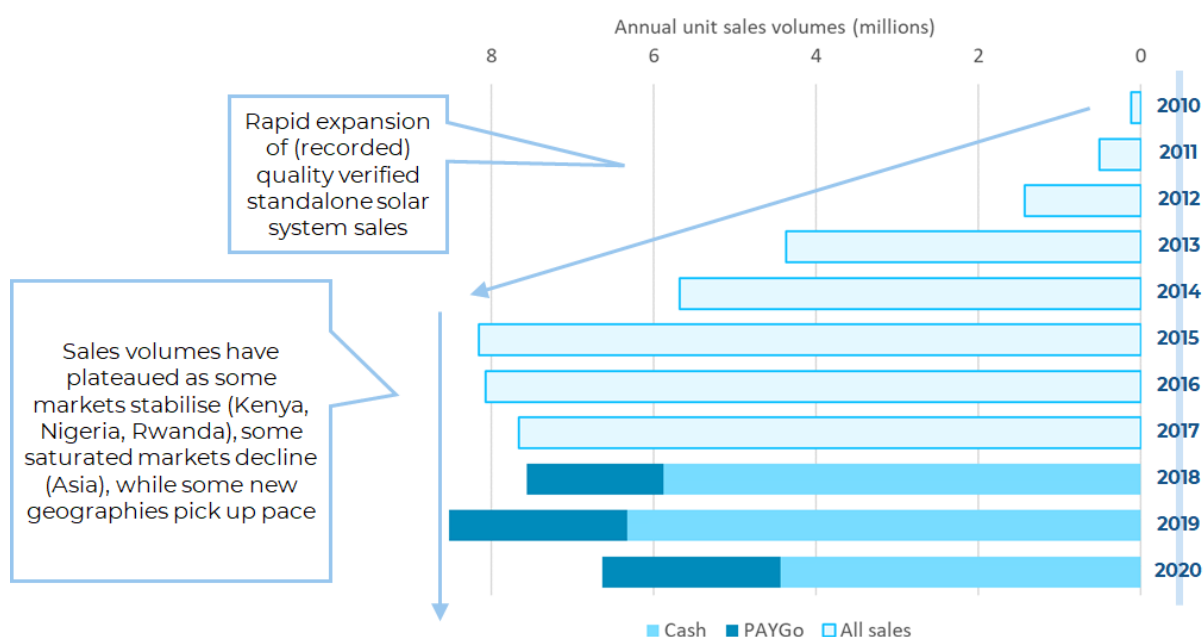
<sup>8</sup> Analysis based on data collected in GOGLA half-yearly sales reports

<sup>9</sup> Reporting and recording of sales also improved with data collected centrally initially by Lighting Global and subsequently by the industry association GOGLA

<sup>10</sup> Proportions based on GOGLA half-yearly sales reports



**Figure 5: Unit sales have stabilised around 8 million each year since 2015**



Source: Greencroft Economics analysis of GOGLA half-yearly sales data and data provided by FMO

**In South Asia, the largest off-grid energy markets are declining.** Annual sales volumes peaked at just over three million units in India in 2016, before gradually falling each year to a low of around 800,000 units in 2020, largely as a result of a rapid roll out of the national grid which now reaches over 99% of the Indian towns and villages. While this is less visible in Bangladesh, a similar trend is present as grid expansion rolls out at pace and the IDCOL-financed solar home scales back.

**Nonetheless, in absolute terms South Asian markets still represent some of the largest off-grid energy markets worldwide.** In 2020, India still ranked as the second largest market for standalone solar solutions behind Kenya, with Bangladesh and Pakistan ranking 14<sup>th</sup> and 16<sup>th</sup> respectively. Across South Asia, solar home systems are a back-up to a weak grid connection for 61% of households,<sup>11</sup> while there is a large potential market for appliances (e.g. fans and refrigerators) given the high summertime temperatures. There is also a growing market for rooftop solar following the introduction of net metering policies in most states in India from around 2015/16, and with similar prospects in Bangladesh which adopted its first national net metering policy in 2018.<sup>12</sup>

**Across much of Southeast Asia, there remains large potential demand for off-grid energy technologies.** For example in Myanmar, where half of households do not have access to the main grid, Lighting Myanmar supported the Department of Rural Development (DRD) results-based finance programme which helped catalyse the standalone solar market from almost no recorded sales to 100,000 units in 2018 and over 200,000 units in 2019, before COVID-19 lockdowns and the 2021 coup caused sales to drop back markedly. In Papua New Guinea where only around 13% of households have access to the main grid, annual sales volumes have been consistently above 50,000 in recent years, peaking at 92,000 in 2020 and maintaining similar levels through the first half of 2021. The Philippines also has low rates of grid connection and a relatively stable market of over 50,000 standalone solar sales each year since 2017, except for a sharp drop in 2020, before recovering in the first half of 2021.

<sup>11</sup> GOGLA (2020) "Powering Opportunity in South Asia", [Link](#)

<sup>12</sup> SREDA (2018) "Bangladesh Net Metering Policy", [Link](#)

**In Sub-Saharan Africa, there is significant variation in market maturity within and across regions.** For example, while several countries in East Africa now have relatively vibrant markets with a healthy ecosystem of well-established companies and hundreds of thousands of unit sales per year, other countries in the region are still very much underserved.

**East Africa is by far the most mature and largest off-grid solar market – with around four million units sold each year.** Nonetheless, there is still much to be done to achieve universal access to electricity even in the most mature markets. For example, Kenya is by far the largest market for standalone solar products worldwide, with around two million sales recorded in each of 2019 and 2020. Nonetheless, there are large parts of the country that remain underserved (and are now being targeted through results-based finance incentives by the Kenya Off-grid Solar Access Programme – KOSAP). Similarly, Ethiopia, Rwanda, Tanzania, and Uganda all record hundreds of thousands of standalone solar units sold each year but have large potential markets that are not yet reached, typically due to a combination of relatively more remote regions with higher distribution costs, and relatively lower income and more dispersed populations. At the other end of the spectrum, Burundi remains a challenging market for private sector companies and investors with limited sales volumes and company activity, and will be reliant on donor programmes to kickstart the market (such as the World Bank’s forthcoming “*Soleil-Nyakiriza*” project).

**West Africa has large potential demand but is still significantly less mature than the East Africa markets, reaching its highest annual sales volume of 790,000 in 2020.** The PAYGo business model is now taking off in West Africa, comprising an increasing market share of sales in key markets such as Nigeria, in addition to a longstanding presence in Cote d’Ivoire, Senegal, and Benin. Cameroon is one of the fastest growing off-grid electricity markets in the region, topping 100,000 units sold in the 12 months from July 2020 to June 2021.

**Southern Africa remains a relatively young region in terms of off-grid sales.** Mozambique has seen several companies enter the market in recent years, with recorded sales jumping from just a few thousand to 60,000 between July 2020 - June 2021. In Zimbabwe the nascent market has declined with low sales volumes since 2019, whereas Zambia saw strong growth in 2018 and 2019 (over 100,000 units sold in each year) before falling back slightly in 2020 but showing signs of recovery so far in 2021. Malawi is also showing positive signs of growth since the second half of 2019.

### **3.2. Flows of finance have also stabilised with access to debt outstripping equity investments**

**An influx of capital mirrored the initial expansion of the sector, reaching over US\$ 300 million per year since 2016.** For the first time in six years, investment dipped just below the US\$ 300 million mark in 2020, although funding remained relatively resilient considering the challenges presented by the COVID-19 pandemic.

**Finance remains heavily concentrated in a few large solar home system providers.** Up to 2020, 80% of financing had gone to just 10 recipients,<sup>13</sup> which is a slightly lower concentration than in 2016, when the equivalent percentage was 86%.<sup>14</sup> Investment was once again highly concentrated in 2020, with 75% of commitments going to just three recipients.<sup>15</sup>

**Conversely, there has been a diversification in the number and type of investors in the last few years.** The number of investors in the standalone solar sector was around 15 prior to 2014, growing

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<sup>13</sup> Lighting Global (2020) “*Off Grid Solar Market Trends Report 2020*”

<sup>14</sup> Lighting Global (2016) “*Off Grid Solar Market Trends Report 2016*”

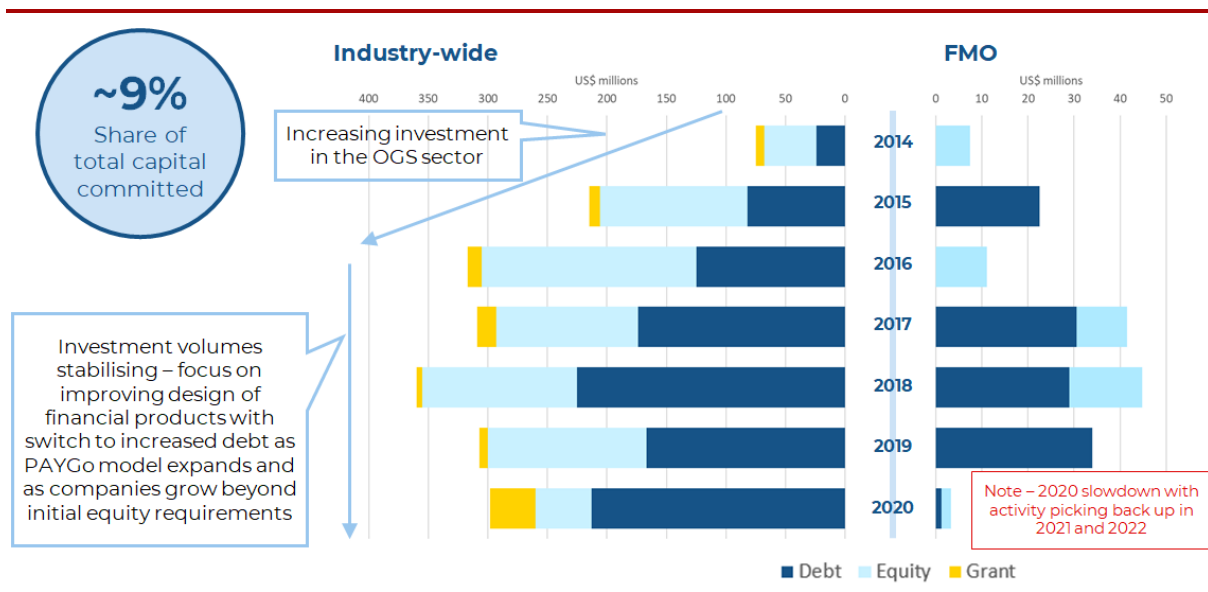
<sup>15</sup> GOGLA (2020) “*Off-grid solar investment trends*”

to almost 50 in 2018 and 2019.<sup>16</sup> This fell back in 2020, possibly as a result of the COVID-19 pandemic and uncertainty facing companies, with mature sector investors providing continuity but fewer transactions involving less experienced investors in the sector.

**As the PAYGo business model has expanded, there has been a relative shift to debt finance.**

This is driven by (1) PAYGo companies' need for working capital while they collect revenues often with a 12+ month delay from the upfront costs incurred, and (2) larger and better-established companies moving beyond early rounds of equity finance. Debt accounted for 33% or less of total capital invested in each of 2012, 2013 and 2014, rising to around 70% in 2020. While the volume of debt held up relatively well in 2020, equity funding dropped sharply to just US\$ 47 million with an offsetting increase in grant funding (see Figure 6). Debt products have also evolved to match the needs of PAYGo businesses – with a range of instruments available to off-grid solar companies.<sup>17</sup>

**Figure 6: Since 2014, there has been US\$1.9 bn recorded investment in standalone solar solutions, over the same period has financed US\$ 170m in off-grid electricity ventures**



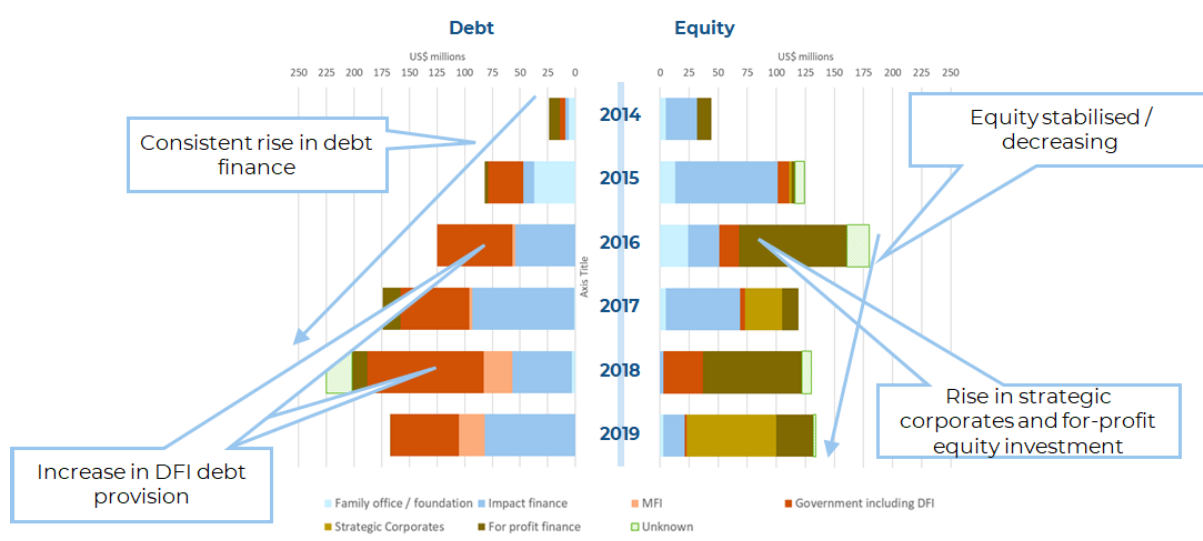
Source: Greencroft Economics analysis of data provided by FMO and industry wide investment volumes from GOGLA investment trends reports  
 Note: FMO investment includes two relatively small mini-grid transactions, whereas the industry-wide figures from GOGLA are for standalone solar providers only

**There has been limited private debt with DFIs continuing to dominate volumes.** Even where commercial banks have been involved in transactions, they have typically come in alongside a much larger tranche provided by DFIs and/or with junior loans provided by foundations (left panel of Figure 7).

**The last few years have seen an uptick in private equity including from large strategic corporates.** Strategic corporate investors have participated in several off-grid energy transactions since 2016 (right panel of Figure 7), such as the Engie Energy Access acquisitions of Mobisol, Simpa Energy India, and Fenix International, and Shell Ventures equity investments in Orb Energy, Husk Power, d.light and SolarNow. These investments are in mature companies at later funding rounds and may combine primary and secondary share purchases – offering an exit to early-stage angel and impact investors. Other corporate investments include Marubeni’s investment in Azuri, Sumitomo’s investment in M-Kopa, and Mitsubishi’s investment in BBOX (all in 2019).

<sup>16</sup> GOGLA (2020) “Off-grid solar investment trends”  
<sup>17</sup> For a comprehensive description and case studies of the range of financing products for off-grid energy companies, see ESMAP (2020) “FUNDING THE SUN – New Paradigms for Financing Off-Grid Solar Companies”. [Link](#)

**Figure 7: In the last few years there have been signs of a transition with less new impact investment and a stronger role of for profit and strategic corporate investments**



Source: Greencroft Economics analysis of GOGLA (2020) "Off-grid solar investment trends"

**A key missing market has been local currency lending by local banks, with a limited number of transactions in the last few years.** The majority of lending has been in hard currency (Figure 8), posing a challenge for PAYGo businesses which raise debt to finance upfront costs of the hardware in hard currency, but recover revenues over many months in local currency, exposing them to the risk of currency fluctuations.

**The majority of local currency finance has come from large debt facilities backed by DFIs with relatively small volumes raised from local commercial banks.** The first major local currency facility with a local commercial bank was secured by M-Kopa in 2017; a US\$ 65 million syndicate to finance receivables in Kenya and Uganda, with investment from FMO, CDC, Norfund and Stanbic.<sup>18</sup> Greenlight Planet recently closed a syndicated sustainable finance facility of up to US\$ 75 million from Standard Bank, Citi, CDC and Norfund.<sup>19</sup> At the smaller end of the spectrum, BBOXX has raised finance from local banks in several jurisdictions, including a US\$ 4 million debt facility from the Union Togolaise de Banque,<sup>20</sup> local currency debt from the Banque Populaire de Rwanda,<sup>21</sup> and a recent US\$ 15 million loan from SBM Bank Kenya with a partial (75%) guarantee from GuarantCo.<sup>22</sup>

**Despite clear interest among some international and local banks, commercial bank lending across Sub-Saharan Africa remains a rarity.** As an example of the challenge, Rwanda's Renewable Energy Fund's (REF) Window 5 aimed to catalyse financing through local financial institutions, but despite two banks registering under the REF, no loans were deployed.<sup>23</sup> One of the challenges to greater access to commercial lending is the lack of a consistent (industry wide) view on how to assess PAYGo company profitability. While initiatives such as PAYGo PERFORM may begin to increase comparability and the ability to benchmark PAYGo companies, this is unlikely to accelerate local bank financing in the immediate future, although may bear fruits over the medium term.<sup>24</sup>

<sup>18</sup> <https://m-kopa.com/breaking-records-in-financing-off-grid/>

<sup>19</sup> <https://www.cdccgroup.com/en/news-insight/news/standard-bank-group-citi-norfund-and-cdc-group-partner-to-fund-75-million-sustainability-linked-facility-in-east-africa/>

<sup>20</sup> <https://www.pv-tech.org/bboxx-secures-us54-million-debt-finance-from-togo-bank-for-off-grid-solar/>

<sup>21</sup> <https://www.bboxx.com/news/pioneering-financing-facility/>

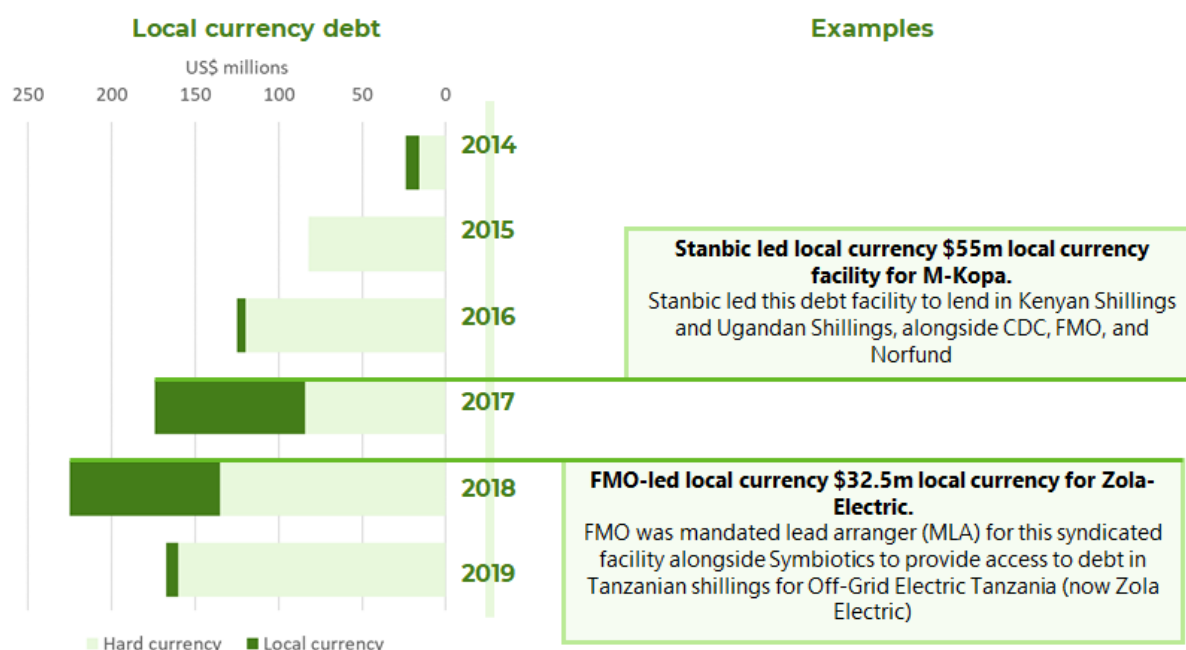
<sup>22</sup> <https://www.bboxx.com/news/bboxx-secures-usd15million-kenya/>

<sup>23</sup> EnDev (2019) "Off-grid Sector Status Report 2018", [Link](#)

<sup>24</sup> [https://www.findevgateway.org/paygo-perform-kpis?utm\\_source=hootsuite&utm\\_medium=&utm\\_term=&utm\\_content=&utm\\_campaign=](https://www.findevgateway.org/paygo-perform-kpis?utm_source=hootsuite&utm_medium=&utm_term=&utm_content=&utm_campaign=)

Small ticket sizes also contribute to the challenges to mobilising local bank lending, who typically see larger investment opportunities (with lower transaction costs) in conventional energy installations, and/or in C&I energy, where it is easier to evaluate potential profitability. Nonetheless, there are encouraging signs of progress, with local banks looking to achieve economies of scale in loans deployed to off-grid energy ventures.

**Figure 8: Paucity of local currency lending to standalone solar providers**



Source: Lighting Global (2020) "Off-Grid Solar Market Trends Report 2020" and Greencroft Economics analysis

**There is a shortage of equity for early-stage ventures operating in emerging country markets – part of the pioneer gap identified by Acumen.** Building on the concentration of finance described above, Acumen found that, by 2018, 67% of the equity invested in the sector since 2012 had gone to just four companies.<sup>25</sup> There remains a gap between early equity investors (seed and Series-A) and larger commercial investors. The missing piece is often equity providers prepared to come in at a relatively early stage (e.g. at or prior to Series-B), to help strengthen the balance sheet of companies as they move from piloting their product to achieving scale. This role is critical in helping to bridge the gap to commercial capital. This equity shortage was confirmed by Persistent in 2020, who noted that, while there are lots of investors enabling higher and higher leverage through debt, there is much less excitement among investors about putting growth equity to work.<sup>26</sup>

**Off-grid ventures are often caught in a cycle of raising new investment and pushing for higher growth and higher impact.** As highlighted by Acumen's 2019 report,<sup>27</sup> there are a lack of exit opportunities for early investors and relatively few commercial investments. The result is that companies may be left seeking to raise capital from investors who want to see accelerated growth and will only provide new capital through primary share purchases.<sup>28</sup> The focus on primary shares may be driven by a need for impact investors (including DFIs) to attribute additional impact to their

<sup>25</sup> Acumen (2018) "Accelerating Energy Access: the role of Patient Capital"

<sup>26</sup> Persistent (2020) "Lessons learned from Lending \$600m to off-grid energy companies"

<sup>27</sup> Acumen (2019) "Lighting the Way: Roadmap to Exits in Off-Grid Energy"

<sup>28</sup> Note, primary share purchases refer to acquisition of newly issued shares to raise new capital. Secondary share purchases refer to purchasing the existing shares held by another investor.

capital, with the result that they typically are unwilling to participate in secondary equity investments, which entails buying-out the existing shares held by an earlier investor.

**This has resulted in a very limited market for secondary shares, meaning early investors cannot exit, and companies struggle to transition from growth to sustainable profitability.** This results in a challenging situation where early-stage investors cannot exit, while new investors get added to the mix. As discussed in Section 7, it may be helpful for FMO to take a lead role in redefining what counts as impact, acknowledging the role of enabling the exit of earlier investors as a part of both commercialisation and achieving sustainable impacts.

**Current flows of finance to the off-grid solar sector fall far short of what would be needed to achieve universal access to electricity.** Estimates of the total financing need range from US\$ 6.6 billion to US\$ 11 billion for standalone solar providers,<sup>29</sup> to up to US\$ 31 billion for solar home systems and mini-grids combined,<sup>30</sup> or at the very upper end – and if mini-grids become a far more important part of the electricity access technology mix, up to US\$ 230 billion for mini-grids alone.<sup>31</sup>

### **3.3. Profitability remains elusive, although there are some signs of success**

**While there has been strong growth in unit sales and revenue generation, profitability remains elusive for most companies.**<sup>32</sup> Across its portfolio, no investee would meet all the guidelines for deployment of the FMO-A balance sheet, such as three consecutive years of EBITDA positive accounts. The sector as a whole is yet to show signs of sustainable profitability, and there is no blueprint for a commercially sustainable standalone solar provider. Nonetheless, there are some emerging signs of success, with some of the large 1<sup>st</sup> generation companies accessing increasingly commercial capital, and some of the specialised 2<sup>nd</sup> generation companies starting to achieve scale, with signs that they could be on the path to profitability.

**Low ability to pay and rapid commoditisation means that cash sales of small systems are unlikely to drive profit.** Cash sales can be a useful entry point for companies to enter new markets, gather market intelligence, set up distribution networks and generate cashflow. Some of the well-established largest solar home system providers such as d.light and Greenlight Planet have relied heavily on cash products as an important part of their product mix. However, these product segments are very price sensitive. They are often commoditised quickly, including from non-branded products (some of which may be lower quality, but some of which may be relatively good and offer consumers a cheaper alternative).

**The PAYGo business model can open up a more commercially attractive market of diversified and higher value products.** Offering payment terms that enable customers to spread the cost of solar home systems, over 12-24 months, the PAYGo model brings SHS within the reach of a much wider share of the population. Nonetheless, the addressable market remains highly price sensitive and requires careful management of repayments and customer protection for what is often the first time a household is exposed to purchasing an asset on credit. For these products quality is a more important consideration, as households need confidence that the system will keep working over several years – with after sales services available. The PAYGo model also establishes a long-term relationship with customers and an ability to offer a range of products to meet each customer's needs, and to upsell and/or make lateral sales to the same customers.

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<sup>29</sup> Lighting Global (2020) "Off Grid Solar Market Trends Report 2020"

<sup>30</sup> Shell Foundation (2018) "Achieving SDG 7: The Need to Disrupt Off-Grid Electricity Financing in Africa", [Link](#)

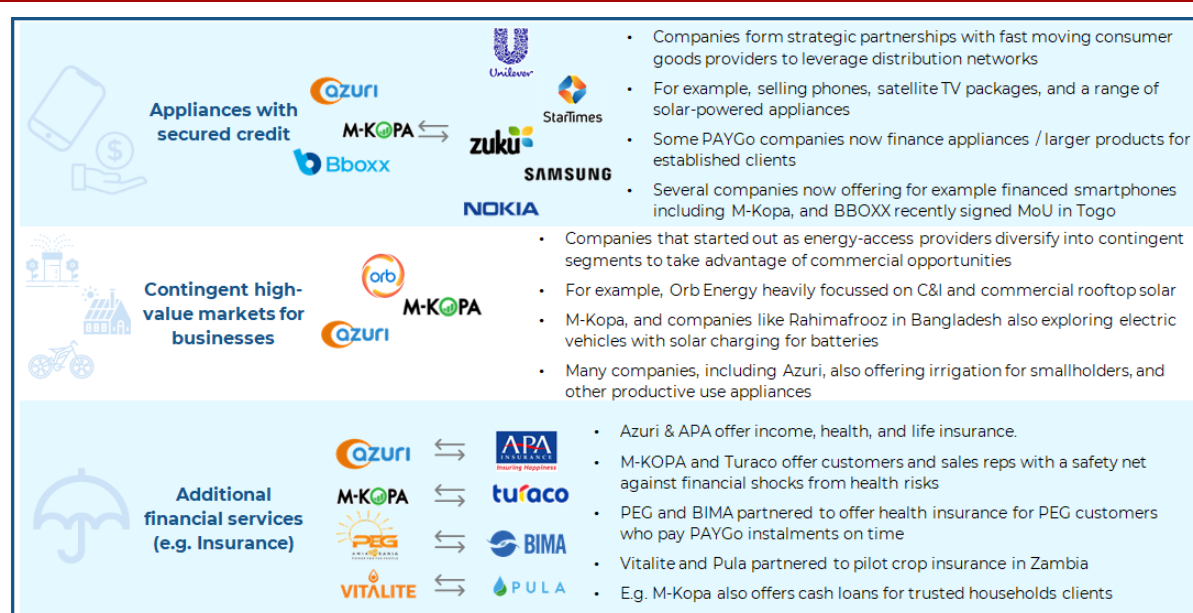
<sup>31</sup> World Bank (2019) "Mini Grids for Half a Billion People: Market Outlook and Handbook for Decision Makers", [Link](#)

<sup>32</sup> <https://www.gogla.org/about-us/blogs/path-to-profitability-an-investors-perspective-5-key-takeaways>

**Nonetheless, the volume of sales of medium and larger solar home systems (20 Wp and above) and larger appliances (e.g. refrigerators) remains at relatively small scale.** By far the biggest product segments in terms of sales volumes remain pico products and multi-light systems with basic charging for e.g. mobile phones.

**Companies are increasingly offering a range of differentiated products and services.** Some companies continue to provide a full vertically integrated service, while others are focusing on product design and hardware, partnering with specialized retailers and last mile distributors to reach customers. Companies are also diversifying 'horizontally' beyond energy access; many no longer describe themselves as energy access providers but rather distributed energy utilities, or asset finance providers that offer a range of products. Indeed staying still can be a risk, as consumer aspirations evolve and so must the products offered by SHS providers. Leveraging distribution networks to sell a wider range of products can be done at low incremental cost, offering potentially high revenue generation. Examples of this evolution in product offering is provided in Figure 9.

**Figure 9: Diversifying company offerings**



Source: Greencroft Economics analysis of various company press releases and product offerings

**There remains a fundamental tension between impact and profitability.** Companies are juggling the demands of investors and governments to achieve access for the poor against their path toward commercial sustainability. The latter may require companies (among other things) to sell to mid- and higher-income populations; to take time to expand to new markets or market segments; and/or to diversify their portfolio to include non- or 'beyond'-energy access products. It may be that some market segments are best reached with grant funding, or through carefully designed demand or supply side subsidies (e.g. results-based financing).

**COVID-19 challenges including interrupted supply chains, cost increases, diminished product quality and movement restrictions have affected off-grid companies to varying extents.** On the demand side, PAYGo portfolio quality declined, with write-offs doubling to 14.5% year-on-year in 2020, while macroeconomic challenges threaten the pace of new customer acquisition.<sup>33</sup> On the supply side, 87% of companies expect to have to increase prices in response to an array of challenges including increased costs and delays in the supply chain, and depreciation of the dollar

<sup>33</sup> Lighting Global (2021) "PAYGo Market Attractiveness Index 2021", [Link](#)

against the yuan (with most hardware manufactured in China).<sup>34</sup> As a result, there has been unprecedented digitisation of the supply chain, particularly among last mile distributors who have had to innovate rapidly to avoid losses. Digital applications are streamlining smaller companies' operations, enabling field credit risk assessments, and facilitating remote marketing, sales and customer management – all of which make local distribution partnerships increasingly attractive.

**Nonetheless, the PAYGo business model has proved more resilient than cash since the emergence of COVID-19 in 2020.** The unit volumes of PAYGo sales have remained stable, although have not continued to grow in line with the upward trend of the previous five years. However, cash sales have been far worse affected, dropping by 30% compared to pre-pandemic sales volumes.

### **3.4. Mini-grid business models are changing as more is understood about consumer demand**

**Renewable or renewable-hybrid mini-grids are widely considered a valuable least-cost electrification technology for rural areas.** However, the commercial market is not well-established, with most financing in the form of (limited) concessional debt or grants.<sup>35</sup> Portfolio approaches to maximise economies of scale, demand stimulation to boost revenue, results-based financing, and cost-reflective tariffs all help, but developers still struggle with unit economics.<sup>36</sup>

**Anchor-business-community ('ABC') business models, whereby a large anchor client ensures electricity demand, are not always possible in rural areas.** In search of profit, mini-grid companies are either diversifying into peri-urban, grid-distribution or commercial and industrial (C&I) models or attempting to stimulate demand by financing productive appliances, training clients on new businesses and providing market linkages for clients' products.

**Mini-grid developer prospects are heavily reliant upon a favourable policy and regulatory environment.**<sup>37</sup> Regulatory issues impact site selection, licensing and permitting procedures, future grid integration, and the access to national subsidy schemes. Projects are often delayed due to the long lead time required to apply for concessions, licences and environmental approvals.<sup>38</sup> In the past five years many governments have acknowledged -- and facilitated -- the role of mini-grids in achieving universal energy access. Nonetheless, mini-grid developers and financiers have typically struggled to achieve commercial sustainability – for example of 43 mini-grid projects supported by EEP, 15 ended before completion of planned activities, while many developers remain reliant on grant funding, or are led by non-profit organisations or government institutions.<sup>39</sup>

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<sup>34</sup> <https://www.gogla.org/about-us/blogs/off-grid-solar-supply-chain-disruption-87-of-manufacturers-expect-increased-prices>

<sup>35</sup> Mini-grids Partnership (2020) State of the Global Mini-grids Market Report 2020: Trends of Renewable Energy Hybrid Mini-grids in Sub-Saharan Africa, Asia and Island Nations

<sup>36</sup> SNV (2021) "The Market for Productive Uses of Solar Energy in Kenya – Status Report"

<sup>37</sup> UNIDO (2020) Clean Energy Mini-grid Policy Development Guide

<sup>38</sup> EEP Africa (2019) "Opportunities and Challenges in the Mini-Grid Sector in Africa – Lessons Learned from the EEP Portfolio".

[Link](#)

<sup>39</sup> *ibid*



## 4. FMO's role in the off-grid electricity sector

**This section analyses the FMO contribution to the off-grid electricity sector since 2014, through investment capital deployed and through capacity development initiatives.** First, from section 4.1 to section 4.3, it describes the type of role the FMO has played in a range of investment contexts, how the FMO strategy has evolved and influenced investment decisions over the past decade, and the justification for, and importance of, the role of Dutch government funds. Then, from section 4.4 to section 4.6 it analyses the relative strengths of FMO as an investor, areas for improvement highlighted by investees, and a description of the role of FMO in providing capacity development, finishing with some areas where the FMO role could be optimised based on lessons learned to date.

### 4.1. FMO has supported a diverse set of companies at different stages of maturity

**FMO has supported a wide range of investees at different stages of maturity and in different regional contexts.** Its portfolio includes, for example, relatively mature 1<sup>st</sup> generation SHS companies as well as major 2<sup>nd</sup> generation companies and start-up operations in initial capital raises. It includes SHS, lantern, pico and mini-grid providers.

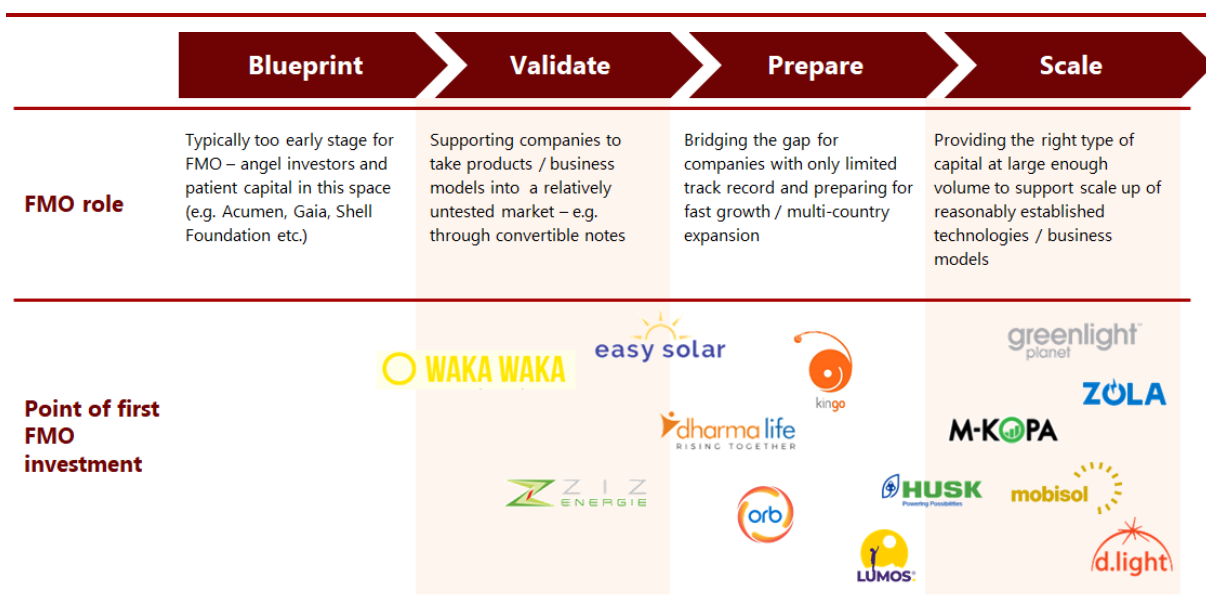
**FMO also supports a relatively diverse range of product-offering among its investees.** This includes some investees diversifying their product offering, including transitioning from a household to C&I focus, and companies offering appliances and products to use with a system that go beyond pure energy access. This can pose a challenge for DFIs in general and for FMO in particular, where use of the concessional government funds may be restricted to supporting a narrow set of defined energy access impacts. For example use of the Access to Energy Fund, which comprises most of the finance deployed by FMO, must show alignment to the AEF strategy including providing energy access to unreached households, productive use of energy, and energy technology innovation.<sup>40</sup>

**FMO has also provided different types of support, spanning equity and credit instruments.** This includes both primary and secondary share purchases, local currency facilities, and guarantees for local banks. FMO has been relatively proactive in terms of type of product and position in the market. It is often the lead DFI in transactions and has supported a variety of first-of-a-kind transactions, such as a receivables debt facility, local currency facilities, bridge finance and early-stage equity.

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<sup>40</sup> FMO (2019) "Access to Energy Fund Investment Strategy 2019 – 2028". [Link](#)

**Figure 10: FMO has taken a range of different positions with a diverse range of experience with different types of companies and different stages in their commercial journey**



Source: Greencroft Economics analysis of data provided by FMO, based on categorisation of investment stages described in Acumen (2018) “Accelerating Energy Access: the role of patient capital”

## 4.2. The FMO strategy has evolved in line with industry trends

**FMO appears to have evolved through three phases of investment (Figure 11).** While there has been no publicly stated strategy, FMO has regularly reviewed its investment portfolio and adjusted its approach as the market has evolved and it has gained more experience.

**In the first few years of investment, the FMO took on some high-risk, early-stage transactions in relatively untested business models and companies.** For example, FMO invested equity at an early stage in Orb Energy’s expansion of its solar home system offering from India into Kenya and provided a convertible grant to Off-Grid Solutions to take the WakaWaka Power product into pilot stage in Rwanda. These types of transactions were high-risk and an important step in companies and investors gaining experience in the sector. In this phase, investment opportunities were limited, and FMO was an early mover supporting transactions with young companies (even relative to what was still an unestablished sector, FMO took on high-risk transactions).

**In the second phase, as the sector matured between 2017 and 2019, FMO invested in some of the well-established companies and capitalised the first specialised sector funds.** FMO invested in several 1<sup>st</sup> generation companies – and as such is part of the trend of capital concentration into a relatively small set of companies (as described in Section 3.2). In this vein, FMO has invested in M-Kopa, d.light, Zola Electric, Lumos, Kingo, Greenlight Planet and Mobisol, representing seven of the top 10 standalone solar providers by capital raised. This is not a surprise, as investors have been in search of – still elusive – evidence of profitability (see Section 3.3); the FMO investments in these companies represented the best prospects for commercialisation at the time.

**In this middle phase, some the transactions FMO supported included financial innovation to pilot first-of-a-kind financing instruments.** The majority of FMO finance in this phase was provided as debt, supporting the expansion of PAYGo companies needing working capital. Transactions included the first major local currency transaction – the Stanbic-led US\$ 55 million facility with M-Kopa in 2017, and lending to national operating companies such as Zola Electric-Tanzania and Lumos-Cote d’Ivoire.

**The FMO also helped capitalise – and gained experience from – some of the major specialised credit and equity investment vehicles.** FMO’s strategy towards investing in these specialised funds has generated important successes – both for the funds which are performing relatively well given the challenges faced by many companies in the sector, and for the FMO in terms of exposure to, and learning from, a wider portfolio of companies. FMO was one of the early DFIs in these funds – in some cases one of the first investors to commit funds. FMO investees and co-investors consistently cite the importance of FMO investment in providing reassurance to other financiers. In some cases, FMO was sought out specifically to join investment rounds in recognition of its expertise. FMO’s investments are highly valued by fund managers. However, FMO has typically taken senior positions and it is only relatively recently that it has begun to take a lead role in fund design, as well as in accepting junior lending positions to catalyse other investors (e.g. in the EEGF).

**Investment through specialised funds has enabled FMO to support a wider type of businesses – including productive use technologies, and C&I.** The fund managers have more flexibility than FMO might have in its direct investments to target a broader range of companies than just stand-alone solar products. For example, these funds often also support C&I solar, mini-grids, productive use, and/or other companion services like telecommunications and consumer finance providers (for energy access). This exposure is both impactful and beneficial to FMO, in that it represents a broader industry trend where companies that only offer household solar is becoming less relevant as the market evolves to more diverse product profiles in pursuit of both profitability and impact.

**In the third phase, since 2019, FMO is leveraging its wide experience and expertise to take on higher risk equity transactions.** The investments in ZIZ Energie (Chad) and Easy Solar (Sierra Leone) are early-stage investments (Series B or earlier) and aim to provide bridge financing to help these companies prepare for subsequent investment rounds. They are highly additional transactions in ventures that it is unlikely could have raised this type or volume of finance from other sources – including other DFIs (see Box 1 for a discussion of additionality). This strategy responds directly to the equity gap identified by other investors such as Acumen and Persistent (see Section 3.2). They demonstrate a significant risk-appetite from FMO, and reflect its confidence arising from its experience as a leading investor in the sector. Since 2019, FMO has also shown willingness to support consolidation and purchase secondary shares alongside primary shares in existing investees, alongside corporate investors providing equity for the first time.

**Figure 11: The evolution of the FMO investment strategy since 2014**



Source: Greencroft Economics

### Box 1: Defining additionality for FMO investments in off-grid ventures

Throughout this review we have considered the additionality of FMO's role, from both a financial and a non-financial perspective. In assessing the role of FMO through its investments and capacity development initiatives, our guiding principle was that FMO should pursue investments that expect to produce economic, social and/or environmental returns, but whose risks and potential for commercial returns are such that they would not be able to attract sufficient private investment capital. This is consistent with the OECD approach to considering additionality in terms of whether the investment led to effects which would not have occurred without the investment.<sup>41</sup>

For investments, we first considered additionality in terms of *volume* and *terms*. For volume and terms we assessed whether the investee could have sourced the same volume of finance on (i) similar terms, or (ii) on less favourable but still viable terms. In a very small number of cases investees may have been able to source funds from other investors on broadly comparable terms – although not necessarily from private investors. However, in most cases there would not have been any other financing available and without FMO the deal would have not closed, or would have closed at a significantly smaller size, or would have been delayed significantly with substantial uncertainty around reaching final close.

The second criteria for considering additionality within investments was whether there was any evidence of innovation on the *type* of financial product. By product additionality we mean the structure of the product other than the cost (i.e. interest rate, target rate of return). This could include for example longer tenors than would otherwise be available, or a financing product that was not widely available to the sector and where there was value in the FMO role as DFI in catalysing a proof of concept. Some of FMO's investments were in companies that were relatively successful in raising finance (so low additionality by the criteria of the paragraph above), but where there was significant innovation in the type of finance provided. For example, supporting synthetic currency facilities at scale, and providing innovative forms of early equity rounds that are not readily available sector-wide (e.g. various forms of convertible notes)

Other potential criteria for financing additionality included the value of long-term partnerships. FMO's financing can also provide additionality through enabling the creation of partnerships that allow FMO to support companies in subsequent fundraising rounds (in ways that other financiers would have been unlikely to do). For example, FMO has supported secondary share acquisitions as some investees start to consolidate shareholdings, and in investing early in some businesses with the intention of helping move the business to be in a position to launch subsequent series of investment raising. This could also include partnerships that have helped crowd in financiers who are otherwise not highly active in the sector.

We also considered the extent to which FMO offered non-financial support otherwise not available to the investee. This included supporting commercial due diligence processes, corporate governance, credit management processes etc., and exploring with investees the extent to which this support could not have been carried out by the business with its own resources, or with support from other parties.

A final consideration was the potential for development of a proof of concept that transcends a single transaction. Specifically, while additionality was always assessed on a case-by-case basis for investees, we also considered where there may have been a case for piloting transactions which could then unlock repeat transactions for other companies in the sector. For example, setting a leading example as a DFI participating in secondary share purchases to enhance exit opportunities for earlier investors, working with local banks on local currency lending etc.

## 4.3. Dutch government funds have played a key role in FMO investments

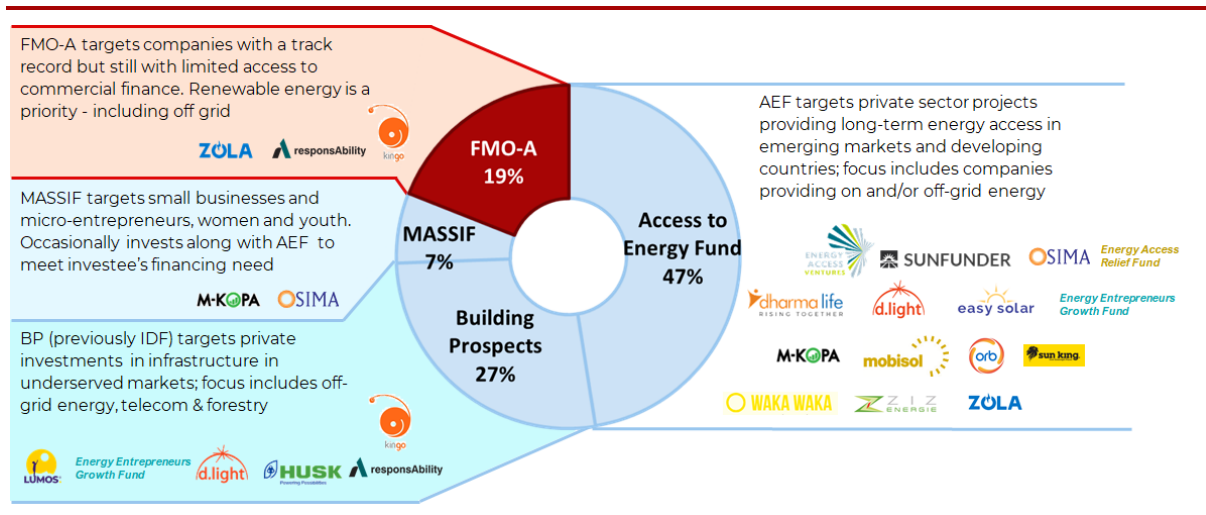
Dutch government funds have provided the majority (81%) of FMO funding committed to the off-grid sector to date. The Access to Energy Fund (AEF) is the main source of committed funding

<sup>41</sup> OECD (2021) "Evaluating Financial and Development Additionality in Blended Finance Operations", [Link](#)

(supporting 14 of 18 clients).<sup>42</sup> The Building Prospects (BP) fund invested in six clients, MASSIF in two and Ventures has made one investment so far. In some instances, multiple sources were committed in a single round, to reach the needed volume and/or to take account of different risk profiles, e.g. AEF and MASSIF or AEF and FMO-A, in combination.

**FMO-A has only been committed three times, and there is no clear trend to increased use of FMO-A over time.** FMO-A was used in the second round of investment into the responsAbility ACPF in June 2019, in a second round of direct investment into Kingo in Latin America in August 2018, and in a first round of FMO investment in Zola Electric Tanzania in December 2018 (i.e. into a relatively well-established company in a relatively mature operating context).

**Figure 12: Dutch government funds provided about 80% of FMO support for the off-grid sector**



Source: Greencroft Economics analysis of data provided by FMO  
Notes: [1]: based on commitments in FP

**In terms of commercialisation, there are limited signs of further opportunities to mobilise the FMO-A balance sheet at scale.** The performance of companies across the sector is still highly variable and, especially since the emergence of COVID-19 in early 2020, many companies face a challenging operating context. This is true for FMO's investments – and equally applicable to investments made where FMO-A has been deployed as to those where only the Dutch government funds have been used. This is consistent with the broader pattern in the sector where even mature companies that have had some profitable years still face significant challenges and uncertainty. There is no demonstrated track record of sustained profitability in any technology segment or business model, and, until very recently, a diverging array of key performance indicators used by different companies and investors through which to assess PAYGo businesses. While this may be starting to improve through initiatives such as PAYGo PERFORM,<sup>43</sup> there is still no available comparable industry-wide data to benchmark PAYGo businesses – or even simple industry-wide financial metrics of for example gearing ratio (debt : equity leverage ratio).

**The extensive use of Dutch government funds is therefore justified and in line with market trends.** The choice of government funds relative to FMO-A funds has been, and continues to be, reasonable given the characteristics of the investees and the limited evidence of commercial success described above. Overall, opportunities for FMO-A continue to be limited in the current

<sup>42</sup> This section makes the distinction between committed and disbursed funding as in a few cases the funding has either not yet or will not ever be fully disbursed.

<sup>43</sup> [https://www.findevgateway.org/paygo-perform-kpis?utm\\_source=hootsuite&utm\\_medium=&utm\\_term=&utm\\_content=&utm\\_campaign=](https://www.findevgateway.org/paygo-perform-kpis?utm_source=hootsuite&utm_medium=&utm_term=&utm_content=&utm_campaign=)

market context as very few companies meet the guidance to justify deployment of FMO-A (such as ideally several years of positive EBITDA).

**The long-term viability of direct investees continues to be difficult to predict.** Most investments have been in companies where either the company or the business model was still relatively young and still at risk. Even in cases where FMO-A has invested in what appeared to be more financially robust companies, these have, in some cases, required significant adjustments in their business models. This mirrors the experience of the sector more broadly as companies face challenges in finding long term paths to financial viability.

**Nonetheless, there is a small risk that FMO may be on the cusp of crowding out or missing opportunities to catalyse commercial investors in the larger, better-established companies.** The Investees and investors we interviewed generally agreed the private sector is not ready to invest significant volumes in the sector. However, there are examples where managers of funds that FMO has invested in feel more in direct competition with FMO, and at least a handful of transactions where commercial investors may be willing to invest. In this context and given the very high concentration of finance to a few companies described in Section 3.2, there is a risk of DFIs including FMO, crowding out commercial debt providers. At the very least, several interviewees felt that the market is mature for DFIs to de-risk investments by the private sector through taking more junior positions.

#### **4.4. FMO is highly valued by clients as a committed, reliable, pragmatic and knowledgeable investor**

**The perceptions of FMO's role in the sector are positive – investees would not have been able to raise the volume and/or type of finance without the FMO contribution.** FMO has clearly contributed to closing transactions that would not otherwise have happened, helped establish a volume of finance in the sector that would not otherwise have happened, and established first-of-a-kind financing products. FMO is seen by investees and co-investors alike as being a rare DFI that is prepared to come in early, provide critical financial volume and retain an involvement in the company into the medium term. In some cases, it is helping companies bridge the pioneer gap – entering before Series B and then helping the company through subsequent funding rounds, providing an important link to other sources of commercial finance.

**One of the most consistently valued contributions of the FMO is the dedication and commitment of its investment officers.** FMO investment officers are seen as highly capable and bring many years of experience to transactions. Their ability to scrutinise the commercial details of transactions, take the time to understand the client business in detail, and to form personal connections with counterparts are highly appreciated and investees do not consider this the norm among investors in the sector. Clients also report seeing much higher frequency of personnel changes and leverage of junior staff by other investors. This provides FMO with a deeper understanding of its investees, that leads to a willingness to show flexibility to make deals happen that is not matched by other investors. Several investees volunteered examples of where investment officers have taken additional efforts to make deals happen in contexts that it would have been easy to walk away from.

**Investees also value the high degree of flexibility to understand each individual client's context and needs, and to offer support during difficult phases.** Several investees, as well as external experts, noted that FMO investment officers bring significant expertise in the sector, and a strong appetite to engage in the detail of each investee's specific operating context and business model. This results in an ability to be creative and flexible and to support investees when they go through difficult periods. This applies to both direct investees and funds.

**FMO involvement is often reassuring to other investors.** As one of the most active DFIs in the sector, FMO involvement in a deal or as an existing investor is consistently reported as being reassuring to other investors. It is perceived as a key investor which other European DFIs and investors. These investors are prepared to take a commitment from FMO as a strong signal of credibility of the investee.<sup>44</sup> In some transactions FMO has played a crucial role as a committed early investor which helped mobilise other investors, for example making the first commitment to the SIMA I fund which helped bring other DFIs onboard. This is broadly consistent with the recent ITAD (2020) evaluation of FMO-A, which noted that “*FMO-Investment Management (FMO-IM) is a clear example of crowding in (i.e. financial additionality), as these investors are typically unfamiliar with these markets and are only prepared to invest because of the comfort provided by FMO and its experience with these types of investments*”.<sup>45</sup> A recent evaluation of the AEF also noted that “*AEF has mostly invested in the riskier part of project financing structures or provided seed capital for early stages of business development. FMO has also often acted as deal arranger, which meant that thanks to the AEF investment other investors were attracted in a direct or indirect way*”.<sup>46</sup>

#### **4.5. FMO has also supported companies and wider sector development through a broad range of capacity development initiatives**

**As FMO gained experience in the sector it has also increasingly provided capacity development – initially to investees to improve core business functions.** Since FMO’s first dedicated capacity development (CD) initiative in the sector in early 2017, FMO has supported 15 CD projects, (right panel of Figure 4). Most of these CD initiatives have been provided alongside investment in FMO clients. For example, FMO worked with M-Kopa and Mobisol to develop credit management systems, which also led to the development of customer protection principles. This type of support has continued with later investees, including similar support to d.light and Zola Electric., and more recently core business support to ZIZ Energie (ESG consultants) and Easy Solar (supply chain management).

**FMO’s contribution to credit management, customer protection, and ESG has helped companies accelerate performance in these areas and contribute to higher standards across the sector.** The contribution of FMO to such initiatives spanning several of the industry’s major companies, and to sector-wide initiatives through GOGLA, should support commercial prospects in the long term by accelerating implementation of activities that would bear a cost companies are reluctant to bear while they are focussing on the fast expansion of their business. By supporting companies to invest in ESG and customer protection, FMO has helped reduce the cost of activities that might otherwise (be perceived to) represent a short-term competitive disadvantage. This echoes the findings of the ITAD (2020) evaluation that raising the bar on such activities “*is a clear win-win to the extent that standards are implemented across the sector*”. Overall, FMO is building on its comparative strengths, again as confirmed in the ITAD (2020) evaluation which noted “*overall, FMO’s E&S policies, its practices in the case studies and its reputation amongst peer DFIs indicate that it is performing well on E&S risk management and is seen as a leading DFI on this issue*”.<sup>47</sup>

**The core business capacity development has generally been well received and supported investees in functions they would otherwise not have pursued as early in their venture.** For example, some of the now well established PAYGo businesses felt that they would not have been

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<sup>44</sup> The findings presented throughout this report stem directly from the interviews and portfolio analysis conducted for this review. However, the findings are substantially consistent with other sources, such as recent independent evaluations of the FMO-A conducted by ITAD (2020) and AEF conducted by Ape (2017).”

<sup>45</sup> ITAD (2020) “*Evaluation Report Evaluation of FMO*”. [Link](#)

<sup>46</sup> APE (2017) “*Evaluation FMO Access to Energy Fund*”. [Link](#)

<sup>47</sup> ITAD (2020) “*Evaluation Report Evaluation of FMO*”. [Link](#)

able to scale up so quickly without *both* the investment and the non-financial support to improve for example credit management processes, customer targeting and pricing.

**For most direct investees, however, the main FMO contribution is financial; capacity development is sometimes seen as peripheral – with a risk of creating more work for investees.**

Quite a few respondents for companies that received CD support showed awareness of the initiatives but were not able to point to specific and significant changes to business operations. Some interviewees were forthright that they would not necessarily expect capacity development from an investor and felt the business could and should manage itself without such support. A handful of investees suggested that CD can be a distraction, especially if carried out through assessments and consultancy assignments which lead to recommendations that create additional workload for already capacity constrained companies.

**A consistent recommendation from investees was that where CD is provided it should be committed to resolving issues identified and embedded within the company.** For example, one investee pointed to an example from a commercial investor which provided a secondee to work directly with the business for a year, both to get to know the business better but also to be in a position to contribute to suggesting ways to improve company performance – with some specific examples of success arising from this type of long term, embedded technical assistance.

**FMO has also used grant funding in its CD portfolio to support initiatives to catalyse investment in the sector and/or deliver key outcomes for end users.** For example, FMO contributed to the establishment of the Access to Energy Institute (A2EI) as a research institute that could draw on the experience of senior managers of companies in the sector to help advise and catalyse successful company performance. FMO has also provided grant funding to the Acumen Pioneer Energy Investment Initiative (PEII) to provide seed finance to very early-stage companies in countries where solar home system markets are still not established. In 2020, FMO provided grant funding to d.light (also an FMO investee) to electrify 300 rural Kenyan health centres – providing access to key public health services in response to the COVID-19 pandemic.

**The advisory and/or informal support FMO provides to investees can often be more important than the formal CD programmes.** Informal knowledge transfer from FMO, particularly in relation to commercial due diligence and financing, has been at least as important to clients as the formal capacity development FMO provides. Investees report that this increases their trust of, and respect for, FMO. They cite numerous positive examples particularly in relation to corporate governance, consumer protection principles and developing credit processes. FMO plays an important role in governance and advisory position on boards of both direct investees and the specialised sector funds. All investees who have benefitted from a more hands-on role from FMO board advisors have greatly valued the experience that FMO brings.

**FMO has also provided support to the industry association GOGLA to implement key sector wide initiatives.** Building on its experience developing customer protection principles on a case-by-case basis with investees, FMO provided grant support alongside CDC and DOEN Foundation for GOGLA to develop industry wide CPPs in 2018. FMO has continued to support GOGLA to carry out important key industry functions, including supporting the PAYGo PERFORM initiative, recently launched in July 2021.<sup>48</sup>

**Overall, the role of FMO as investor is stronger than its support to wider sector initiatives.** The contribution to the sector-wide initiatives described above has been relatively limited, and very much in a support role rather than as a driving force. While this is not the main role of a DFI, some interviewees expressed the view that, given the breadth and depth of the FMO experience in the

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<sup>48</sup> <https://www.findevgateway.org/paygo-perform-kpis>



sector, it could be more proactive in sharing knowledge and networks through enhanced participation in sector-wide programmes. While almost all interviewees had a very clear perception of FMO as a financier, they had much less awareness of the FMO appetite and ability to support the sector through capacity development – and felt that there are other capacity development or technical assistance providers who are more proactive.

#### **4.6. Some areas where clients and co-investors would like to see FMO evolve its role**

**Some direct investees and fund managers would like FMO take a more catalytic position in debt transactions.** As described in Section 4.3, some investors and investees express a feeling that there is now a risk of crowding out potential commercial investors in senior debt tranches for relatively well established and well capitalised companies. There may be opportunities for FMO, in particular when using the concessional Dutch government funds, to take junior positions so as to catalyse greater interest from commercial investors in senior tranches. This must of course be balanced against the need for FMO to seek companies on a path to commercial success – which is elusive and may not justify taking on junior positions even in relatively well-established companies.

**In a similar vein, there is a perception that FMO investment in specialised funds may inadvertently result in competition between FMO and these funds for subsequent transactions.** There needs to be a careful balance struck between contributing to funds – which fill an important part of the investor ecosystem and help FMO gain exposure to learn from a wide set of investees – and not pricing these same funds out of future transactions. It is a tricky balance as direct FMO lending and equity investment is highly valued by investees and can be preferred to the same volume provided by funds, and FMO should continue to provide such investments.

**A small number of interviewees felt that there may be a risk of investors continuing to finance all companies in the sector, reducing the signal of successful commercial ventures.** Especially given the impact mandate of many investors in the sector – including DFIs like FMO – there is often a relatively high degree of flexibility and patience to finance ventures which are not showing strong signs of achieving profitability. While this may be beneficial from an impact perspective, it may make it more difficult for commercially successful prospects to easily differentiate themselves, and thereby have a better chance of securing commercial investors. This view is also to some extent expressed in a recent evaluation of FMO investments, noting that there is a risk that *“concessional finance does not enable a commercial transition, but instead supports non-viable enterprises, wasting scarce financial resources, or that it supports commercially viable enterprises, distorting market development”*.<sup>49</sup> One partial solution to this challenge is to clearly separate, and fund differently, those investments that are focused primarily on achieving impact.

**A few investees felt that FMO could do more in opening access to networks to support subsequent funding rounds.** While the finance is always highly valued and appreciated, and the non-financial support through capacity development initiatives and corporate governance support are also often valued, some investees felt that FMO could be more proactive in helping make the link to other financiers and to support investees in moving to subsequent – more commercial – funding rounds.<sup>50</sup> For the most part, investees felt that they made connections to other investors

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<sup>49</sup> ITAD (2020) *“Evaluation Report Evaluation of FMO”*. [Link](#)

<sup>50</sup> For example, by helping investees identify other potential funders, and if feasible facilitate relationship building more “actively” with these subsequent financiers. FMO is seen as a valued investor and with a strong brand that is valuable for investees, but not as a very active shareholder which will also provide proactive suggestions and ways to approach other investors.

through their own networks, and would have valued more direct engagement from FMO (it is not clear if this could have been done without any potential conflict of interest).

**FMO's willingness to take on small transactions is highly valued but can also entail high transaction costs.** Several investees felt that the FMO requirements on small transactions were onerous and took a long time to fulfil. A few investees – ranging from smaller companies but also including larger well-established investees – described the process as “*painful*”, noting that due diligence can be very time consuming, to the extent that it puts the investee business under considerable strain and means they can not access the capital they need as quickly as they had hoped, and/or they have to incur significant transaction costs. While FMO is seen as comparable to other DFIs in this regard, investees suggest it may be worth exploring options to take a different approach when building a portfolio of smaller ticket size investments. For example either making technical assistance available to small companies which do not have the same legal / financial expertise in-house, and/or investing through funds which specialise in smaller ticket size and can spread transaction costs across multiple deals.

**While most capacity development has been valuable, it can also be a distraction if not demand-led and tailored to the needs of the client.** The most sought-after support mentioned by investees is embedded technical assistance working with the business over a committed period. This ensures the assistance both identifies and seeks to address problems, including with a degree of pragmatism.<sup>51</sup> What can be less well-received is top-down technical assistance through consultancy type assignments that identify problems but then are perceived to leave businesses to resolve alone. Investees have typically appreciated the support from FMO in terms of working on commercial transactions, in particular its clear focus on commercial details, carried out in a way that supports the companies and facilitates engagement with other investors; in credit management systems; and in some targeted ESG support. Noting the point on transaction costs in the paragraph above, some investees would have found it highly valuable for FMO to provide transaction expertise that it has in-house, which small investees do not – for example on legal or insurance expertise etc.

**Some investees and co-investors would value increased clarity on FMO's strategic plan for investments in the sector.** It is not clear to some investees interviewed why FMO does or does not make a particular investment, especially regarding, for example, technologies that may compete with the grid. This may be a result of FMO's pragmatism and willingness to work with investees on strengthening their position rather than imposing rigid boundaries on investments.

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<sup>51</sup> There are also organisations which offer this type of support, such as the Young Expert Programme: see <https://www.yepprogrammes.com/programmes/yep-energy>

## 5. FMO investee impacts achieved

**This section quantifies the FMO contribution to unlocking impact through its investments in off-grid electricity ventures.** Sections 5.1 to 5.4 summarises impact achieved for end users of off-grid energy systems, while Section 5.5 summarises the contribution of FMO to the commercial journey of investees.

**We assess separately the impacts achieved through direct investments in off-grid energy ventures, and the impacts achieved through investments in off-grid energy funds.** As discussed in Section 5.2, there is significant overlap in the companies that make up the portfolios of the six specialised funds which FMO has helped capitalise, and with FMO's direct investments. While we can robustly identify the impacts achieved by FMO direct investees – and estimate the share of that impact attributable to FMO's capital deployed – this same depth of analysis is not possible for the specialised funds given data availability.

**The attribution of impact is done based on the share of capital provided to each investee.** This in turn is based on (1) the FMO equity shareholding, (2) the FMO outstanding long-term debt, (3) total long-term debt and permanent equity raised by each business. More information on impact calculations and attribution is provided in Annex 1.

### 5.1. Summary of approach

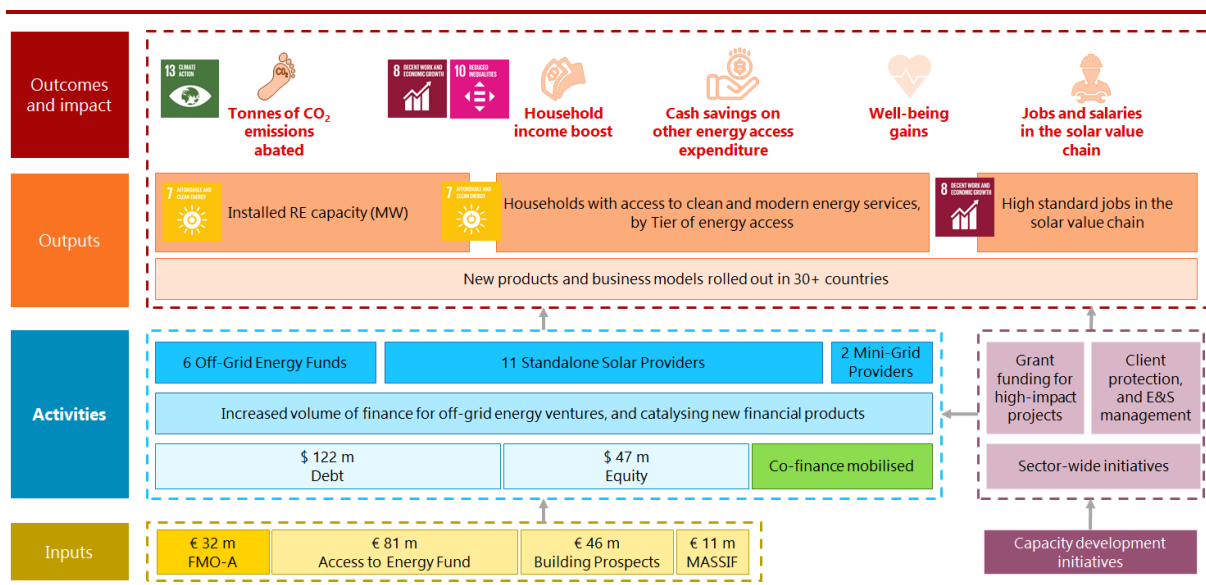
**The theory of change (TOC) below traces the relationship from investment capital and capacity development through to outcomes and impacts.** The theory of change for FMO's off-grid portfolio is based largely on the broader theory of change for the Access to Energy Fund, given that the majority of finance deployed to off-grid energy investees originates from the AEF.<sup>52</sup>

**The sustainability of these impacts rests on supporting a commercially viable ecosystem of companies.** While the TOC is oriented around how FMO's support to the sector delivers impacts through its portfolio of investees, these impacts will only be sustained – and potentially multiplied – if companies are commercially sustainable. This is discussed in Section 5.5 below, which could be seen as a cross-cutting requirement underpinning the TOC.

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<sup>52</sup> FMO (2019) "Access to Energy Fund Investment Strategy 2019 – 2028". [Link](#)

**Figure 13: FMO off-grid energy theory of change**



Source: Greencroft Economics

**We follow the methodology set out in GOGLA’s standardised impact metrics to estimate the impact of FMO’s investments in the off-grid sector.** These impact metrics have been developed to provide a consistent industry-wide benchmark, with parameters adapted to represent the best available evidence in different regions. We set out the parameters and how these are used to generate impact estimates in Annex 1.<sup>53</sup>

**While some of the FMO investee companies have carried out their own impact evaluations, we do not make client-specific adjustments to impacts.** This is for three reasons:

- First, we do not have information to justify adjustments for all clients, and consider it more appropriate to use well recognised industry-wide impact metrics in the absence of being able to adjust for the circumstances of all FMO off-grid energy clients.
- Second, even where clients have published impact studies they are often not comprehensive enough to serve as a basis for our estimates – for example the d.light evaluation in 2015 only looks at one specific d.light product (the D20g solar home system), not the full range of products that different customers purchase.
- Third, there is relatively limited data in most impact studies – and we do not consider these sufficient to generalise the values beyond the specific contexts of the original study.

**The discussion of gender results below synthesises a separate study undertaken concurrently by FMO.** Running concurrently to this off-grid energy review, FMO commissioned Value for Women to first analyse the performance of its direct investees, before then moving on to a second phase to enhance and build the gender capabilities of selected investees of FMO through dedicated technical assistance support.

<sup>53</sup> GOGLA (2020). “Standardised Impact Metrics for the Off-Grid Solar Energy Sector”. [Link](#)

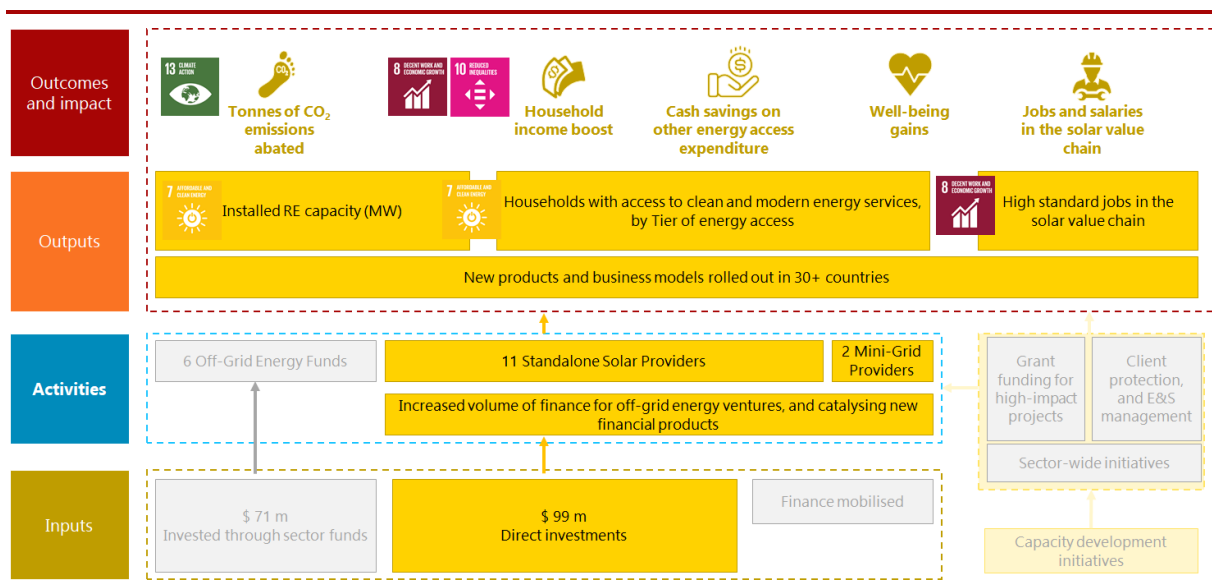
## 5.2. Impacts achieved by FMO's investments in off-grid solar companies

### Impact achieved by FMO's direct capital invested in off-grid energy ventures

First, we trace the impact achieved by FMO's direct investments in off-grid energy ventures, in the period since the initial FMO investment. The updated theory of change shown in Figure 14 identifies the impact pathways included in this analysis, while the inputs and activities not included are greyed out. While the quantification of impacts is based only on the US\$ 99 million of direct investments made by FMO, we also describe the contribution made by capacity development initiatives in support of this capital deployed.

The US\$ 99 million FMO has invested directly in off-grid solar companies has contributed to reaching 40 million people with energy access technologies (Figure 15). This reach in terms of energy access has delivered a range of social, economic, and environmental impacts – discussed further below.

Figure 14: Tracing the impact of FMO's direct off-grid energy interventions



Source: Greencroft Economics

First and foremost, increased energy access has contributed to an improved quality of life for end user households. Solar energy products give households access to a basic energy service, which brings a range of welfare benefits; SDG 7 enshrines the goal of universal access to energy as a goal in and of itself. While we discuss some of the more quantifiable benefits below, the impact of these products is first and foremost one of access to a basic primary service and improved welfare. Welfare improvements include: (1) access to lighting for education,<sup>54</sup> (2) improved safety in and around the home,<sup>55</sup> (3) health benefits where replacing dirty indoor lighting products, (4) time savings by reducing time collecting conventional fuels, (5) access to communication and information technologies, boosting social interaction and connection to the world, (6) improved leisure time through access to solar powered devices such as radios, TVs etc. These products are often targeting relatively poor rural communities who would otherwise not have access to these products and the benefits they bring. For example, 60 Decibels sample of 23,000 households spanning 57 standalone solar providers found that 93% of customers reported that their quality of

<sup>54</sup> See for example UNEP (2014) "Light and Livelihood: A Bright Outlook for Employment in the Transition from Fuel-Based Lighting to Electrical Alternatives". [Link](#)

<sup>55</sup> See for example Acumen (2017) "Energy Impact Report". [Link](#)

life had either “*greatly improved*” or “*slightly improved*”, and that 71% of customers live below US\$ 5.50 per day.<sup>56</sup>

**There are also a range of further benefits generated through delivery of the off-grid solar supply chain and to households accessing clean energy technologies:**

- FMO’s investees have deployed 167 MW of solar energy solutions, resulting in a reduction of over nine million tonnes of CO<sub>2</sub> emissions, worth US\$ 463 million at a social cost of carbon of US\$ 50 per ton. Avoided CO<sub>2</sub> emissions are calculated using GOGLA’s standardised impact metrics approach for standalone solar providers and self-reported data for mini-grid providers. This is valued using a social cost of carbon of US\$ 50, which represents the cost to society associated with an additional tonne of CO<sub>2</sub> emitted.<sup>57</sup>
- Access to clean energy technologies is estimated to have unlocked gross energy savings of up to US\$ 1.2 billion by reducing the amount households spend on conventional lighting technologies. These savings are predominantly driven by access to smaller capacity lighting systems which (partially) replace kerosene lamps, and which provide a gross saving as these systems are cheaper than kerosene lamps. By contrast, households purchasing larger capacity systems are likely to increase their expenditure on energy as they benefit from a higher quality of energy access.
- By accessing larger powered systems, households may have been able to access income generating activities worth up to US\$ 730 million. This impact is driven by access to multi-light systems and larger systems powering appliances.
- Investees are employing around 25,000 people to deliver products – supporting jobs often in rural areas where unemployment and underemployment rates are high.

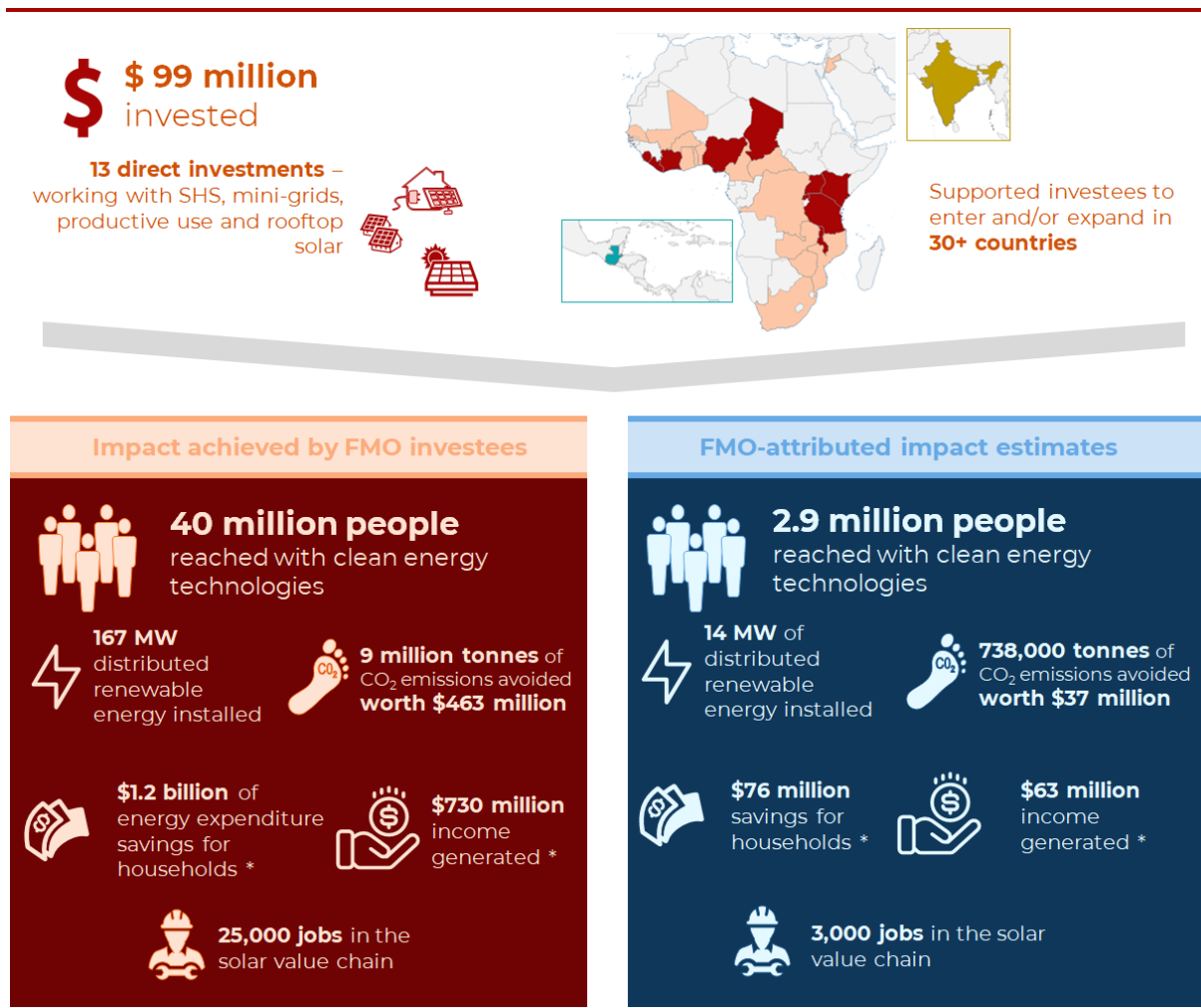
**Figure 15 summarises both the total impact achieved by FMO investees, and also provides an attribution of impact to the FMO share of capital in each business.**

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<sup>56</sup> 60 Decibels (2020) “Impact Performance Benchmarks: Off-Grid Energy”. [Link](#)

<sup>57</sup> Further discussion of typical estimates of the social cost of carbon are provided in Annex 1.

**Figure 15: Impact achieved by FMO investees and the FMO capital-weighted attribution of impacts**



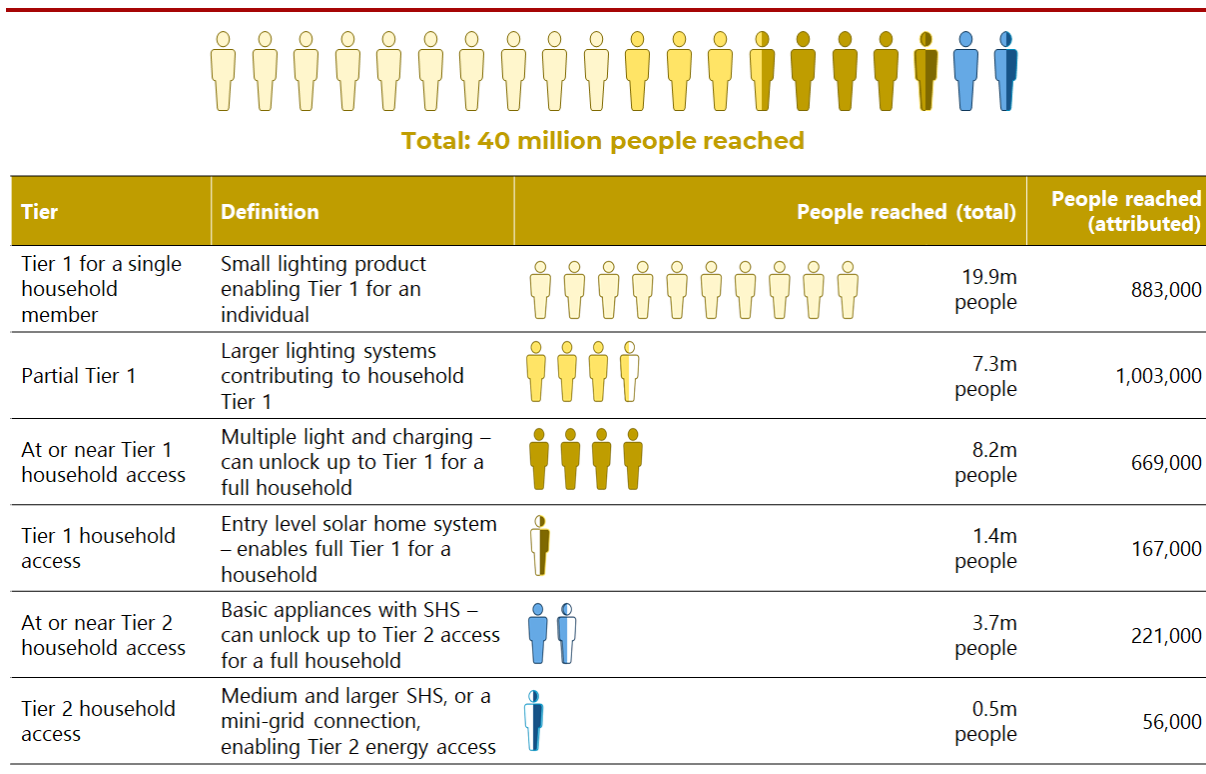
Source: Greencroft Economics analysis

Note 1: \*these numbers represent gross savings and income generating gains realised by households who see a reduction in expenditure or an increase in income respectively. They are based on standard industry multipliers and do not represent a causal statistical relationship.

Note 2: These number of people reached, and resulting impacts, represent a lower bound, as (1) they do not include impacts from the most recent investments completed in the second half of 2020, for which there is not enough time and data available yet to evaluate impacts, and (2) these calculations are based largely on standalone solar systems sales, which comprise the majority of the FMO investee product sales but may underestimate some impacts achieved through mini-grids and C&I installations from a limited number of investees.

**Of the 40 million people reached most are using low-capacity entry-level energy product, below Tier-1.** The range of products provided by FMO investees to clients goes from a single pico lighting system, through multi-light and basic phone charging technologies, up to larger capacity solar home systems. For many households the entry-level energy access technology they are using only gets them access to partial Tier 1 – typically enough for a single user to have the equivalent of Tier 1 energy access but not enough for all members of a household to have Tier 1 energy access. In total, just 0.5 million people are accessing systems enabling Tier 2 energy access, and only 5.1 million are living in households with a complete Tier 1 service. This leaves over 35 million – the vast majority of people reached – using systems that offer only a contribution to Tier 1 energy access (Figure 16).

**Figure 16: Access by Tier of energy access**



Source: Greencroft Economics analysis

**FMO investees have also delivered a range of outcomes not captured in the standardised impact metrics described above.** Several investees have diversified well beyond the provision of standalone solar systems. For example, M-Kopa has developed a successful line of PAYGo mobile phones, provides cash loans and health insurance, and is exploring the e-mobility market. Orb Energy has transitioned from its origins as a (mostly) solar home system provider in India and a subsequent expansion into Kenya, to focus much more on rooftop solar installations on commercial and industrial properties. Husk Power provides mini-grid connections – and while the household connections, MW capacity and CO<sub>2</sub> emissions reductions are included above, most of their connections serving thousands of businesses and industrial customers are not included. ZIZ Energie – one of the most recent investees – is rolling out solar hybrid mini-grids in Chad, but these are not included in the calculations above as the investment has only recently been deployed.

**The capital FMO has deployed will continue to help unlock further impacts in the future.** Especially as many of the investees in the FMO portfolio have been added recently (since 2018), many of these companies are expected to continue to expand their reach, supported by FMO investment. This means that the numbers presented here represent impacts achieved at the current point in time and are not comparable to an impact evaluation at the close of each investment.

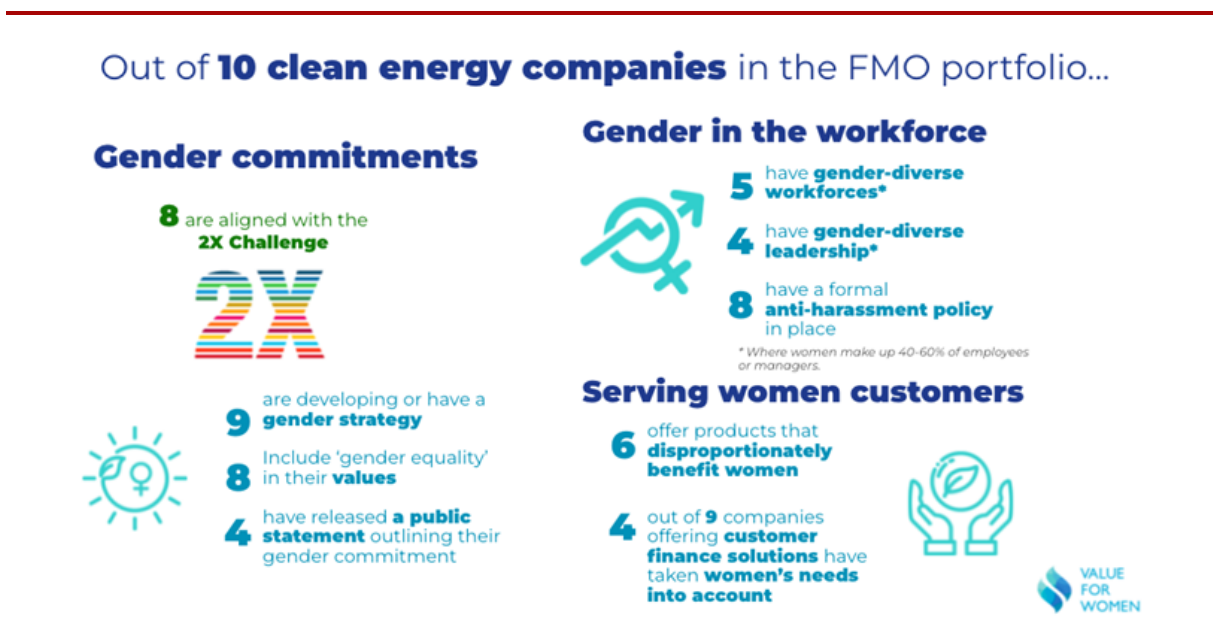
**Alongside the impacts directly estimated above, FMO investees also report some instances of impact supported by the capacity development activities described in Section 4.5.** We do not have information to quantify these impacts and these are likely to be less important than the impact of the growth capital provided. Nonetheless, some specific instances of CD initiatives highlighted as having a significant impact include::



- Grant funding to the Acumen Pioneer Energy Investment Initiative (PEII) which has provided seed finance to early-stage energy access ventures in countries where solar home system markets are still not established.<sup>58</sup>
- FMO provided grant funding to d.light to electrify 300 rural health centres in rural Kenya – providing access to key public health services in response to the COVID-19 pandemic.
- Several investees highlighted that their credit management and client protection principles were improved (and accelerated) thanks to the support by FMO, although not linked to specific quantifiable benefits.

**On gender-related outcomes, the FMO direct investees perform slightly above average when compared to similar companies.** In general there is a demonstrated commitment to increasing gender inclusion among FMO investees (Figure 17), which serves as a powerful starting point for deeply impactful strategies. But there remains a lot of critical work to be done to capture opportunities, from employing women and knowing how to address their women customers, to going public with their gender commitment.

**Figure 17: Gender profile of FMO's direct investees**



Source: analysis carried out by Value for Women, covering the same direct investees as included in this report

Note: the VFW study had survey responses from 10 direct investees; of the 13 direct investees discussed throughout this report, two are no longer active FMO investees (WakaWaka and Mobisol), and there was one non-response to the VFW survey, hence the sample size of 10

**While women are often the main beneficiaries of access to off-grid energy systems, they are still significantly under-represented in the supply chains to deliver these systems and in customer decision making.** Women make up just 27% of employees in the off-grid solar value chain,<sup>59</sup> and the decision to buy a solar home system remains predominantly the purview of male head of households, with men comprising 68% of energy customers.<sup>60</sup> Nonetheless, it is often the women in households using a solar home system that record higher satisfaction with the product,

<sup>58</sup> Acumen (2022) "Bridging the Gap: What We Learned from Pioneering the Next Wave of Energy Access". [Link](#)

<sup>59</sup> GOGLA (2019) "Off Grid Solar – a growth engine for jobs". [Link](#)

<sup>60</sup> 60\_Decibels (2020) "Why off-grid energy matters". [Link](#)

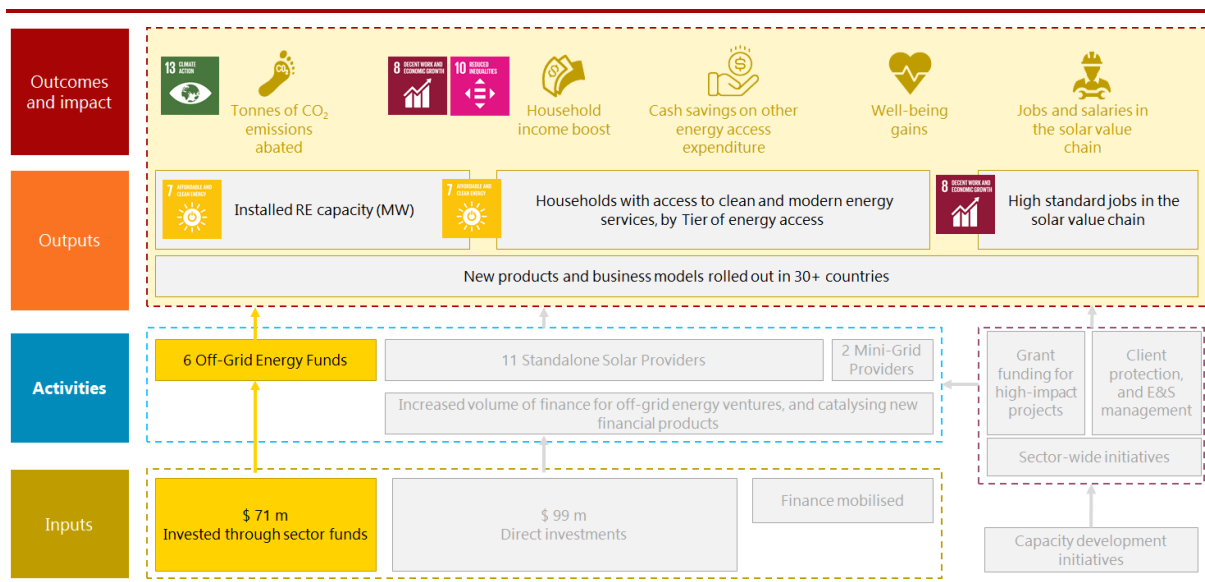
and women are often the main beneficiaries of time savings, improved safety, and diversification of economic opportunities in the home.

## Unlocking impact through investing in off-grid energy funds

**The portfolios of companies supported by the six funds in which FMO has invested would reach well over 100 million people.** As shown in Figure 18, FMO has committed US\$ 71 million of investment through specialised sector funds. In the paragraphs below we describe the evidence of impacts achieved by each fund and note the extent of FMO’s contribution to each fund.

**There is significant overlap in the portfolios of the funds, so we do not aggregate impacts across funds, nor with the direct FMO investment impacts described above.** Many of the larger companies such as d.light, Greenlight Planet and M-Kopa are in the portfolio of several funds and are also direct investees of FMO. Summing these impacts would risk significant double counting, with the same company’s impact contribution being counted under several overlapping investments. Attributing the impacts based on the share of capital held by each investor would resolve this problem but is beyond the scope of this assessment, which has not collected detailed impact and investment information for the portfolios of each of the six specialised funds.

**Figure 18: Tracing the impact of FMO’s indirect investments in off-grid energy ventures**



Source: Greencroft Economics

**Figure 18 summarises the impacts achieved by each fund and the extent of the contribution FMO has made.** Rather than report an aggregate impact – which is likely to be misleading without the data to make a series of company specific adjustments – we instead report an estimate of the overall contribution each fund has made to achieving impacts in the sector through its portfolio of investments. We rely on fund-level impact reporting for these estimates – which are broadly consistent with the GOGLA standardised impact metrics but which may have fund-specific adjustments, especially since many of the funds include a mix of solar home system providers, mini-grid companies, productive use companies and in some cases financial institutions.

**Figure 19: Overview of impacts from the specialised sector funds**

Fund	Total size	Summary of impacts
 <p><b>Energy Access Ventures Fund</b></p>	<p><b>Start:</b> March 2015  <b>Size:</b> \$75 million  <b>Portfolio:</b> 15 investees  <b>FMO contribution:</b> ~13% after second close in December 2017</p>	<p>Reached over <b>21.5 million people</b>, added <b>16 MW</b> of renewable energy capacity, powered <b>1,637 businesses</b>, supporting <b>1,274 jobs</b> and <b>reducing 144 million tonnes of CO<sub>2</sub> emissions</b>.<sup>61</sup></p>
 <p><b>Energy Access Fund / Access to Clean Power Fund</b></p>	<p><b>Start:</b> August 2015  <b>Size:</b> \$150 million  <b>Portfolio:</b> ~15 investees  <b>FMO share:</b> ~22% at first close in 2015, reducing to ~15% at second close in 2019</p>	<p>Contributed to reaching over <b>80 million people</b>, supporting close to <b>20,000 jobs</b> for full-time employees and commissioned agents, and <b>reducing around 15 million tonnes of CO<sub>2</sub> emissions</b>.<sup>62</sup></p>
 <p><b>Beyond the Grid Fund</b></p>	<p><b>Start:</b> October 2016  <b>Size:</b> \$47 million  <b>Portfolio:</b> ~20 investees  <b>FMO contribution:</b> ~16% after final close (November 2017)</p>	<p>We estimate that the Beyond the Grid Fund has contributed to reaching over <b>3 million people</b>, and <b>reduced CO<sub>2</sub> emissions by 300,000 tonnes per year</b>.<sup>63</sup></p>
 <p><b>SIMAI Fund</b></p>	<p><b>Start:</b> July 2017  <b>Size:</b> \$90 million  <b>Portfolio:</b> ~30 investees  <b>FMO contribution:</b> ~25% of first close</p>	<p>Contributed to reaching over <b>100 million people</b>, supporting over <b>20,000 jobs</b> and <b>reducing around 20 million tonnes of CO<sub>2</sub> emissions</b>.<sup>64</sup></p>
 <p><b>Energy Entrepreneurs Growth Fund</b></p>	<p><b>Start:</b> December 2019  <b>Size:</b> \$45 million (initial close)  <b>Portfolio:</b> ~5 investees  <b>FMO share:</b> ~30% of first close commitments</p>	<p>The EEGF was launched at the end of 2019, although deployment of capital has been slowed by the emergence of COVID-19 pandemic in early 2020. EEGF is focused on supporting younger, second generation ventures.</p>
 <p><b>Energy Access Relief Fund</b></p>	<p><b>Start:</b> September 2021 (first close)  <b>Size:</b> \$68 million (first close)  <b>Portfolio:</b> ~20 investees  <b>FMO share:</b> ~7%</p>	<p>The EARF was conceived around March 2020 in response to the emerging COVID-19 pandemic and had achieved first loans by Autumn 2020. It is too early to tell the impact of EARF yet, but it is expected to provide much needed financing to companies as they face supply chain disruption and customers struggle to keep up payments in response to the pandemic.</p>

Source: Greencroft Economics

Notes: [1] We note that the CO<sub>2</sub> savings reported by EAVF are significantly higher than those estimated for other funds / the FMO direct investment portfolio – we have not investigated these self-reported figures in this study.

<sup>61</sup> Energy Access Ventures (2021) “Breaking Frontiers – EAV’s Inaugural Impact Report”. [Link](#)

<sup>62</sup> Based primarily on data provided by responsAbility, with adjustments to round figures and present cumulative impacts over the active investment period of EAF/ACPF

<sup>63</sup> This is based on an approximate mapping of SunFunder’s headline impact reporting covering all of its funds, which comprises the US\$ 15m Solar Empowerment Fund, the US\$ 47m Beyond the Grid Fund and the recently launched US\$ 70m Solar Energy Transformation Fund, and the US\$ 30m Kenya Off-Grid Solar Access Project (KOSAP) debt fund managed account. The impacts we estimate for Beyond the Grid are based on a combination of sales reported by the BGTF, and the size of BGTF relative to the other funds.

<sup>64</sup> Estimates based on impact estimates reported by SIMA up to June 2021

### 5.3. Further discussion of impacts in the context of the broader off-grid solar impact literature

**In this section we discuss research that explores in more detail impacts achieved by off-grid energy companies, and where impacts may be less strong than those described above.** As described in Annex 1, the results presented above are not based on individual impact evaluations of the FMO portfolio of investees and rely on standardised metrics for the sector. However, there is significant uncertainty / heterogeneity around some of these metrics depending on the type of product deployed, and the market context.

**We look in further detail at three of the more contentious impact pathways, for:**

- The profile of off-grid solar customers, and to what extent off-grid energy providers are reaching the poorest rural households.
- Energy expenditure savings.
- Income generation from acquiring a solar home system.

#### Profile of off-grid energy households

**In general, the majority of off-grid solar customers live in rural areas, and around half live below the poverty line.**<sup>65</sup> For many, their off-grid solar solution will be their first access to clean and modern energy. However, this is not always the case and there are important exceptions to this overall narrative of connecting rural, previously unconnected, households. For example, in South Asia, 61% of solar home system users now deploy them as back up alongside a weak grid connection,<sup>66</sup> while the Energy Access Ventures fund's inaugural impact report notes that just 27% of people reached are in rural areas.<sup>67</sup> Similarly, as the sector grows, there is increasingly competition with other solar home systems, with the FMO's recent evaluation of Orb Energy's impact in Kenya finding that 17% of customers had a grid connection while 58% had previously owned another solar home system prior to buying an Orb system (only one third of Orb clients did not have access to electricity prior to purchasing their system).<sup>68</sup>

#### Impact on energy expenditure

**While households may spend less on energy products after purchasing an off-grid solar product it is notable that, especially for larger systems, energy expenditure may go up while the cost of the system is being paid off.** Households purchasing the d.light D20g system in Uganda, at a cost of around US\$ 230, saw average household energy expenditure as a share of total expenditure rise from 13% to 40% in the first year of payments, before eventually falling to 3% in subsequent years assuming the system remains in use. This shows that, while some smaller lighting products may deliver energy savings to households, larger systems are often more costly than the energy access technologies previously used – albeit offering a higher quality of energy access. Even where households may be able to reduce energy expenditure over the lifetime of their product, these savings are often not realised in the first year(s), during which period paying for the solar product may account for a significant share of total household expenditure.<sup>69</sup> Similarly, Orb Energy

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<sup>65</sup> For example, both d.light (2015) and the Greenlight Planet (2020) evaluations find around half of end users are below the poverty line.

<sup>66</sup> GOGLA (2020) "Powering Opportunity in South Asia". [Link](#)

<sup>67</sup> Energy Access Ventures (2021) "Breaking Frontiers – EAV's Inaugural Impact Report". [Link](#)

<sup>68</sup> Trinomics (2017) "Off-grid solar in Kenya: Market potential and development impacts Impact evaluation Orb Energy Kenya Synthesis report". [Link](#)

<sup>69</sup> IDinsight and d.light (2015) "d.light Solar Home System Impact Evaluation". [Link](#)

customers in Kenya saw a reduction in their spending on some lighting products, potentially offset by an increase on spending in other products, with an ambiguous impact on total expenditure, and in any case a relatively long expected pay-back period of seven-to-eight years.<sup>70</sup>

**For some households this can result in financial stress and trade-offs with expenditure on other basic products.** It is not uncommon for households to have to reprofile payments from the original payment plan – especially in response to pressures on disposable income resulting from the COVID-19 pandemic. Furthermore, a recent evaluation of household expenditure among Greenlight Planet customers found that 58% purchased less food, 47% of households skipped a meal to pay for their SHS, 48% purchased less clothes, and 41% spent less on education after purchasing a PAYGo system.<sup>71</sup> This points to the difficult trade-offs poor households in rural areas have to make when paying for energy access systems – and the potential risk of aiming for larger solar home systems which may not be financially viable for poor households.

### Impact on economic activity and income generation

**In general, there is a very limited evidence base of statistical studies that can robustly identify income increases *as a result of* access to off-grid solar products.** A recent metareview of 98 studies concluded that “it is not yet possible to draw definitive conclusions on their quantitative impact in specific areas”, including cost savings and income generation.<sup>72</sup> As described below, where econometric approaches have been used, the evidence on a *causal* relationship between accessing a solar home system and increasing income generation is relatively weak. No primary evidence has been collected to probe this causal relationship in this assessment. As a result, much of the evidence underpinning commonly used impact metrics relies on self-reported income increases after acquiring a SHS, not on a structured (experimental or non-experimental) study of incomes *before* and *after* the acquisition of a SHS.

**Where studies have tried to robustly identify income increases, the evidence is mixed.** For example, while 43% of Orb Energy customers in Kenya report income as a main benefit from their SHS, less than 1.5% reported using their SHS for income generating activities and users “do not spend more or less time in income generating activities”.<sup>73</sup> Similarly, for users of the d.light D20g “there is no statistically significant increase or decrease on the amount of time that d.light households spend on productive activities.”<sup>74</sup> Further, as described above, a recent evaluation of Greenlight Planet customers found that a significant portion had to make adjustments to other expenditure to pay for their system, and/or ask for a loan,<sup>75</sup> which would suggest they are not seeing income increases (at least not that outweigh the additional cost of the system).

## 5.4. Implications for maximising FMO impact for end users

**Drawing on Section 5.2 and Section 5.3, we draw the following implications for how FMO can optimise its contributions to maximising impact for end users:**

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<sup>70</sup> Wagner et al (2021) “The impact of off-grid solar home systems in Kenya on energy consumption and expenditures”. Energy Economics Volume 99, July 2021, 105314. [Link](#)

<sup>71</sup> Shell Foundation and Greenlight Planet (2020) “Improving the Quality of Life of Kenyan Households with Off-Grid Solar Home Systems”. [Link](#)

<sup>72</sup> Lemaire (2018) “Solar home systems and solar lanterns in rural areas of the Global South: What impact?”. [Link](#)

<sup>73</sup> Trinomics (2017) “Off-grid solar in Kenya: Market potential and development impacts Impact evaluation Orb Energy Kenya Synthesis report”. [Link](#)

<sup>74</sup> IDinsight and d.light (2015) “d.light Solar Home System Impact Evaluation”. [Link](#)

<sup>75</sup> Shell Foundation and Greenlight Planet (2020) “Improving the Quality of Life of Kenyan Households with Off-Grid Solar Home Systems”. [Link](#)

- **Continue to support provision of energy access to poor and rural households and contributing to progress towards achieving SDG 7.** The most important impact delivered by off-grid energy ventures is welfare improvements to households often living around or below the poverty line. This is valuable even when energy access does not directly enable additional income-generation or cash expenditure savings. However, realising this impact may also mean some customer/product segments are unlikely to be commercially viable without concessional public finance.
- **Carefully consider what FMO and the Dutch government fund managers consider an acceptable level of energy access, including access to entry-level solar products.** The majority of households reached by FMO investees are using products that provide below or only partial Tier-1 energy access. Insisting on Tier 1 access would mean favouring larger systems and mini-grids, which, given the affordability challenges facing many rural consumers, risks leaving many people behind, or requiring impractical amounts of public subsidy. We recommend FMO continues to take a pragmatic approach and accept a broad definition of energy access to encompass products offering partial Tier-1 access to both maximise impact and support companies in their transition to commercialisation. In terms of impact, 60 Decibels' notes that lanterns are the "*highest performing across most impact indicators*".<sup>76</sup>
- **Focus on how customers can use their systems to catalyse income generation.** Given the significant differences and uncertainty in the impact of access to solar home systems on income generating activities, FMO could contribute further in three key areas through its investments and capacity development activities:
  - Exploring the potential for inclusive business development technical assistance, perhaps in cooperation with foundations and philanthropies,<sup>77</sup> to pilot and study initiatives to support customers to take advantage of economic activities using solar technologies.
  - Carrying out structured impact evaluations to identify under what conditions (country/regional characteristics, product characteristics, household characteristics) off-grid energy solutions have the most potential to catalyse income generation. For example, access to a small lighting system in rural regions where there is high unemployment and underemployment may be less likely to generate income for users than access to larger systems in peri-urban areas. To date the evidence on what works best under different conditions is lacking, and it would add value to the industry to explore what conditions need to be in place for off-grid energy products to support delivery of economic livelihood uplifts.
  - Expanding its investee base to include companies with a focus on income generation and productive use, or helping existing investees expand into products which generate income for users. This may mean a shift away from defining impact mostly by the number of people reached (quantity) with more direct impact on and monitoring of impact on livelihoods (quality).
- **Support improved data collection on who is using solar home systems and how far into poor and rural areas companies are reaching.** Without access to new primary data in this study, we are unable to evaluate the extent to which FMO investees are serving rural

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<sup>76</sup> 60\_Decibels (2020) "*Why off-grid energy matters*". [Link](#)

<sup>77</sup> Such as Shell Foundation, Ikea Foundation, Rockefeller Foundation who are well placed to contribute to such initiatives, but which might also benefit from a more commercial lens brought from a DFI

customers, nor establish a profile of those customers. This would be a useful area to understand better, especially as, for some investees, off-grid solar units are sometimes replacing older off-grid solar systems, and/or are being purchased by relatively wealthier households. There is increasingly an acknowledgement of the trade-off between reaching the most vulnerable to leave no-one behind, and seeking commercially sustainable (profitable) customer segments.

## 5.5. Impact on investee commercial journey

**This final impact subsection looks at the role of the DMO in catalysing commercial success with its investees.** While the previous sections have focused on the impact achieved for end users, FMO is also seeking to improve the commercial success of its investee clients, for example by improving commercial profitability and/or increasing access to commercial finance.

**The extent of FMO's success in supporting commercial transitions has largely correlated with the investment phases described in Section 4.2.** FMO's first phase of investments up to 2017 was characterised by relatively high risk-appetite in a sector with limited commercial experience. Some investees experienced significant challenges, including WakaWaka ceasing operations in Rwanda, and Mobisol filing for insolvency before being acquired by Engie in 2019. Among the other investees in this initial phase, those that have succeeded have had to overcome significant challenges and/or a pivot to their business strategy. For example, Orb reoriented its focus from solar home systems in India and expansion into Kenya, to a core market in India with a focus on rooftop solar installations for commercial and industrial properties with higher revenue generating potential.

**FMO investees since 2018 have scaled up, although commercial sustainability is still uncertain across the sector.** FMO has invested in seven of the 10 most capitalised standalone solar businesses, including M-Kopa, d.light, and Greenlight Planet. These companies have scaled up and shown success in raising private sector capital. Other companies such as Easy Solar in Sierra Leone and Liberia, and Lumos Cote d'Ivoire, are showing signs of growth and potential profit, albeit from a small initial sales volume. While this points to an improved success in catalysing commercial success for investees, there is no well-established benchmark of long-term commercial success even among the most mature companies.

**We do not attempt to construct a counter-factual of the commercial outcomes of the FMO investees had FMO not invested.** While we have provided a short discussion of commercialisation of these companies above, we have no robust counterfactual to how these companies would have evolved without the presence of FMO as an investor and strategic partner. There are likely to be differences in the importance of the FMO role across the portfolio, but in some cases it is clear that the commercial journey would have been significantly different in the absence of FMO. For example, FMO was highly additional in its early-stage investments in WakaWaka, Kingo, Orb, Easy Solar and ZIZ Energie, where there would have been no obvious alternative. In some of these cases the early FMO investment has been an essential step to accessing subsequent rounds of funding. On the other end of the spectrum, some of the better-established investees such as d.light, Greenlight Planet, M-Kopa, had a much wider set of potential investors. In these cases FMO's presence has helped reach a larger volume of funding on viable financing terms, but has been less transformational in terms of catalysing commercial transition of these businesses.

## 6. Lessons learned from reviewing FMO's investments in off-grid energy ventures

**This section draws out some of the lessons learned from FMO's experience in the sector.** These are drawn from the experience of FMO investees, including regular reporting by investees, and from the 30+ interviews held with FMO investment officers, co-investors and sector experts. The three lessons learned contribute to the (still limited) literature from investors to give a perspective on what is needed to support companies to successfully achieve impact and commercial success.

### Lesson #1: cash sales are unlikely to achieve profitability alone while projections of market potential for larger size systems are often overly optimistic

**Cash sales, often of smaller pico products, are a good way to build young businesses but do not provide a sustainable long-term business proposition.** Cash sales of pico products and smaller SHS can help establish brand presence and a customer base and feedback mechanism, as well as local distribution networks. However, they are exposed to competition from grey/counterfeit goods in a price sensitive market, and which has relatively low barriers to entry for those wishing to make a one-off sale to customers. As such, this product segment can become highly competitive and commoditised, with margins squeezed relatively quickly. Cash products can still be an important part of the product offering for companies – especially where they can be sold in bulk as a B2B transaction – but are unlikely to deliver stable profit margins for last mile distributors.

**Sales projections remain overly-optimistic – the customer segment for larger products is typically relatively thin.** There are several barriers to achieving scale, especially for medium and larger solar home systems. First, companies will tend to start with the most viable customer segments meaning that subsequent customers may have a significantly lower ability to pay. Second, companies tend to set up distribution networks to cater for customers who are relatively easier to reach – this implies that, at the same time as new customer ability to pay is falling, the cost to serve incremental customers may be increasing. The drive to achieve economies of scale is often therefore elusive, as there is a risk of average revenue per unit (ARPU) falling as costs increase.

**The drive to commercialisation can create challenges for companies not well geared up to scale quickly.** Most PAYGo companies have started with an impact-focused mandate – and impact-focused investors. There is a risk of pushing such companies to take on commercial debt and scale quickly before profitability indicators are strong enough. This can result in these firms chasing a growing receivables book as they need more and more working capital while they have outstanding revenues to be collected from customers. Furthermore, the expertise needed to grow and run a large distribution business is not always the same as the expertise needed to set up a small, impact-focused venture.

**Conclusion #1: Off-grid electricity providers will have to identify their specialisation in the value chain to achieve commercial success.** There is no single blueprint to achieving commercial success – companies may need to diverge to specialise in different business models to maintain their individual value-offering. As described below, this may mean specialising in just one part of the value chain and/or diversifying to capitalise on established customer relationships to generate horizontal sales (i.e. of other, non-energy, access products) or vertical sales, i.e. upselling to larger higher-margin solar systems.



## Lesson #2: PAYGo offers the best commercial potential but will require continuous innovation and a focus on viable customer segments

**PAYGo is a key enabler in unlocking long-term customer relationships, market intelligence, and higher-margin product segments.** PAYGo works well for relatively high-volume, mid-sized products which can be rolled out quickly and achieve economies of scale. The sales network and repeat interactions with customers can serve as a useful launchpad to upsell other product and service lines to an established customer base.

**Moving to larger products and product innovation is essential to achieve sustainable margins.** Once a viable sales network is established, profitable product segments are likely to be larger systems, and additional products and services such as appliances, consumer finance and extras like insurance. Companies may also leverage products with only a very thin profit margin – or potentially loss-making in some business units – but which provide access to a potential opportunity to upsell higher-margin products and services.

**Nonetheless, PAYGo comes at a cost – and one that rural customers can find difficult to bear.** The embedded cost of finance can be high, significantly raising the total price of access to the product. This both raises risks of non-payment and requires careful attention to customer protection. It also means that while PAYGo undoubtedly helps address affordability challenges, it is not a panacea, and the poorest rural customers may not be the right customers to serve with a commercially priced solar home system.

**A fundamental difference between PAYGo and microfinance is being clear on income generating potential.** Like PAYGo, microfinance also emerged to address short-term capital constraints and low affordability among poorer households. However, the main driver of success for microfinance has been that it often enabled the purchase of assets that generated an improved income stream that facilitated loan repayment. By contrast, the PAYGo business model for SHS emerged first as a way to address the affordability constraint – and reducing expenditure on other energy access technologies – with less focus on how to unlock income-generating opportunities that would provide a reliable revenue stream to households to then afford the repayment of their system.

**As a result there may be a need for companies to blend cash, PAYGo SHS and other products to achieve both commercialisation and impact.** While cash sales can play an important role to set up distribution networks and provide high-impact access to basic energy products, and PAYGo SHS represents a way for households to help step up the energy access ladder, if energy access companies are to become commercially sustainable they may need keep prices of energy access products low, and achieve higher margins through both upselling larger products where possible and cross-selling non-energy-access products and services.

**Conclusion #2: Companies must be able to flexibly respond to customer demands and move into adjacent product/service markets.** The initial cost of setting up an energy access business focussed on providing much needed pico solar and solar home systems to (often rural) customers must be converted into sustained relationships that can deliver higher-value products with viable profit margins. This may mean not all companies can focus exclusively on energy access if they want to also achieve commercial sustainability.

### Lesson #3: the role of DFIs and the broader financing landscape must evolve and reflect the conditions in different market contexts

**There is an inherent tension between wanting companies to be profitable, while also wanting to serve the most needy populations.** Financing structures need to adapt to market segments that are not – nor likely to become quickly – commercially viable. A significant share of the potential off-grid energy customer base is not sustainable, necessitating some form of subsidy. A key question for DFIs is the role of subsidies – and what type of funds to use – in (1) relatively mature markets, (2) markets with commercial growth prospects, (3) markets where the impact is high but the commercial potential low.

**The use of concessional government funds will continue to be essential to support companies not yet ready for commercial financing.** FMO has used concessional Dutch government funds for 85% of funding to the sector. Still today very few companies would meet the requirements of a commercial investor (or the main FMO-A balance sheet), and DFI funding is essential to provide the volume of capital needed, in senior positions, supported by impact investors and philanthropies in junior capital positions.

**Nonetheless, there are now some relatively mature and well-capitalised companies where DFIs risk crowding out commercial investors and should be moving to junior positions / exiting.** There is now a wide availability of debt in the sector, with DFIs and impact investors in some instances competing to finance a small number of attractive companies. In these instances DFIs should only be using concessional funds to leverage other investors – moving out of senior capital positions. For these companies. There are now a range of commercial investors – and large strategic investors – looking to enter.

**DFIs still have a more conventional role to play in many markets which remain underdeveloped.** Outside East Africa and a few West African countries, most off-grid energy markets are still at a relatively nascent stage. DFIs will continue to play an important role in providing capital in senior debt / preferred equity positions using concessional government funds. This will help companies transition from early-stage grant funding and impact investment, to scale up, and prepare for commercial capital rounds.

**DFIs can also help bridge the ‘pioneer’ gap in younger ventures and facilitate consolidation and exit in more mature investees.** Building on Acumen’s Exits report in late 2019, a key crunch point for companies is often the transition between angel and patient capital investors. Experienced DFIs can be catalytic by purchasing secondary shares and/or supporting high-performing 2<sup>nd</sup> generation companies to move through Series A funding to subsequent funding rounds.

**Conclusion #3: DFIs will have to gradually move out of debt provision for well capitalised SAS providers and support earlier stage ventures and/or less developed regional markets.** Following the influx in debt finance in recent years, some established may now be able to access commercial capital – possibly with DFIs in a smaller role or in junior tranches. Additionality will be higher through supporting younger companies achieve scale in emerging regions.

## 7. Optimising the FMO role in future

**This final section draws recommendations for how the FMO contribution to the sector can be optimised in future.** It builds on the lessons learned in Section 6 and the analysis of FMO's role to date in Section 4 and informs the development of the FMO's future strategy for the off-grid energy sector, considering a range of possible scenarios for the sector.<sup>78</sup>

**We note that the FMO's role in the off-grid sector seeks to balance three core objectives; impact for end users, commercialisation of investees, and promoting innovation.** Underpinning each of these aims is an overarching objective of additionality; that is to use FMO's concessional capital to catalyse results that could not be achieved from private capital markets alone. As discussed in Section 5.4, the impact objective may need to carefully define what types of impact FMO energy access investments support, in particular considering two potential sources of tension: (1) supporting access to entry-level solar products which do not reach full Tier-1 access for a household, and therefore may not count immediately towards SDG 7, and (2) impacts beyond energy access, as companies diversify their product offering. As discussed further in Section 7.2 below, there may also be a tension between the objectives to drive commercialisation, innovation and impact, depending on future market conditions and especially as the sector continues to face challenging macroeconomic conditions.

**A broader consideration is how to strike a balance between direct investments and contributions to the specialised sector funds.** As noted in Section 4.6, there is a perception that the absence of clear definition of when the FMO finances through the specialised credit or equity funds, and when it invests directly, may risk creating a conflict or competition between FMO and the funds it invests in. While both types of investment are highly valued and can serve different purposes, and co-investment alongside funds can deliver valuable synergies, it may be valuable to develop a clear internal policy for when FMO will invest in a fund, and as a result when it might forego direct investment opportunities.

### 7.1. Five key recommendations for FMO's role in the off-grid sector

**We propose the following five recommendations for the FMO to further optimize its role and additionality in the off-grid electricity sector.**

**Rec #1. Where providing equity to new investees, be innovative and flexible, joining early rounds and staying in to bring the investee through to commercial scale.** FMO has started to take on this role in transactions in the last year or so, and its flexible approach combined with deep sector expertise puts it in a unique position to provide early-stage equity. FMO should continue to work alongside early impact investors such as Acumen to address the pioneer gap providing Series-B (and earlier bridge finance) equity. This may include continuing to offer small-ticket direct equity investments or working with other DFIs to set up a fund targeting this pioneer gap, potentially in a similar spirit to the Acumen PEII which FMO helped capitalise, or the EEGF which FMO has helped bring to fruition alongside Shell Foundation.

**Rec #2. With existing equity investees, stay in to support consolidation and provide a much-valued balance to entry from strategic corporates.** In companies in which FMO is already a shareholder, it should stay in and support consolidation of shares by participating in

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<sup>78</sup> Drawing on a separate second phase of this assignment with FMO providing analysis to support the FMO's forward-looking (internal) strategy for the sector.

secondary purchases alongside corporate investors, enabling angel and impact investors to exit and redeploy capital. FMO's commercial expertise, combined with its sector expertise and impact mandate, means that it has an important oversight and advisory role to play, and it adds complementary skills to those brought by the corporate investors.

**Rec #3. For debt provision to established and well-capitalised companies, seek to catalyse local commercial banks.** This can be done by offering a mix of synthetic and true local currency facilities, and by taking on junior positions to demonstrate proof of concept for local commercial banks taking senior positions. There is growing interest in, and some transactions which demonstrate the potential of, local bank lending, but this remains relatively modest compared to the volume of debt finance needed. FMO has a key role to play in catalysing more of these transactions until local banks have confidence to carry out transactions without co-investment from a DFI, which is certainly not yet the case.

**Rec #4. Take a flexible stance on energy access impacts, enabling companies to innovate and balance impact with commercial success.** FMO may need to consider and define its stance on the type of impact it seeks to unlock with its investees, including continuing to support providing end users access to products which provide only partial Tier 1 energy access. There is also a risk that by focussing on energy-access-centric indicators that companies are restricted in making the transition to businesses that achieve *both* impact and pursue commercially viable product and customer segments. For example, commerciality may be enhanced by allowing investees to also offer products to business customers and/or commercial and industrial solar where appropriate, or by supporting companies to diversify the products and services they offer to include adjacent products such as mobile phones, productive use technologies, and some financial services. Many of the more successful commercial ventures – both within and outside of the FMO portfolio – do not see themselves as energy access companies, but distributed utilities, or consumer and asset financiers, offering a range of products beyond energy access.

**Rec #5. Use targeted technical assistance to help businesses continue to improve governance and credit management through core business support.** Where FMO's capacity development has been most appreciated – and what clients would like more of – is support for core business functions which are essential to the commercial operations of the business, such as credit management, supply chain management, governance etc. FMO could also use its technical assistance in supporting companies so that as they add new products and services to their offering (as discussed above), they retain a strong impact focus. FMO could also consider defining a core series of TA product offerings, with a dedicated peer-to-peer learning and knowledge sharing function to allow industry practitioners to learn from one another's experiences (this could be implemented for example through the FMO Ventures program).

## 7.2. Informing the FMO's in an uncertain future

**The relative importance of these recommendations and FMO's role will depend on how the sector evolves in the coming years.** There is significant uncertainty facing the sector, in terms of (1) the global macroeconomic conditions including the ongoing impact of COVID-19 on economic development, (2) the extent to which technology and business model innovations evolve to reduce costs and/or improve performance of energy access technologies, (3) the volume and type of public and private sector finance flows to off-grid ventures, and (4) how supportive policy and regulation will be for different technology segments. While we do not discuss these drivers in detail here, the

following bullets provide a summary of how FMO could respond flexibly to a range of possible market conditions:

- **In a future where challenging macroeconomic conditions prevail:**<sup>79</sup> recommendation #2, #3, and #4 may be especially important – FMO will need to support existing investees and demonstrate flexibility to make sure these companies find a viable path to commercialisation while continuing to deliver impact to end users. FMO may need to deprioritise catalysing commercialisation and unlocking access to commercial capital. Instead, its key partners may be philanthropies and impact funders, helping to make sure the impacts achieved are not reversed as companies struggle in difficult market conditions.
- **In a more benign future, with a fast international recovery from COVID-19 and (some) African economies capitalise on growth opportunities:** recommendation #1 may be more important in seeking to catalyse specialised solar distributors in less mature markets, while capacity development may focus more on ensuring that as companies grow, they do so in a way that maximises impacts to end users, ensures customer protection, and protects the environment. Recommendation #3 would also be important in this scenario, to demonstrate ‘proof of concept’ to local commercial banks so that at least some companies are able to successfully secure commercial capital.
- **If public funding, policy and innovation prioritises the mini-grid sector:** FMO may have to ensure a balance of investment across the SHS, mini-grid, and productive use technology segments, continuing to provide equity to early-stage mini-grid ventures and finding opportunities to lend to projects. Building on FMO’s commercial experience, capacity development could focus on supporting mini-grid companies to managing credit risk and repayments from customers and working with companies to ensure that growth does not come at the cost of robust customer protection and ESG practices.

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<sup>79</sup> as may be expected with the ongoing effects of the COVID-19 pandemic and the evolving situation in the Ukraine

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## Annex 1 – summary of approach to impact calculations

### **A key challenge in assessing the role of the FMO in delivering the outcomes and impacts**

**achieved by investees as described in Section 5 is ascribing the *contribution* of the FMO.** Each of FMO's investees has received a (often complex) mix of finance, all of which would have some claim over the bottom-line impacts delivered. We therefore need to balance the need to (1) describe the important role the FMO has played in helping clients deliver impact, and (2) avoid duplication of impacts achieved not only by FMO but by all funders in the investee business.

**The key principle we aim for in our approach is internal consistency of calculations.** The key check is to make sure that if our approach to attributing FMO's impact were applied to all investors that have financed the FMO clients, the sum of each investors' attributed impacts should not exceed the total impact delivered by that client.

**With this in mind, we quantify the outcomes and impacts associated with FMO investees in one of two ways:**

- **Contribution analysis**, i.e. quantifying and describing outcomes achieved by FMO investees, but not attributing those outcomes to different capital providers.
- **Allocation based on capital amounts**, i.e. taking the results achieved by FMO investees and allocating them according to the financial holdings of different investors at the point that the results are achieved. For example, if FMO had provided 20% of the capital raised by an investee over a particular period, then 20% of the outcomes achieved during that period would be attributed to FMO.

### Estimating the impact achieved by FMO investees

**All the impacts presented in this review are estimated on the basis of annual sales volumes delivered by FMO investees.** No primary research has been carried out on the impact of different investees – and this report should not be interpreted as an impact evaluation of any individual investee. As described below, impacts are estimated using standard multipliers commonly used across the off-grid solar sector. We only present the direct impacts generated by end users; we do not consider any indirect or induced impacts of increased incomes on the wider economy from either the salaries of workers in the off-grid solar value chain, or from the users of solar home systems who may generate additional income.<sup>80</sup>

**To estimate the impacts delivered from access to standalone solar solutions we follow the methodology set out in GOGLA's standardised impact metrics.** These impact metrics have been developed to provide a consistent industry-wide benchmark, with parameters adapted to represent the best available evidence in different regions. We do not reproduce all the multipliers used here, as these are set out in the GOGLA impact metrics reports (see footnote and references).<sup>81</sup>

**The major advantage of this approach is that it generates outputs that are consistent across companies and means we can aggregate across the FMO investees.** To make these calculations we collected sales data from all of the FMO direct investees, with a commitment to preserve the confidentiality of any individual client's data which may have included for example (1) unit sales

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<sup>80</sup> For a definition of "Direct", "Indirect" (or "backward" and "forward" linkages) and "Induced", see for example FMO (2019) "FMO Impact Model – Methodology". [Link](#)

<sup>81</sup> GOGLA (2020). "Standardised Impact Metrics for the Off-Grid Solar Energy Sector". [Link](#)



volumes, by asset type, (2) pricing, (3) adjustments to discount for losses and the proportion of systems functioning over time and delivering impacts for end users.

**While some of the FMO investee companies have also carried out their own impact evaluations, we do not make client-specific adjustments to impacts.** This is for three reasons: (1) we do not have information to justify adjustments for all clients, and consider it more appropriate to use well recognised industry-wide impact metrics in the absence of being able to adjust for the circumstances of all FMO off-grid energy clients, and (2) even where clients have published impact studies they are often not comprehensive enough to serve as a basis for our estimates – for example the d.light evaluation in 2015 only looks at one specific d.light product (the D20g solar home system), not the full range of products that different customers purchase, (3) there is relatively limited data in most impact studies – and we do not consider these sufficient to “transfer” the values beyond the specific conditions of those studies. Indeed, that is the purpose of the GOGLA standardised impact metrics, which is therefore what we use here.

**For the key impacts presented in the main body of the report, the indicators are calculated as follows:**



**People reached:** is (1) the number of product units sold, (2) multiplied by the average household size in the region, (3) adjusted for (a) repeat sales, (b) products not functioning for their full asset life.

The adjustments for (a) repeat sales also varies by system size, which accounts for a more likely “stacking” of lanterns – i.e. a single household unit using multiple lanterns. So, while only 3% of multilight systems and larger are assumed to be “repeat” sales, for pico lantern products (< 3Wp), it is assumed 10% of products are repeat sales within the same household.



**Renewable energy capacity installed:** is (1) the sum of the capacity of all standalone solar capacity installed, (2) adjusted for products that have reached the end of their asset life.

The calculations are based on the Watt peak capacity of products sold by FMO investees based on, in order of preference: (1) information on Wp capacity per product, provided directly by the companies, (2) information available by product type from Lighting Global / Verasol quality certificates, (3) our best estimate of product sizes based on our knowledge of these products and similar products in their class.



**GHG emissions avoided:** is calculated as (1) the unit sales by product capacity (Watt peak), (2) adjusted for the proportion of systems not fully functioning over their full asset life, (3) multiplied by an estimate of the average number of kerosene lamps no longer used after gaining access to the solar system, (4) multiplied by an estimate of the CO<sub>2</sub> and black carbon emissions per kerosene lamp, (5) multiplied by the asset life of the solar product.

**Value of GHG emissions avoided:** is estimated using the estimated CO<sub>2</sub>e tonnes avoided as described above, multiplied by a (conservative) social cost of carbon of US\$ 50. We use this as a relatively conservative social cost of carbon for emission over the period 2014 to 2021, on the basis of an “explicit carbon-price level consistent with achieving the Paris temperature target is at least US\$40–80/tCO<sub>2</sub> by 2020”.<sup>82</sup>

<sup>82</sup> Carbon Pricing Leadership Coalition (2017) “Report of the High-Level Commission on Carbon Prices”, [Link](#)



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**Energy expenditure savings for households:** is calculated as the average reduction in expenditure over the lifetime of a standalone solar product. Note this is only applied to smaller solar lighting systems where the evidence on reduced expenditure is strongest – purchasing solar home systems can often result in an increase in overall energy access expenditure (for a higher quality of service).

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**Additional income generated:** this uses the income generation multipliers for systems of different size presented in the GOGLA standardised impact metrics, drawing on the GOGLA Powering Opportunity series of reports.<sup>83</sup> This evidence in particular should be treated with caution, as much of the evidence is based on self-reported income increases *after* acquisition of an SHS, rather than on experimental or quasi-experimental studies that could establish a causal statistical relationship. The few statistical studies that we are aware of show mixed results on generating employment opportunities or additional income after acquisition of standalone solar technologies.

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**Jobs supported:** We use gross employment in terms of full-time contracted employees and commissioned agents as reported by investees, at their peak volume (so we do not “duplicate” jobs over multiple years, but consider the maximum employment generated by each investee).

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## Attributing impact to FMO based on capital allocation to the investee businesses

**We attribute a share of the impacts delivered by FMO investees on the basis of the share of capital from FMO in each business.** We do this using the following two steps: (1) estimate the total impact(s) delivered by the investee between the date of FMO investment or FMO exit, whichever is earliest, (2) attribute to FMO a share of impacts (%) proportionate to the share of capital held by FMO in the investee, or an estimate if the precise share of capital is not known. For example, if FMO invested in Company X in 2015, which has subsequently delivered energy to 1,000,000 people, and FMO held (on average) 10% of the capital (equity and/or debt) in the business, then 100,000 people gaining access to energy would be attributable to FMO.

**The attraction of this approach is that it would be internally consistent if summed across all investors.** However, it can be a crude approximation as we will not have a perfect data set of exactly when end users are reached, and exactly the share of FMO capital in the business at all points of time. This approach also does not weight the nature of different types of capital, or the point at which investment was made – so for example early-stage finance is equally weighted on a dollar-to-dollar basis as senior loans provided much later in the same investee’s journey.<sup>84</sup>

## Analysing gender-related outcomes of the FMO direct investee portfolio

**The analysis of gender outcomes is linked to a parallel study – no additional research was conducted as part of this review.** The gender-related results are synthesised from a separate study commissioned by FMO, which ran concurrently to this review, and was carried out by Value for Women. In the first phase of the Value for Women (VfW) assignment commissioned by FMO, VfW analysed the performance of its direct investees against gender-related metrics, which form the

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<sup>83</sup> <https://www.gogla.org/powering-opportunity>




<sup>84</sup> The approach taken here is broadly consistent with the approach set out in the FMO impact model methodology guidelines, except that we do not include a x2 multiplier for equity compared to debt, as this could lead to a situation where the sum of impact if all investors adopted the same methodology could be greater than the total impact achieved. For more information see: FMO (2019) “FMO Impact Model – Methodology”. [Link](#)

basis of the portfolio-level gender results presented here. In a second phase of their assignment, VfW and FMO will then be delivering technical assistance with a small number of investees to enhance and build gender capabilities in these businesses.

## Mapping standalone solar systems to the ESMAP energy access Tiers

To estimate the number of people by tier of energy access, we use the mapping shown in Figure 20. This is based on GOGLA's standardised impact metrics, combined with data we collected from FMO investees on product sales by system size. To this we add mini-grid connections, on the assumption that all mini-grid connections are at Tier 2.

**Figure 20: GOGLA description of SAS products and mapping to ESMAP Tiers**

Overall category	Solar module capacity, Watt Peak (Wp)	Categorization by services provided by product	Corresponding level of Multi-Tier Framework energy access enabled by use of product
 Portable Lanterns	0 – 1.499 Wp (indicative)	Single Light only	Enables partial Tier 1 Electricity Access to an individual person
	1.5 – 2.999 Wp (indicative)	Single Light & Mobile Charging	Enables full Tier 1 Electricity Access to at least one person and contributes to a full household
 Multi-light Systems	3 – 10.999 Wp (indicative)	Multiple Light & Mobile Charging	Enables full Tier 1 Electricity Access to at least one person up to a full household
 Solar Home Systems	11 – 20.999 Wp	SHS, Entry Level (3-4 lights, phone charging, powering radio, fan etc.)	Enables full Tier 1 Electricity Access to a household
	21 – 49.999 Wp	SHS, Basic capacity (as above plus power for TV, additional lights, appliances & extended capacity)	Enables full Tier 2 Electricity Access to a household when coupled with high-efficiency appliances
	50 – 99.999 Wp	SHS, Medium capacity (as above but with extended capacities)	Enables full Tier 2 Electricity Access to a household even using conventional appliances
	100 Wp +	SHS, Higher capacity (as above but with extended capacities)	

Source: GOGLA standardised impact metrics

## Annex 2 – Stakeholders interviewed for this assignment

All interviews were carried out confidentially and while notes were taken these were not shared with FMO. The analysis presented in this report does not represent the view expressed by any single stakeholder and is the interpretation of the report author only.

**Table 1: FMO internal consultations**

#	Department	Respondent
1	Impact measurement	Sam Nierop, Drena Miftari
2	Capacity development	Susie Shuford, Marija Urumovska
3	Technical assistance (Ventures)	Abigail Thomson
4-11	Investment officers	Maite Pina Ward Nusselder Corine Franken David Nieuwendijk Linde Lassche Manu Musonza Flavia Villela Ferreira, Mark Roesink Robert Voskuilen
12	Credit	Gert-Jan Monster
13	Government funds	Dorien Lobeek

Source: Greencroft Economics

**Table 2: FMO investee consultations**

#	Organisation	Respondent
1	Orb Energy	Damian Miller (CEO)
2	Kingo	Jose Ordonez (CEO), Alejandro Gonzalez (Investment Relations)
3	responsAbility	Pauline Herisson (Country Director France & Senior Project Manager), Simon Gupta (Head of Business Development)
4	M-Kopa	Jesse Zigmund (General Counsel)
5	SunFunder	Thomas Parr (Debt Funds Manager)
6	Energy Access Ventures	Paras Patel (Managing Partner), Vladimir Dugin (Partner), Elizabeth Biney-Amissah (Partner)
7	SIMA	Asad Mahmood (CEO and Managing Partner, Michael Rauenhorst (Managing Partner)
8	d.light	Ned Tozun (Founder, CEO)
9	Husk Power	Manoj Sinha (CEO), Sindhu Mamillapalli (Investor Relations)
10	Zola Electric	Remco van de Riet (Director, Corporate Finance)
11	Lumos	[Unable to carry out this interview due to internal limitations and active deal discussions ongoing during the course of this review]
12	Greenlight Planet	Krishna Swaroop (CFO), Purav Shah (Investor Relations)
13	Dharma Life	Gaurav Mehta (Founder, CEO), Sonali Jawa (Project Manager)
14	ZIZ Energie	Julien Jeannet (Business Development)

#	Organisation	Respondent
15	Easy Solar	Alexandre Tourre (CEO)
16	Triple Jump (EEGF)	Mark van Doesburgh (Board Advisor, formerly Managing Director), Jan-Henrik Kuhlmann (Head of Climate & Nature)

Source: Greencroft Economics

**Table 3: External stakeholder consultations**

#	Department	Respondent
1	GOGLA	Susie Wheeldon, Drew Corbyn
2	Shell Commercial	Maaïke Friedeman, Jan-Matthijs de Berg
3	CDC	Geoff Manley
4	Acumen	Sarah Bieber
5	GOGLA	Koen Peters

Source: Greencroft Economics

## About Greencroft Economics

Greencroft Economics is a boutique economic consultancy, founded in June 2019, to advise public and private sector clients on sustainable development in emerging economies.

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