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Demand-Side Subsidies in Off-Grid Solar:

A tool for achieving universal energy access and sustainable markets

AFRICA CLEAN ENERGY (ACE)
TECHNICAL ASSISTANCE FACILITY (TAF)

Demand-Side Subsidies in Off-Grid Solar:

A tool for achieving universal energy access and sustainable markets

Department for International Development (DFID)
Africa Clean Energy Technical Assistance Facility

Tetra Tech International Development

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Cover page: Everline Wafula's three children study with the aid of a solar lamp. | Photo credit: oneacrefund.org
Primary school children in Kenya holding solar lights (made by Greenlight Planet). | Photo: Corrie Wingate
Title page: Catherine Wambu uses her M-KOPA solar panel to power her cell phone while her husband Nicholas Parsitau (54) uses it to power his M-KOPA radio. | Photo by Morgana Wingard

CONTENTS

ABBREVIATIONS

Abbreviations	Definition
AgTech	Agricultural Technology
DFI	Development Finance Institution
DRD	Department for Rural Development
DSS	Demand Side Subsidy
E4I	Energy 4 Impact
EnDev	Energising Development
FI	Financial Institution
FSP	Fertilizer Subsidy Program
GBP	British Pound Sterling
GSM	Global System for Mobile Communications
HSNP	Hunger Safety Net Program
IFC	International Finance Corporation
lmhr	lumen hours
KOSAP	Kenya Off-Grid Solar Access Project
KWh	Kilowatt-hour
LED	Light-Emitting Diode
M&E	Monitoring & Evaluation
MDCL	Market Development Credit Line
MTF	Multi-Tier Framework for Measuring Energy Access
MW	Megawatts
NAIVS	National Agricultural Input Voucher Scheme
NEP	National Electrification Plan
NGO	Non-Governmental Organization
OGS	Off-Grid Solar
PAYGo	Pay-As-You-Go
PULSE	Productive Use Leveraging Solar Energy
PV	Photovoltaic
RBF	Results-Based Financing
RISE	Regulatory Indicators for Sustainable Energy
SDG	Sustainable Development Goals
SHS	Solar Home System
SSS	Supply-Side Subsidy
UNICEF	United Nations International Children's Emergency Fund
US$	United States Dollars
USSD	Unstructured Supplementary Service Data
VAT	Value Added Tax
Wh	Watt-hour
Wp	Watt-peak

EXECUTIVE SUMMARY

Access to energy has increased significantly over the past decade, though the energy access gap remains significant.

In 2010, 1.2 billion people lacked access to modern electricity globally, and since then, countries have invested heavily in infrastructure to electrify vast populations.[1] In 2016, 193 countries adopted the Sustainable Development Goals (SDGs), of which SDG 7 promises universal access to clean and modern energy. The number of people without electricity dropped to 789 million people globally in 2018.[2] Despite the progress, this electrification gap is significant, and leaders must come together to accelerate access in pursuit of SDG 7, especially in the hardest-to-reach areas and for the most vulnerable populations.

Hundreds of millions remain unelectrified in Sub-Saharan Africa. The region represents the largest access gap, with 548 million unelectrified people as of 2018.[3] Sub-Saharan Africa is also home to 20 countries with the lowest energy access rates.[4] Some countries have massive energy access deficits to overcome, with 218 million people remaining without access in Nigeria, the Democratic Republic of Congo, and Ethiopia alone.[5]

Off-grid solar (OGS) has emerged as a viable way to provide clean and modern access to energy. Since 2010, innovations in technology and business models, coupled with significant private and public investments, have improved electricity access for 420 million users. Of these, at least 231 million users have access to Tier 1 energy access and above based on the Multi-Tier Framework for Measuring Energy Access (MTF).[6] Tier 1 access is the universally accepted minimum level of electrification needed for energy access under SDG 7. With this level of access households increase productivity, with up to 22 percent of households generating additional income using OGS products in a business and 44 percent of households working longer hours. The sector now supports an estimated 110,000 full-time equivalent jobs in East, West, and Central Africa.[7] OGS also provides other socioeconomic benefits, with 84 percent of households noting that children study longer, while 90 percent of households feel healthier and safer by replacing kerosene with OGS products.[8]

1 *International Energy Agency (IEA) et al, Tracking SDG 7: The Energy Progress Report 2019 (Washington DC: IEA, IRENA, UNSD, WB, WHO, 2019), 1, https://trackingsdg7.esmap.org/data/files/download-documents/2019-tracking_sdg7-execsumm-withoutembargoed.pdf*

2 *International Energy Agency (IEA) et al, Tracking SDG 7: The Energy Progress Report 2019,14*

3 *International Energy Agency (IEA) et al, Tracking SDG 7: The Energy Progress Report 2019, 23*

4 *International Energy Agency (IEA) et al, Tracking SDG 7: The Energy Progress Report 2019,4*

5 *Lighting Global, Vivid Economics and Open Capital, 2020 Off-Grid Solar Market Trends Report (MTR), (Amsterdam: GOGLA, 2020),14, https://www.lightingglobal.org/wp-content/uploads/2020/05/VIVID_OCA_2020_Off_Grid_Solar_Market_Trends_Report_Full_High-compressed.pdf*

6 *Energy Sector Management Assistance Program (ESMAP), Beyond Connections - Energy Access Redefined, (Washington, DC: World Bank, 2015), 6, https://www.worldbank.org/content/dam/Worldbank/Topics/Energy%20and%20Extract/Beyond_Connections_Energy_Access_Redefined_Exec_ESMAP_2015.pdf*

7 *GOGLA, Off-Grid Solar: A Growth Engine for Jobs Off-grid solar: on the level, nature and wider impact of employment opportunities in the off-grid solar sector, (Amsterdam: GOGLA, 2019), 4, https://www.gogla.org/sites/default/files/resource_docs/gogla_off_grid_solar_a_growth_engine_for_jobs_web_opt.pdf*

8 *GOGLA, Powering Opportunity (2018), (Amsterdam: GOGLA, 2019), 10 & 11, https://www.gogla.org/powering-opportunity-2018*

Despite progress to date and the expected trajectory of the OGS sector, a substantial energy access gap will remain in 2030, if the sector continues on the current growth trajectory.

At least 228 million people will not have Tier 1 access by 2030, with the majority in Sub-Saharan Africa.[9] This figure will be larger if consumers are unable to access OGS products as a result of companies being unable to grow as they have in the past, achieve success in new markets, and steadily raise additional capital to fuel growth. Also, more people will not gain access if consumers are unable to afford OGS products.

- The **"access gap"** encompasses those individuals that have no feasible way of obtaining an OGS product, though some may have the willingness and ability to pay. Due to remoteness, a lack of infrastructure, and low population density, it may not be economical for OGS companies to set up networks in hard-to-reach areas.
- The **"affordability gap"** includes customers who are not able to afford an OGS product, though some may have access to locations where they can purchase one. Providing energy access to these low-income households will require up to US$ 3.4 billion of additional public financing to close the affordability gap, in addition to other public finance needed to support the development of commercial markets.[10]

COVID-19 will further put energy access out of reach for end users in Sub-Saharan Africa. The World Bank estimates 23 million people will fall below the poverty line in Sub-Saharan Africa due to the pandemic.[11] Low-income households will struggle more to afford products due to job losses or wage cuts, and reduced international remittances.[12] Additionally, off-grid solar (OGS) companies will struggle to maintain operations (notably sales and after-sales support) due to reduced consumer ability to pay and restricted movements from lockdowns.[13] As a result, there will be additional pressure for stakeholders to accelerate energy access to achieve SDG7.

9 *Lighting Global, Vivid Economics and Open Capital, 2020 Off-Grid Solar Market Trends Report (MTR), 205*

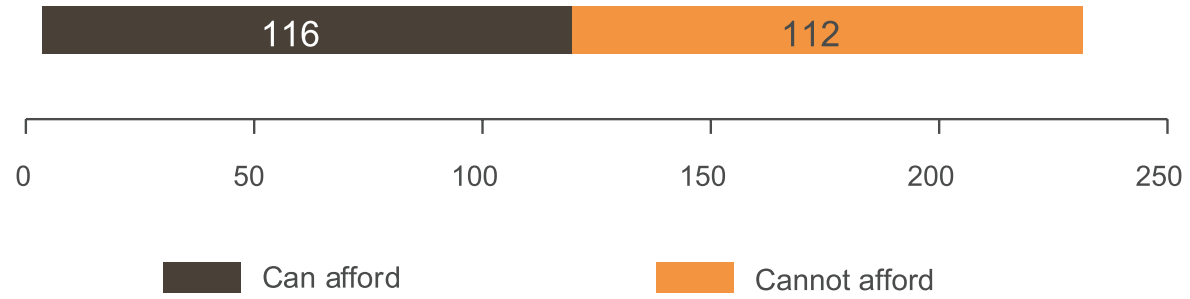
10 *Lighting Global, Vivid Economics and Open Capital, 2020 Off-Grid Solar Market Trends Report (MTR), 33*

11 *Daniel Gerszon Mahler et al, "The impact of COVID-19 (Coronavirus) on global poverty: Why Sub-Saharan Africa might be the region hardest hit (blog)", World Bank, April 20, 2020, https://blogs.worldbank.org/opendata/impact-covid-19-coronavirus-global-poverty-why-sub-saharan-africa-might-be-region-hardest*

12 *International Labor Organization, ILO Monitor: COVID-19 and the world of work (2nd edition), (Geneva: International Labour Organization, 2020) , 3 – 5, https://www.ilo.org/wcmsp5/groups/public/@dgreports/@dcomm/documents/briefingnote/wcms_740877.pdf, World Bank, "World Bank Predicts Sharpest Decline of Remittances in Recent History", https://www.worldbank.org/en/news/press-release/2020/04/22/world-bank-predicts-sharpest-decline-of-remittances-in-recent-history*

13 *GOGLA, COVID-19: Coordinating an industry response for the off-grid solar sector, (Webinar presentation, March 2020), https://www.gogla.org/sites/default/files/resource_docs/covid19_webinar_slides_forsharing.pdf*

Figure ES1: Estimated unserved population in 2030, by affordability (population, millions) [14]



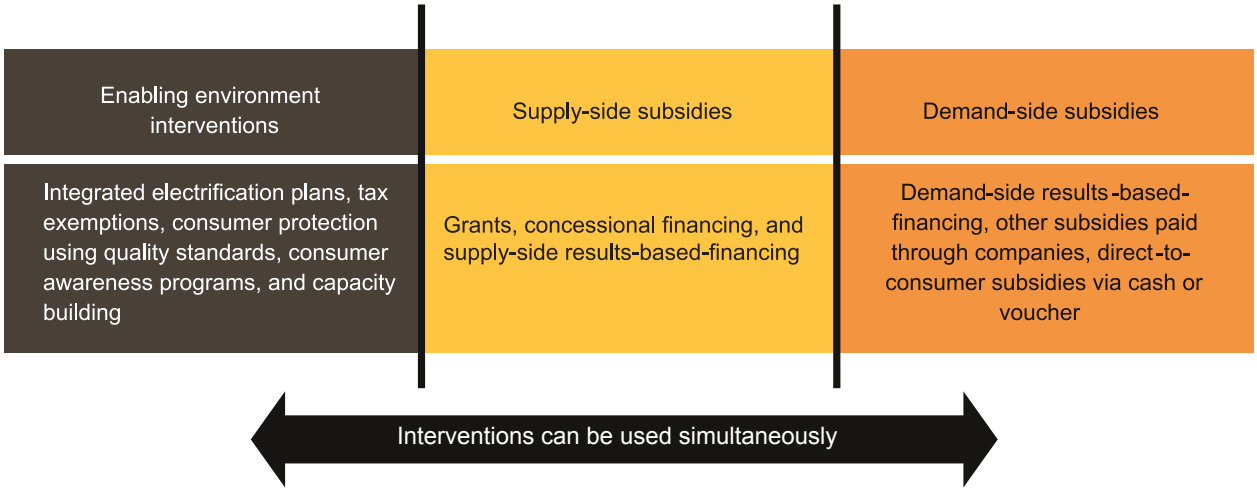
Governments and donors have launched substantial initiatives to accelerate energy access.

Efforts so far have largely focused on developing a robust enabling environment for OGS and implementing supply-side subsidies (SSS). A strong enabling environment has been essential to catalyze commercial activity in nascent OGS markets and crowd in private sector companies and investment to ensure the availability of OGS products. Enabling environment interventions include setting up national electrification plans, tax exemptions, quality standards, consumer awareness programs and capacity building programs. In addition, SSS such as grants, concessional financing, and results-based financing (RBF) reduce upstream risks or costs for businesses, encouraging growth. These interventions have encouraged companies to scale up operations and increase access for customers in challenging markets. These combined initiatives are also a great first step in improving affordability as they help companies achieve economies of scale and operational efficiency. However, they do not adequately address the affordability gap for the poorest and most vulnerable consumers.

Demand Side Subsidies (DSS) are therefore an essential tool for governments to achieve SDG 7 and ensure 'no one is left behind' on the path to universal access. DSS, unlike other subsides, close the affordability gap by directly reducing the price paid by end users for OGS products. DSS can be provided directly to consumers or through companies with the intent of reducing the price for end users who cannot afford a product, allowing private companies to continue selling products to those who can pay full price for OGS products in a commercial manner.

14 Lighting Global, Vivid Economics and Open Capital, 2020 Off-Grid Solar Market Trends Report (MTR), (Amsterdam: GOGLA, 2020), 31, https://www.lightingglobal.org/wp-content/uploads/2020/05/VIVID_OCA_2020_Off_Grid_Solar_Market_Trends_Report_Full_High-compressed.pdf

Figure ES2: OGS market-building toolkit

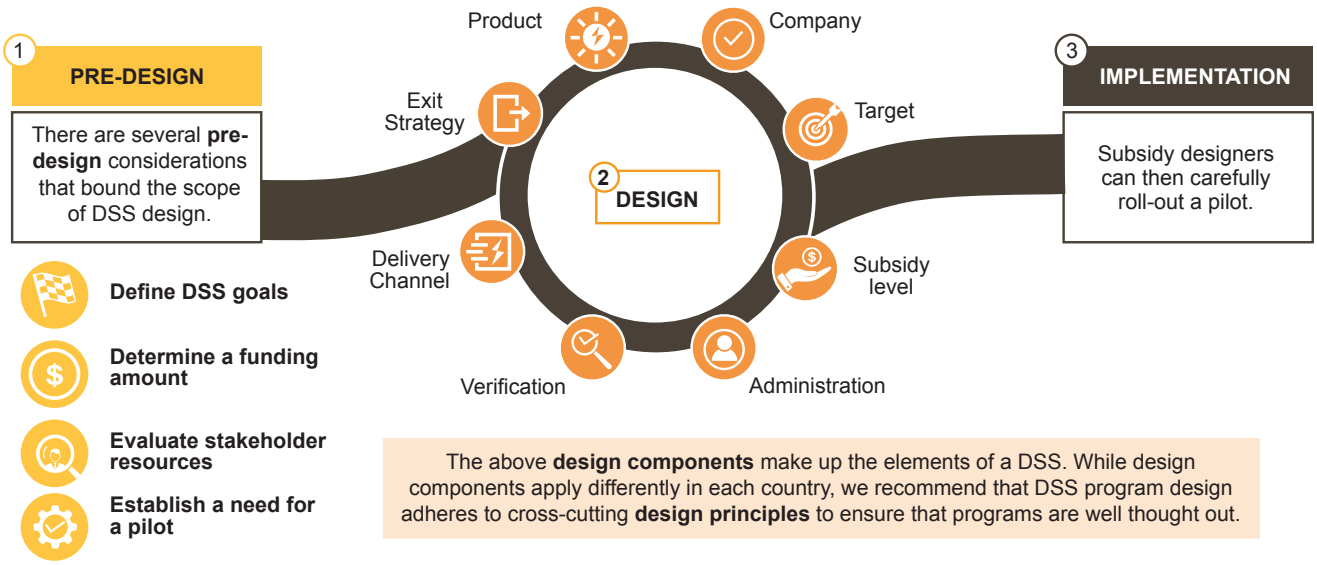


To reach SDG 7 by 2030, countries with significant affordability gaps might introduce DSS alongside SSS to drive their countries towards universal access. For counties with significant access deficits, using SSS to accelerate organic market growth is often the quickest, most efficient, and sustainable way to reach as many people as possible. However, for those countries with a significant affordability gap, DSS may also be needed. Given the objective to ensure that no-one is left behind, governments may need to implement SSS and DSS in parallel, while carefully managing the risks of market distortion inherent in such an approach. Each intervention should be designed within the context of the country's plan to achieve universal access, ensuring a robust enabling environment, and taking into account a country's unique challenges. Notably, by understanding hard to reach areas, governments can incentivize companies to serve these populations in practical ways. And by understanding consumer affordability, governments can identify the most vulnerable populations who cannot afford OGS products without direct subsidies.

This paper provides a framework for how governments can design DSS to ensure that no one is left behind.

Before embarking on subsidy design, policymakers should consult with industry stakeholders and align on specific pre-design considerations. These include program goals, the funds available for the program, beneficiary context, the level of private sector maturity, and the availability of data. Governments should start with a pilot DSS program, and all pre-design considerations must be taken into account when designing a pilot. These pre-design considerations define the scope and context of DSS and enable governments to assess the trade-offs associated with specific designs.

Figure ES3 Subsidy design overview



When designing a DSS, there are several key design components policymakers must consider to ensure that programs efficiently meet their target outcomes. Components are the elements which collectively form a subsidy program. Every DSS is made up of these components, and governments will need to tailor each of these components to fit their unique local context and the subsidy goals. Each of the decisions around components should be made transparently and with a high degree of justification.

Table ES1: DSS program components

COMPONENT	KEY ASPECTS TO CONSIDER
Product selection	Programs can subsidize a range of OGS products or specifics products. If subsidizing specific products, programs can choose an actual product (e.g., smaller plug-and-play solar home system (SHS), larger component-based SHS, productive use appliances, among others), or specific product capabilities (e.g., mobile phone charging, minimum daily energy production, a productive use component).
Company selection	Programs must choose how many companies to partner with and what types of companies (e.g. international or local) to partner with. This decision impacts the supplier mix and the oversight needed by a program.
Level of targeting	Subsidies can “target” specific populations or be available to anyone, reaching a wider cross-section of the intended population. Forms of targeting include geographic, demographic, and economic targeting.
Subsidy level	Programs can apply subsidies with fixed amounts or based on a percentage of a product cost. Where feasible, programs can also provide different subsidies to different subsets of targeted groups to more closely match the varying affordability gaps that users have.

Verification system	Verification ensures that subsidized products reach their targeted beneficiary, that beneficiaries have not already received a subsidy, and that beneficiaries do not re-sell products for a profit. Programs can choose between either manual or technology-enabled verification systems.
Delivery channel	Programs can choose to deliver DSS to beneficiaries through private companies that must reduce prices for end users or to beneficiaries directly via cash or via vouchers. In both cases, beneficiaries receive the full subsidy amount.
Form of administration	Programs can leverage either government administrators or independent, third-party implementation organizations to provide oversight for subsidy implementation and program management.
Exit strategy	Programs can incorporate a clear exit strategy that is pegged to a specific date or milestone. This ensures that programs can manage a smooth transition to a commercial market in which customers and companies do not expect everlasting subsidies.

DSS designs will differ depending on country context, however, there are still best-practice design principles that can guide DSS design in the OGS sector. These principles can be applied to each country's unique set of resources and challenges to enable DSS to efficiently use funding and contribute to commercial markets. These principles are as follows:

1. **DSS should be developed through extensive discussions with relevant stakeholders and be clearly communicated to ensure stakeholder alignment.** Extensive stakeholder consultation early on and throughout the life of a subsidy informs effective design tailored to the local context and ensures stakeholder buy-in.
2. **DSS should be efficiently targeted based on available data.** Targeting should consider whom the commercial markets can and cannor serve, so there is no overlap between commercial and subsidized populations. Where possible, targeting should leverage existing data to minimize program costs.
3. **The level of subsidy should reflect the affordability gap.** Minimizing the subsidy level per user enables a DSS program to reach more beneficiaries. To minimize price expectation distortion, DSS programs should avoid giving away products for free.
4. **Verification systems should be robust to minimize leakages.** Verification systems should ensure that the correct beneficiaries receive the subsidy and that they receive no more subsidy than stipulated. Market leakage can greatly restrict commercial market growth.
5. **Programs should allocate enough resources to build the capacity of all stakeholders, including beneficiaries, government agencies, and the private sector.** Stakeholder capacity building initiatives should be budgeted from the onset of a program.

Photo credit: lightingafrica.org

6. **Processes should be efficient to maximize value for money for governments, donors, and consumers.** Minimizing operational costs frees up funds to maximize the total subsidies disbursed to beneficiaries. Nonetheless, program efficiency should not come at the expense of excluding specific population segments which may be difficult or more costly to serve.

7. **Processes should be transparent to promote accountability.** Programs should ensure fair supplier selection and clear messaging to beneficiaries about why they may or may not be eligible for a subsidy. In all cases, programs should incorporate robust monitoring and evaluation (M&E) and audit processes to ensure operational transparency.

8. **DSS should be designed with the long-term sustainability of both the program and of commercial markets in mind.** As most programs have finite budgets, they should have a clearly communicated end-date to minimize private-sector distortion once the subsidy ends. Where programs are extended or evolve, this transition should also be communicated to all stakeholders well in advance.

There is no time to lose in our effort towards universal electrification.

2030 is fast-approaching, and the sector must ensure that the most vulnerable populations are not left behind. It is now more urgent than ever for governments, donors, and the private sector to come together in this effort. DSS will be one necessary tool among a set of policy tools needed for all countries to ensure their most vulnerable populations gain access to electricity. This paper is a guide for policymakers on developing DSS for off-grid solar in Sub-Saharan Africa. It serves to help ensure that electrification goals are met by providing access to OGS to the most vulnerable populations in a sustainable manner where commercial markets can thrive.

1 THE PROBLEM OF ACHIEVING UNIVERSAL ENERGY ACCESS

Access to energy has increased significantly over the past decade, though the energy access gap remains significant. In 2010, 1.2 billion people lacked access to modern electricity.[15] Since then, countries have invested heavily in infrastructure to electrify vast populations, and in 2016, 193 countries adopted the Sustainable Development Goals (SDGs), of which SDG 7 promises universal access to clean and modern energy sources. The number of people without electricity has since dropped to 789 million people globally in 2018.[16] This gap is significant, and progress must remain steady while leaders attempt to electrify the hardest-to-reach areas.

Hundreds of millions remain unelectrified in Sub-Saharan Africa, representing 70 percent of the global energy deficit. Five hundred forty-eight million people were unelectrified in Sub-Saharan Africa as of 2018, with Nigeria, the Democratic Republic of Congo (the DRC), and Ethiopia alone representing 218 million of those people.[17] Large rural populations and high population growth are major factors causing the energy access gap in Sub-Saharan Africa[18] Rural populations, which reside in difficult-to-reach areas that make grid electrification uneconomical, represent 85 percent of the global energy access deficit. In 2018, 59.8 percent of Sub-Saharan Africa's population lived in rural areas, compared to 44.7 percent globally.[19] Further exacerbating this challenge, high population growth is projected in Sub-Saharan Africa, as the region expects to hold a quarter of the global population by 2050.[20] From 2016 to 2018 the region's share of the global energy deficit increased as its population grew faster than electrification rates, particularly in Nigeria, the DRC, Burkina Faso, and Niger.[21] Given these unique challenges in the region, Sub-Saharan Africa will be a focal point in universal electrification efforts, and governments will play a critical role through strategic allocation of public funding.

1.1. THE ROLE OF OFF-GRID ENERGY

Historically countries have increased energy access through grid connections. The grid has provided electricity to over 96 percent of the 6.675 billion people who have access today.[22] The grid

15 *International Energy Agency (IEA) et al, Tracking SDG 7: The Energy Progress Report 2019 (Washington DC: IEA, IRENA, UNSD, WB, WHO, 2019), 1, https://trackingsdg7.esmap.org/data/files/download-documents/2019-tracking_sdg7-execsumm-withoutembargoed.pdf*

16 *This idea is embodied in Sustainable Development Goal 7 (SDG7) and is inspired by the principle of "leaving no one behind." Universal energy access is defined as a minimum of Tier 1 access based on the Multi-Tier Framework, International Energy Agency (IEA) et al, Tracking SDG 7: The Energy Progress Report 2019, 1, Energy Sector Management Assistance Program (ESMAP), "Multi-Tier Framework", https://www.esmap.org/node/7120*

17 *Lighting Global, Vivid Economics and Open Capital, 2020 Off-Grid Solar Market Trends Report (MTR), (Amsterdam: GOGLA, 2020),14, https://www.lightingglobal.org/wp-content/uploads/2020/05/VIVID_OCA_2020_Off_Grid_Solar_Market_Trends_Report_Full_High-compressed.pdf*

18 *International Energy Agency (IEA) et al, Tracking SDG 7: The Energy Progress Report 2019, 23*

19 *The World Bank, Rural population (% of total population) based on the United Nations Population Division's World Urbanization Prospects , (Washington, DC: World Bank, 2018), https://data.worldbank.org/indicator/SP.RUR.TOTL.ZS?view=map*

20 *The Economist, "Africa's population will double by 2050", March 26, 2020, https://www.economist.com/special-report/2020/03/26/africas-population-will-double-by-2050*

21 *International Energy Agency (IEA) et al, Tracking SDG 7: The Energy Progress Report 2019, 23*

22 *As at 2017. Assumes 7.5 billion global population at 2017 (WB), and 89% electrification rate (IRENA). It also assumes 231M people have access to Tier 1 OGS, per the MTR 2020, Lighting Global, Vivid Economics and Open Capital, 2020 Off-Grid Solar Market Trends Report (MTR), (Amsterdam: GOGLA, 2020), 10, https://www.lightingglobal.org/wp-content/uploads/2020/05/VIVID_OCA_2020_Off_Grid_Solar_Market_Trends_Report_Full_High-compressed.pdf*

can supply large amounts of energy to multiple types of end users, from commercial and industrial to residential users. Massive economies of scale accomplished through large generation plants, coupled with transmission and distribution infrastructure, can theoretically make per unit electricity costs affordable for many, though power providers in many countries rely on subsidies to improve affordability for end users.

However, grid extension is not optimal for electrifying last mile end users. Large, centralized power plants have high capital expenditures. For instance, the 310MW Lake Turkana wind power plant in Kenya had an estimated project cost of US$ 680 million. By comparison, the 300MW Kam'mwamba coal power plant in Malawi had an estimated cost of US$ 667 million.[23] Raising large amounts of capital is challenging for cash-strapped governments, it is time-intensive, and it depends on a range of factors including a country's creditworthiness, the availability of capital, and local procurement regulations. Second, this system requires expensive transmission and distribution networks that often suffer from construction delays, particularly in rural areas.[24] Costs per connection rise significantly in rural areas due to low population density. Third, even if the grid arrives, many potential residential grid customers cannot afford the cost of grid connection, which often excludes low-income households. As a result, grid electrification has mainly benefited denser, higher-income urban areas.[25]

In addition, over 1 billion people globally have an unreliable grid connection.[26] These people face frequent or lengthy power outages that can decrease productivity and necessitate alternatives such as expensive back-up diesel-powered generators.[27] This is an acute problem in Sub-Saharan African countries such as Nigeria, where 66 percent of grid customers have an unreliable connection and where the population spends more on generator fuel than on grid electricity.[28] It is also a massive issue in South Asia; despite the region benefiting from significant increases to grid access, almost half of those with grid access have an unreliable connection.[29]

Over the past ten years, OGS solutions have benefited from technological advancements that have significantly reduced component costs. For instance, average prices for LED lights and lithium-ion batteries fell 90 and 85 percent respectively between 2010-2018.[30] Wholesale prices of crystalline modules for solar photovoltaic (PV) panels larger than 200 W dropped from US$ 0.50 per Wp in 2018 to US$ 0.39 per Wp in 2019.

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23 *Africa Development Bank, "Lake Turkana Wind Power Project: The largest wind farm project in Africa", September 17, 2015, https://www.afdb.org/en/projects-and-operations/selected-projects/lake-turkana-wind-power-project-the-largest-wind-farm-project-in-africa-143, Rex Chikoko, "Govt to go solo on Kam'mwamba", The Nation, October 26, 2018, https://www.mwnation.com/govt-to-go-solo-on-kammwamba/*

24 *An example of this was seen in the Lake Turkana wind power project where the 428-kilometer transmission line connecting the power plant to the grid was not completed on time. This made the Government of Kenya liable to pay roughly US$ 65 million in liquidated damages and resulted in lost revenues for the national utility and taxes for the government, John Mutua, "Sh1bn extra fine for delayed wind power", Daily Nation, April 2, 2019, https://www.businessdailyafrica.com/economy/Sh1bn-extra-fine-for-delayed-wind-power/3946234-5053866-ys6a7cz/index.html*

25 *International Energy Agency (IEA) et al, Tracking SDG 7: The Energy Progress Report 2019 (Washington DC: IEA, IRENA, UNSD, WB, WHO, 2019), 4, https://trackingsdg7.esmap.org/data/files/download-documents/2019-tracking_sdg7-execsumm-withoutembargoed.pdf*

26 *Lighting Global, Vivid Economics and Open Capital, 2020 Off-Grid Solar Market Trends Report (MTR), (Amsterdam: GOGLA, 2020), 92, https://www.lightingglobal.org/wp-content/uploads/2020/05/VIVID_OCA_2020_Off_Grid_Solar_Market_Trends_Report_Full_High-compressed.pdf*

27 *Lighting Global, Vivid Economics and Open Capital, 2020 Off-Grid Solar Market Trends Report (MTR), V*

28 *International Finance Corporation (IFC), The Dirty Footprint of the Broken Grid : The Impacts of Fossil Fuel Back-up Generators in Developing Countries, (Washington, DC: IFC, 2019), 21, https://www.ifc.org/wps/wcm/connect/2cd3d83d-4f00-4d42-9bdc-4afdc2f5dbc7/20190919-Full-Report-The-Dirty-Footprint-of-the-Broken-Grid.pdf?MOD=AJPERES&CVID=mR9UpXC*

29 *Lighting Global, Vivid Economics and Open Capital, 2020 Off-Grid Solar Market Trends Report (MTR), 98*

30 *Lighting Global, Vivid Economics and Open Capital, 2020 Off-Grid Solar Market Trends Report (MTR), 65*

OGS companies have also invested heavily in product and business model innovations to serve a range of rural and peri-urban customers. Companies have invested at least US$ 150 million in product research and development since 2012, resulting in higher quality and more durable products designed specifically for off-grid populations.[31] They have also built extensive and lean last-mile distribution networks that sell systems sized appropriately for the end user, avoiding the over-capacity issue of the grid. Furthermore, the pay-as-you-go (PAYGo) business model, which offers consumer financing by allowing consumers to spread out payments for OGS products over time, further boosts affordability.[32] This consumer-level approach has allowed OGS companies to serve hard-to-reach and low-income households at affordable price points.

Case box 1: What is the MTF?

The MTF is a framework to measure energy access that was launched by the Energy Sector Management Assistance Program (ESMAP) in 2015.[33] The MTF measures energy access based on seven attributes (namely capacity, availability, reliability, quality, affordability, formality, and health and safety) and determines energy access levels on a scale of 0 to 5. Globally, most governments use Tier 1 access as the minimum level for purposes of universal electrification targets.[34] Example attributes defining Tier 1 access include power capacity of 3 W or 12 Wh, lighting of 1,000 lmhr per day, and availability for at least 4 hours a day and 1 hour in the evening.[35]

As a result, OGS solutions are now a viable and affordable alternative to the centralized, on-grid power model. The price to purchase a Tier 1 OGS device (Table 1) can be cheaper than the cost to connect a household to the grid, with grid connection costs ranging widely from US$ 10 to 200, depending on the country and level of subsidy provided.[36] In comparison, the deposit for an 11-20 Wp solar home system (SHS) providing full Tier 1 energy access to an entire household costs an average of US$ 28, which is on the lower end of the cost range for grid connections.[37] As a result, the OGS sector has provided a scalable model to reach off-grid users.

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31 Lighting Global, Vivid Economics and Open Capital, 2020 Off-Grid Solar Market Trends Report (MTR), 126

32 Industry consultations reveal that instalments for entry-level SHS are usually pegged against the monthly disposable income a household has for energy expenditure. The objective is for households to take on OGS as a substitute to existing energy sources such as kerosene, charcoal, or firewood.

33 Energy Sector Management Assistance Program (ESMAP), Beyond Connections - Energy Access Redefined, (Washington, DC: World Bank, 2015), 6, https://www.worldbank.org/content/dam/Worldbank/Topics/Energy%20and%20Extract/Beyond_Connections_Energy_Access_Redefined_Exec_ESMAP_2015.pdf

34 Lighting Global, Vivid Economics and Open Capital, 2020 Off-Grid Solar Market Trends Report (MTR), 183

35 Energy Sector Management Assistance Program (ESMAP), Beyond Connections - Energy Access Redefined, 6,

36 Raluca Golumbeanu and Douglas Barnes, Connection Charges and Electricity Access in Sub-Saharan Africa, (Washington, DC: World Bank, 2013), 23, http://documents.worldbank.org/curated/en/499211468007201085/pdf/WPS6511.pdf

37 Lighting Global, Vivid Economics and Open Capital, 2020 Off-Grid Solar Market Trends Report (MTR), (Amsterdam: GOGLA, 2020), 43, https://www.lightingglobal.org/wp-content/uploads/2020/05/VIVID_OCA_2020_Off_Grid_Solar_Market_Trends_Report_Full_High-compressed.pdf

Table 1: Classification of sample off-grid solar products and level of energy access [38]

Product category	Definitions	Product capacity, Watt Peak (Wp)	Multi-Tier Framework (MTF) level	Example
Portable Lanterns	Single light only	0 – 1.49	Enables Tier 0 (or partial Tier 1) Energy Access for an individual person	 SunKing Pico Plus
Entry-level SHS	Three to four lights, phone charging and powering a radio	11 – 20.99	Enables Tier 1 Energy Access for a household	 M-KOPA 6
Medium-capacity SHS	As above, plus power for a television, more lights, appliances & extended capacity	50 – 99.99	Enables Tier 2 Energy Access for a household even using conventional appliances	 d.light X850

Beyond energy access, OGS products also provide a wide range of secondary benefits. Larger SHS provide not only lighting to households but also power for a wide range of household appliances, including radios, fans, and televisions, and productive use appliances such as refrigerators and water pumps. OGS products can improve economic productivity and income generation. Up to 22 percent of households generate additional income using OGS products in a business, while 44 percent of households had members who work longer hours due to their OGS product. As of 2018, the OGS sector supported an estimated 110,000 full-time equivalent jobs in East, West, and Central Africa.[39] OGS solutions can impact other socioeconomic factors as well. Eighty-four percent of households note that children study longer, while 90 percent of households feel healthier and safer by replacing kerosene with OGS products.[40]

As a result, 420 million users now have access to clean and modern energy through a wide range of OGS products that improve quality of life and productivity. Of these, 231 million users as of 2019 have Tier 1+ energy access (Figure 1).[41] Based on current projections, 389 million customers will have Tier 1+ energy access through OGS products by 2030.[42] This continued growth will require business model adaptations, sales of larger systems and appliances, new sources of capital, and new forms of public funding.[43]

38 *Lighting Global, Vivid Economics and Open Capital, GOGLA MTR Framework: 2020 Off-Grid Solar Market Trends Report (MTR), VII*

39 *GOGLA, Off-Grid Solar: A Growth Engine for Jobs Off-grid solar: on the level, nature and wider impact of employment opportunities in the off-grid solar sector, (Amsterdam: GOGLA, 2019), 10, https://www.gogla.org/sites/default/files/resource_docs/gogla_off_grid_solar_a_growth_engine_for_jobs_web_opt.pdf*

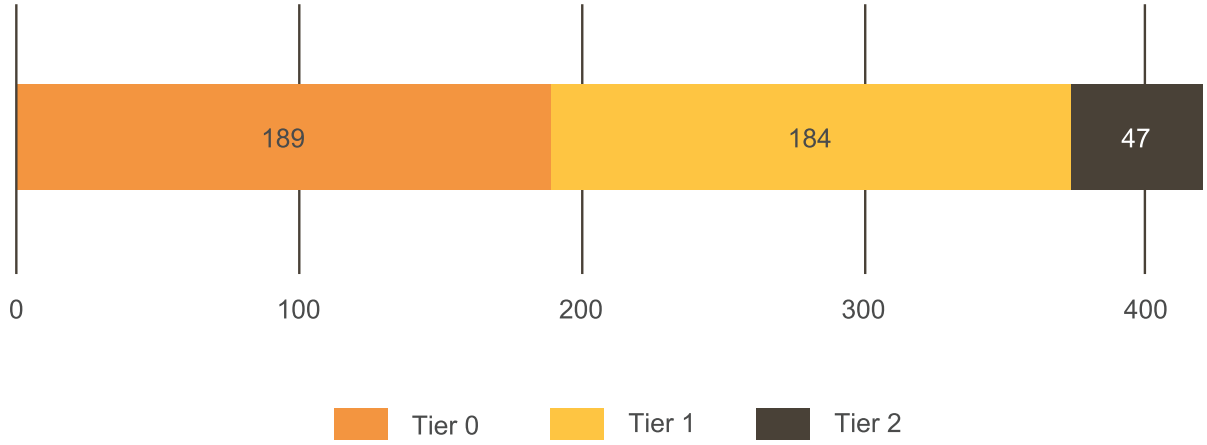
40 *GOGLA, Powering Opportunity (2018), (Amsterdam: GOGLA, 2019), 10 & 11, https://www.gogla.org/powering-opportunity-2018*

41 *Lighting Global, Vivid Economics and Open Capital, 2020 Off-Grid Solar Market Trends Report (MTR), (Amsterdam: GOGLA, 2020), 180, https://www.lightingglobal.org/wp-content/uploads/2020/05/VIVID_OCA_2020_Off_Grid_Solar_Market_Trends_Report_Full_High-compressed.pdf*

42 *Lighting Global, Vivid Economics and Open Capital, GOGLA MTR Framework: 2020 Off-Grid Solar Market Trends Report (MTR), 200*

43 *Lighting Global, Vivid Economics and Open Capital, GOGLA MTR Framework: 2020 Off-Grid Solar Market Trends Report (MTR), 201*

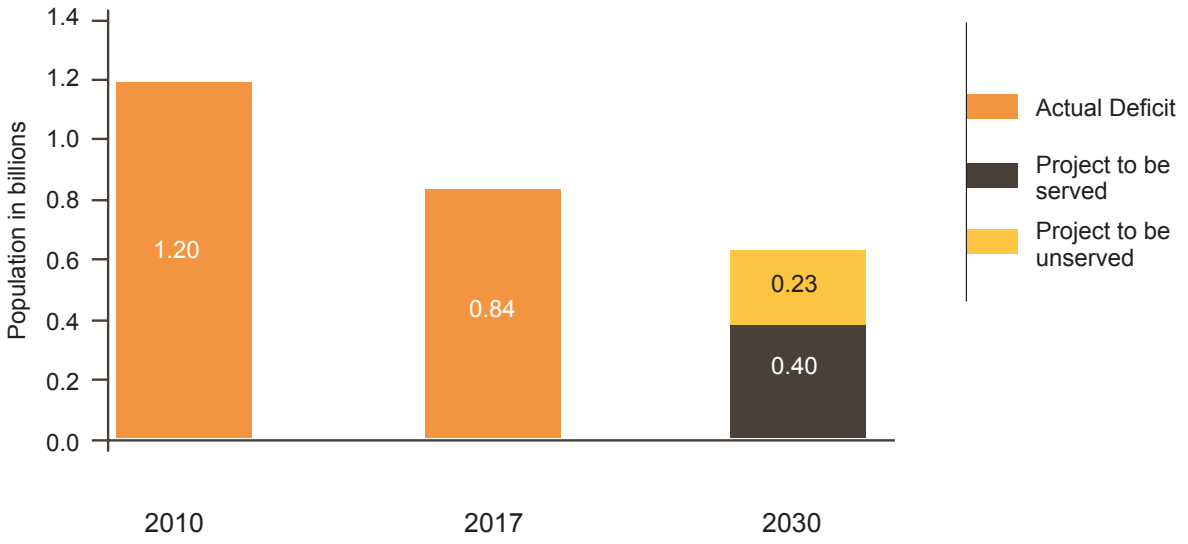
Figure 1: Conservative estimate of the number of people worldwide benefiting from energy access through off-grid solar devices (millions)[44]



1.2. CLOSING THE ENERGY ACCESS GAP

Despite progress to date and the expected trajectory of the OGS sector, a substantial energy access gap will remain. At least 228 million people will still not have Tier 1 access by 2030, the majority in Sub-Saharan Africa (Figure 2).[45] This figure will be larger if consumers are unable to access OGS products as a result of companies being unable to grow as they have in the past, achieve success in new markets, and steadily raise additional capital to fuel growth. Also, more people will not gain access if consumers are unable to afford OGS products.

Figure 2: Global energy access deficit (population in billions)[46]



44 Lighting Global, Vivid Economics and Open Capital, 2020 Off-Grid Solar Market Trends Report (MTR), 208

45 Lighting Global, Vivid Economics and Open Capital, GOGLA MTR Framework: 2020 Off-Grid Solar Market Trends Report (MTR), 205

46 Lighting Global, Vivid Economics and Open Capital, GOGLA MTR Framework: 2020 Off-Grid Solar Market Trends Report (MTR), 205

The "access gap" encompasses those individuals that have no feasible way of obtaining an OGS product, though some may have the willingness and ability to pay. Moving forward, the vast majority of unelectrified populations will be rural. Due to remoteness, a lack of infrastructure, and low population density, it may not be economical for OGS companies with lean distribution models to set up networks in these areas. Beyond rural populations, certain people lack access due to demographic characteristics, for example, gender and disabilities.

(Case box 2).[47]

Case box 2: Impact of gender on energy access

A recent World Bank study on access-deficit countries found significant variability in household access to energy, based on the head of the household's gender.[48] Male-headed households were more likely to be connected to the grid and had higher access to OGS compared to female-headed households.

Furthermore, surveys conducted by Energia across three countries found that women had several disadvantages that reduced their ability to access energy, both for accessibility and affordability.[49] First, surveyed women in Kenya earned on average 60 percent less than men. Second, women lacked decision-making power, given the patriarchal nature of Kenyan society, and fixed assets were largely owned by men. Finally, adult women lacked educational opportunities when they were children, which created even more dependency on men to make decisions on their behalf.

Because of these long-standing disadvantages, government efforts to increase energy access must pay special consideration to the needs of this group and other vulnerable groups to ensure no one is left behind.

The "affordability gap" includes customers who are not able to afford an OGS product, though some may have access to locations where they can purchase one. Affordability is a factor of both low consumer ability to pay, especially amongst the most vulnerable households, and high product prices coupled with the lack of consumer financing options. Consumer income and price heavily impact

47 *Soma Dutta, Annemarije Kooijman, and Elizabeth Cecelski, Energy Access And Gender: Getting The Right Balance, (Washington, DC: World Bank, 2017), 1 – 3, http://documents.worldbank.org/curated/en/463071494925985630/pdf/115066-BRI-P148200-PUBLIC-FINALSEARSFGenderweb.pdf*

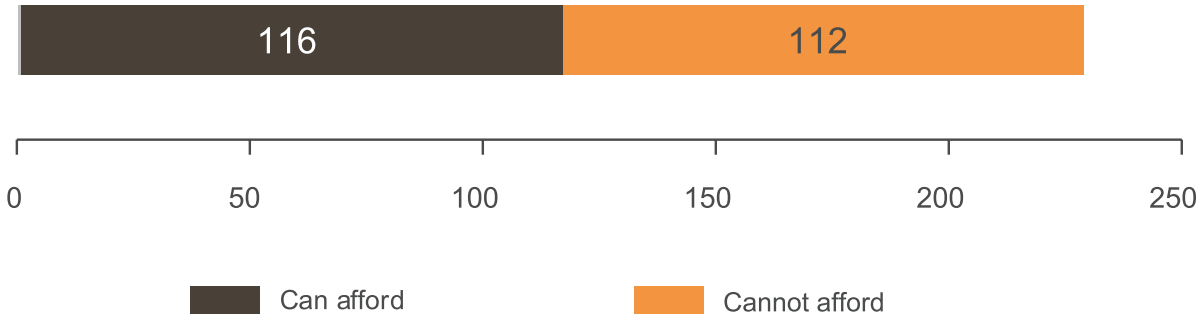
48 *Federal Ministry for Economic Cooperation and Development (BMZ), Germany, Ministry of Foreign Affairs of the Netherlands, International Renewable Energy Agency (IRENA) and World Bank, Policy Brief #24: Energy Sector Transformation – Decentralized Renewable Energy for Universal Access, (New York: United Nations, 2018), 5, https://sustainabledevelopment.un.org/content/documents/17589PB24.pdf*

49 *Tanja Winther et al, Women's empowerment and electricity access: How do grid and off-grid systems enhance or restrict gender equality?, (The Hague: Energia, 2019), 12, https://www.energia.org/cm2/wp-content/uploads/2019/04/RA1-Womens-empowerment-and-electricity-access.pdf*

50 *Lighting Global, Vivid Economics and Open Capital, 2020 Off-Grid Solar Market Trends Report (MTR), (Amsterdam: GOGLA, 2020), 31, https://www.lightingglobal.org/wp-content/uploads/2020/05/VIVID_OCA_2020_Off_Grid_Solar_Market_Trends_Report_Full_High-compressed.pdf*

51 *Lighting Global, Vivid Economics and Open Capital, 2020 Off-Grid Solar Market Trends Report (MTR), 213*

Figure 3: 2030 unserved population, by affordability (population, millions)[52]



affordability, prices driven by a wide range of factors, including high taxes and fragmented supply chains. By 2030, an estimated 112 million people will fall within the affordability gap (Figure 3).[50] Providing energy access to these low-income households will require up to US$ 3.4 billion of additional public financing.[51]

COVID-19 will further put energy access out of reach for end users in Sub-Saharan Africa. The World Bank estimates 23 million people will fall below the poverty line in Sub-Saharan Africa due to the pandemic.[53] Low-income households will struggle more to afford products due to job losses or wage cuts, and reduced international remittances.[54] Additionally, off-grid solar (OGS) companies will struggle to maintain operations (notably sales and after-sales support) due to reduced consumer ability to pay and restricted movements from lockdowns.[55] As a result, there will be additional pressure for stakeholders to accelerate energy access to achieve SDG7.

Governments and other stakeholders will need to act swiftly and purposefully to meet energy access targets. This report sets out the multiple interventions that governments can use to tackle energy access, with a focus on demand-side subsidies to ensure no one is left behind. It will also set out how each intervention can be used to catalyze commercial markets while minimizing the risk of market distortion.

52 *Lighting Global, Vivid Economics and Open Capital, 2020 Off-Grid Solar Market Trends Report (MTR), (Amsterdam: GOGLA, 2020), 213, https://www.lightingglobal.org/wp-content/uploads/2020/05/VIVID_OCA_2020_Off_Grid_Solar_Market_Trends_Report_Full_High-compressed.pdf*

53 *Lighting Global, Vivid Economics and Open Capital, 2020 Off-Grid Solar Market Trends Report (MTR), (Amsterdam: GOGLA, 2020), 31, https://www.lightingglobal.org/wp-content/uploads/2020/05/VIVID_OCA_2020_Off_Grid_Solar_Market_Trends_Report_Full_High-compressed.pdf*

54 *International Labor Organization, ILO Monitor: COVID-19 and the world of work (2nd edition), (Geneva: International Labour Organization, 2020) , 3 – 5, https://www.ilo.org/wcmsp5/groups/public/@dgreports/@dcomm/documents/briefingnote/wcms_740877.pdf, World Bank, "World Bank Predicts Sharpest Decline of Remittances in Recent History", https://www.worldbank.org/en/news/press-release/2020/04/22/world-bank-predicts-sharpest-decline-of-remittances-in-recent-history*

55 *GOGLA, COVID-19: Coordinating an industry response for the off-grid solar sector, (Webinar presentation, March 2020), https://www.gogla.org/sites/default/files/resource_docs/covid19_webinar_slides_forsharing.pdf*

2 MARKET - BUILDING INTERVENTIONS

The OGS market delivers quality and affordable energy services to hundreds of millions of people, including those that traditional electricity utilities are unable to serve. The OGS market, particularly in Sub-Saharan Africa, comprises primarily privately-owned companies that distribute durable consumer goods (OGS products) to end users. These companies range from global, vertically integrated companies to small and local last-mile distribution companies. They import, distribute, market, sell, finance, and provide after-sales support for OGS products.

This market has grown significantly over the past 10 years. Technological innovation, lower costs, consumer financing, and increased consumer demand have all fueled market growth. This sector has notably grown on commercial terms, attracting over $1.5 billion in private investment over the past decade. From a little known sector in 2008, the sector has since ballooned and now sells over 30 million OGS products a year.[56]

The current state of the market varies dramatically across countries, and even within countries. Markets vary primarily based on whether customers can access or afford OGS products. These markets are commercial, logistically challenged, financially challenged or non-commercial (Figure 4). Industry stakeholders require robust market data to assess the current state of the market and its barriers.

Figure 4: The four types of OGS markets[57]

The market will continue to expand naturally. As markets grow and companies achieve economies of scale, product prices for end users will decline and technology will continue to improve. Simultaneously, consumers will be more willing to invest in OGS products with increased awareness. With increased sales, companies can then expand their geographical footprint and increase access to new customers.

Governments, however, can accelerate the market's natural growth. In many markets, governments have launched substantial interventions to catalyze sector growth. Creating a robust enabling environment first reduces the risk of doing business. Supply-side mechanisms then fuel market expansion. These interventions combined go a long way also to improve affordability for users. As industry stakeholders attempt to reach less commercial, harder-to-reach, and more vulnerable populations, government and donor interventions will become increasingly important.

56 *Lighting Global, Vivid Economics and Open Capital, 2020 Off-Grid Solar Market Trends Report (MTR), 5*

57 *GOGLA et all, Guidance for Governments, (Amsterdam: GOGLA, 2018), 36, https://www.gogla.org/sites/default/files/resource_docs/gogla_powering_opportunity_report.pdf*

2.1. INTERVENTIONS TO DEVELOP A ROBUST ENABLING ENVIRONMENT

Several types of interventions are crucial to developing the political, social, and economic foundations for a vibrant market that can increase energy access for consumers.[58] While providing direct support for companies is critical to build these markets, governments must also improve the overall business environment to achieve sustainable market development.[59] The foundation needed for the OGS sector includes a positive policy framework starting with national electrification plans (NEPs) that include OGS, responsible taxation policies that include OGS products and services, and consumer protection regulations. Non-policy interventions, such as consumer awareness and capacity building programs, are also essential to ensure the sector can deliver on energy access goals.

2.1.1. Policy Interventions

2.1.1.1. National Electrification Plans With Off-Grid Solar Components

Countries increasingly recognize OGS as a critical component for universal electrification. The World Bank's Regulatory Indicators for Sustainable Energy (RISE) tracks the progress of 133 countries in establishing policy and regulatory frameworks to support sustainable energy access.[60] Based on these factors, RISE evaluates a country's performance and derives a performance score per country.[61] The number of low energy access countries which have adopted OGS-related policies has dramatically increased from 15 percent to 70 percent between 2010 to 2017.

Policymakers should incorporate OGS into NEPs as one of the essential first steps in creating a supportive policy framework to achieve universal energy access. By doing so, governments send a strong signal to the private sector that OGS will play a significant role in electrification efforts. Importantly, the inclusion of OGS in NEPs provides the basis for governments to strategically allocate resources and implement targeted interventions such as subsidies for the sector.

Integrated electrification plans using geospatial mapping ensure that both on-grid and off-grid solutions are used most efficiently to achieve universal energy access. For instance, Rwanda's NEP plans to electrify 52 percent of Rwanda's population with on-grid energy and 48 percent with off-grid energy by 2024.[62] The Rwandese Government arrived at this split using geospatial mapping to determine the cost effectiveness of each solution based on remoteness and energy requirements of end users.[63] Given the advantages of OGS compared to the grid for electrifying dispersed and low-income populations, it is a valuable tool for achieving universal access goals.

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58 *International Labour Organization (ILO), An enabling environment for sustainable enterprises, (Geneva: ILO, 2014), 1, https://europa.eu/capacity4dev/iesf/documents/enabling-environment-information-overview-and-reference-analysis-tool-ilo-2014*

59 *International Labour Organization (ILO), An enabling environment for sustainable enterprises, 1*

60 *Sustainable Energy for All (SE4All), "RISE: Regulatory Indicators for Sustainable Energy", https://www.seforall.org/news/rise-regulatory-indicators-for-sustainable-energy*

61 *Sustainable Energy for All (SE4All) and Lighting Global, Policy Matters: Regulatory Indicators for Sustainable Energy, (Washington, DC: World Bank, 2018), 7, http://documents.worldbank.org/curated/en/553071544206394642/pdf/132782-replacement-PUBLIC-RiseReport-HighRes.pdf*

62 *Republic of Rwanda: Ministry Of Infrastructure, "Energy Access", https://www.mininfra.gov.rw/index.php?id=312*

63 *World Bank, Reliable and Affordable Off-Grid Electricity Services for the Poor: Lessons from the World Bank Group Experience, (Washington, DC: World Bank), 24, http://documents.worldbank.org/curated/en/360381478616068138/pdf/109573-WP-PUBLIC.pdf; see further footnote 84 on the MTF's classifications of energy access.*

2.1.1.2. Tax Exemptions

Responsible taxation can catalyze nascent markets by reducing inventory acquisition costs and increasing affordability. Import duties and VAT can significantly increase the cost for companies to import products, which in turn increases the retail price paid by customers. In Senegal, for example, import duties and VAT increase the retail price of OGS products by around 40 percent, making them unaffordable for many.[64] Reducing taxes enables companies to increase sales due to lowered costs and improved affordability.[65] Kenya, Tanzania, Uganda and Rwanda all used tax exemptions to drive growth in the early stages of the OGS sector's development while adhering to broader tax policy improvements in each country . Many other countries have followed suit, with the proportion of countries globally surveyed by RISE utilizing tax exemptions for OGS increasing from 20 to 41 percent between 2010 to 2017.[66]

Tax exemptions can create healthy competition with minimal market distortion. Companies often pass on tax savings to customers to remain competitive in non-monopolized, price-sensitive markets.[67] Tax exemptions apply across eligible companies, reducing market distortion as all companies can benefit equally, compared to interventions that provide an advantage to a few select companies.[68]

However when tax reductions are not enforced properly, they can deter private sector investment. Tax exemption regulations need to be clear, specific, and consistently enforced to provide transparency, promote certainty, and generate private sector confidence. In some countries, import duties have been applied inconsistently, depending on the port-of-entry, the specific customs officer on duty, and type of packaging for the goods.[69] This creates disputes between tax authorities and OGS companies which increase companies' tax liabilities, prevent companies from effectively planning, and reduce the likelihood that tax benefits will reach end users.

One perceived disadvantage of tax exemptions is reduced tax revenue for governments in the short term, though initial losses can be recovered in the long run. First, the revenues that governments would lose on OGS tax exemptions is relatively low. Even in a relatively mature market like Kenya, a 20 percent tariff would only provide the Government with an additional US$ 5 million in revenue a year—0.03 percent of the country's US$ 15.6 billion tax base—but this would reduce sales by 40,000

64 *Power Africa, Off-Grid Solar Market Assessment: Senegal, (Washington, DC: USAID, 2019), 15, https://www.usaid.gov/sites/default/files/documents/1860/PAOP-Senegal-MarketAssessment-Final_508.pdf*

65 *GOGLA et all, Guidance for Governments, (Amsterdam: GOGLA, 2018), 38,*

66 *Sustainable Energy for All (SE4All) and Lighting Global, Policy Matters: Regulatory Indicators for Sustainable Energy, (Washington, DC: World Bank, 2018), 88, http://documents.worldbank.org/curated/en/553071544206394642/pdf/132782-replacement-PUBLIC-RiseReport-HighRes.pdf*

67 *Rob Fetter, and Jonathan Phillips, The True Cost of Solar Tariffs in East Africa, (North Carolina: Duke University Nicholas Institute for Environmental Policy Solutions, 2019), 7, https://energyaccess.duke.edu/wp-content/uploads/2019/10/true_cost_of_solar_tariffs_in_east_africa_web.pdf*

68 *Governments can vary eligibility criteria; however, many governments have incorporated quality standards as part of eligibility requirements. See further Chapter 2.1.1.3 Consumer protection using quality standards.*

69 *Lighting Global, Vivid Economics and Open Capital, 2020 Off-Grid Solar Market Trends Report (MTR), (Amsterdam: GOGLA, 2020), 218 & 229 https://www.lightingglobal.org/wp-content/uploads/2020/05/VIVID_OCA_2020_Off_Grid_Solar_Market_Trends_Report_Full_High-compressed.pdf*

OGS units, roughly 3.5 percent of total sales in a year.[70] Second, OGS products enable commercial activity including increased working hours; new income-generating activities; and improvements in existing businesses, job creation, and financial inclusion. Third, OGS products improve quality of health and education for households, which are important foundations for economic productivity.[71] These factors cumulatively generate higher tax revenues for governments in the long run by stimulating economic growth.

2.1.1.3. Consumer Protection Using Quality Standards

Cheap, poor-quality OGS products are one of the biggest threats to a sustainable OGS sector.[72] Non-quality-verified OGS products, some of which are poor quality, dominate the sector with a 72 percent market share.[73] Cheap, poor-quality products have a higher lifetime cost for consumers as they require frequent replacement. They also create safety hazards as certain components, such as batteries, can cause fires or explode, while improper disposal damages the environment.[74] As a result, consumers often lose confidence in OGS products, making sales for quality products challenging without consumer education interventions.[75]

To prevent the negative effects of poor quality products, policymakers can adopt international quality standards early on for pico-PV and SHS products.[76] International standards, namely those set forth by the International Electrotechnical Commission (IEC) Technical Specification 62257-9-8 and verified by VeraSol, allow governments to easily adopt quality standards and verify product quality at ports-of-entry using pre-verification of conformity (PVoC) mechanisms.[77] Governments can further encourage quality product adoption by tying OGS incentive programs to quality-verification. One such example is in Ethiopia, where only quality-verified OGS products are eligible for tax exemptions as part of the National Electrification Program (NEP) 2.0.[78] Additionally some companies are promoting consumer protection through self-regulation, for example GOGLA members through the GOGLA Consumer Protection Code.[79]

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70 *Rob Fetter, and Jonathan Phillips, True Cost of Solar Tariffs, 8; Kenya's tax revenue in FY2018-2019 was 1.58 trillion Kenya Shillings (KES). Conversion was done using the FY2018-2019 US$: KES exchange rate of US$ 1: KES 101.16. Kenya's annual OGS affiliate unit sales between 2016-2018 was 1.1 million units. The reduction of 40,000 units is 3.5 percent of 1.1 million units, Kenya Revenue Authority (KRA), 2018/19 Annual Revenue report, (Nairobi,: KRA, 2019), 4, https://www.kra.go.ke/images/publications/Revenue-Performance-Report-2018-19.pdf*

71 *See further Section 5, MTR 2020 for secondary benefits of OGS products, Lighting Global, Vivid Economics and Open Capital, 2020 Off-Grid Solar Market Trends Report (MTR), 179 -193*

72 *See further MTR 2020 on the distinction between affiliate and non-affiliate companies and how non-affiliate companies that dominate the OGS market can be sources of poor-quality products, Lighting Global, Vivid Economics and Open Capital, 2020 Off-Grid Solar Market Trends Report (MTR), 54*

73 *Lighting Global, Vivid Economics and Open Capital, 2020 Off-Grid Solar Market Trends Report (MTR), 52*

74 *Lighting Global, Vivid Economics and Open Capital, 2020 Off-Grid Solar Market Trends Report (MTR), 306 & 167*

75 *See further Chapter 2.2.2.1 on consumer awareness programs.*

76 *Lighting global, "Quality Assurance Standards", https://www.lightingglobal.org/quality-assurance-program/our-standards/*

77 *Lighting Global, Quality-Matters: Lighting Global Report on non-QV product-testing 2018, (Washington, DC: World Bank, 2018) ,13, https://www.lightingglobal.org/wp-content/uploads/2018/08/Quality-Matters_LG-QA_Report-on-non-QV-product-testing-2018.pdf*

78 *Government of Ethiopia, Ethiopia, National Electrification Program 2.0, (Addis Ababa: Government of Ethiopia, 2019), 47, https://www.africa-energy-forum.com/article/ethiopia-national-electrification-program-20-report*

79 *GOGLA, "GOGLA Consumer Protection Code", https://www.gogla.org/consumer-protection*

Case box 3: The quality of non-quality-verified OGS products

In 2018, Lighting Global conducted a study of 17 leading non-quality-verified OGS products in Ethiopia, Kenya, Myanmar, Nigeria, and Tanzania. The study found that 94 percent of the products tested failed to meet Lighting Global Quality Standards, now IEC Technical Specification 62257-9-8, specifically failing to meet requirements for product durability (including battery protection and durability, physical durability, water ingress protection, and lumen maintenance), truth of advertising, and warranty coverage. Furthermore, the study found these products were mainly consumed by the bottom of the pyramid consumers who are most financially vulnerable.[80]

2.1.2. Non-Policy Interventions

2.1.2.1. Consumer Awareness Programs

Consumer awareness is a critical part of developing the OGS ecosystem to ensure consumers know about OGS products and their benefits. Over the past ten years, basic consumer awareness of OGS products has increased significantly, even in nascent markets. The greater issue now is educating consumers on quality issues.[81] Consumers need to understand the health, economic, and educational benefits, the economic benefits such as additional productivity and income generation, and the educational benefits including additional study hours at night.[82] These benefits must be demonstrated in contrast to traditional forms of energy access such as kerosene.

Consumers need to understand the importance of purchasing quality products, given the negative experiences associated with poor quality OGS products. Poor quality products can actually cost customers more over time, despite lower upfront costs for comparably-sized products.[83] Consumer awareness programs should be used heavily in the nascent stages of an OGS market for the greatest effect to prevent market spoilage, as seen in the early years of Kenya's OGS market (Case box 4). Government support for such initiatives, together with development partners and donors, can be instrumental to scaling energy access quickly. To continue building on the progress of awareness programs to date and complement the efforts of other stakeholders, governments should continue incorporating OGS awareness-building in national health, education, and energy access programs.

The gender gap in energy access is aggravated by inadequate consumer awareness. Increased awareness of OGS products is critical in boosting women's participation in the energy industry. Targeted consumer awareness programmes, particularly to socially excluded groups, enhance knowledge about the need for energy efficient practices.[84] Such programmes are also important to enhance understanding

80 *Lighting Global, Quality-Matters: Lighting Global Report on non-QV product-testing 2018, (Washington, DC: World Bank, 2018),13, https://www.lightingglobal.org/wp-content/uploads/2018/08/Quality-Matters_LG-QA_Report-on-non-QV-product-testing-2018.pdf*

81 *OCA consultations*

82 *See further Section 5, MTR 2020 on socioeconomic impact of OGS products, Lighting Global, Vivid Economics and Open Capital, 2020 Off-Grid Solar Market Trends Report (MTR), (Amsterdam: GOGLA, 2020), 179 - 193*

83 *GOGLA et al, Pricing Quality: Cost Drivers And Value Add In The Off-Grid Solar Sector, (Amsterdam: GOGLA, 2020), 18, https://www.gogla.org/sites/default/files/resource_docs/pricing_quality.pdf.*

84 *Tanja Winther et al, Women's empowerment and electricity access: How do grid and off-grid systems enhance or restrict gender equality?, (The Hague: Energia, 2019), 12, https://www.energia.org/cm2/wp-content/uploads/2019/04/RA1-Womens-empowerment-and-electricity-access.pdf*

Case box 4: Lighting Global's consumer awareness programs

Lighting Global has been at the forefront of conducting consumer awareness campaigns for the OGS sector globally. In Kenya, Lighting Africa launched the "Songa mbele na solar" (meaning "Get ahead with solar" in Kiswahili) in 2010 to create market awareness on the benefits of using quality-verified OGS products. This campaign was aimed at encouraging behavioural change from using traditional sources of energy and light, such as kerosene, to clean and sustainable OGS products. By 2013, the campaign organized over 1,100 community forums to engage locals on the use of OGS products with an estimated reach of 27 million people across Kenya. The campaign was awarded the Marketing Society of Kenya's best experiential campaign in the NGO/government category in 2012.[85]

of consumer rights and offer a clearer perspective on livelihood opportunities availed in the OGS value chain, particularly where women can play a role as sales agents.

2.1.2.2. Capacity Building Programs

In addition to awareness programs, capacity building programs can provide both government agencies and companies with the skills required to develop the OGS sector. Government agencies can benefit from technical assistance facilities that share information on OGS products and best practices for growing the market to commercially serve end users. An example of this is Lighting Africa's work with the Uganda National Bureau of Standards to adopt international quality standards for OGS products.[86] Companies also benefit from capacity building programs as they build companies' managerial, operational, financial, and capital raising capacities. One of the many examples is the DFID-funded BRILHO program, which provides a suite of technical assistance and financial support for companies in Mozambique.[87]

2.2. SUPPLY-SIDE SUBSIDIES (SSS)

SSS reduce 'upstream' risks or costs for OGS companies resulting in increased access and often increased affordability for consumers. Reducing costs or risk can encourage companies to expand their presence in existing markets or enter new markets. They are particularly useful to incentivize companies to expand into more remote areas with sparse populations where distribution costs would otherwise render business unprofitable. SSS can also reduce the affordability gap as they reduce costs for companies, which can translate to reduced prices for end users. They are generally considered to be less distortive because they do not impact consumer expectations of price or willingness to pay.[88] SSS include grants, concessional financing, and Results-Based Financing (RBFs).

85 *Lighting Africa, Lighting Africa Newsletter, (Washington, DC: International Finance Corporation (IFC), 2013), 1, http://documents.worldbank.org/curated/en/820071495007527048/pdf/115082-NEWS-PUBLIC-Lighting-Africa-Newsletter-28.pdf*

86 *World Bank, Quality Assurance Capacity Building for the Off-Grid Solar Sector, (Washington, DC: World Bank, 2019), 4, http://documents.worldbank.org/curated/pt/592141568212569829/text/Project-Information-Document-PID-Quality-Assurance-Capacity-Building-for-the-Off-Grid-Solar-Sector-P171037.txt*

87 *Brilho, "About us", https://brilhomoz.com/about-us*

88 *World Bank analysis consultations*

One potential contribution of SSS in energy programmes would be promoting the role of women, youth and other socially excluded groups, as service providers and energy supply agents. Such interventions may also significantly contribute to gender responsive employment practices in the renewable energy sector. AECF's Investing in Women program is a good example of a targeted SSS support programmes catering for excluded groups, though in a sector outside of off-grid solar. This program, which provides grants and technical assistance, aims to disburse US$ 50 million to support women-owned SMEs and companies which focus on reducing the gender gap in the agricultural sector.[89]

2.2.1. Grants

Grants provide companies with capital, and are non-repayable, reducing costs to conduct product research, develop business models, and expand into new markets. They are crucial for early-stage companies as they allow companies to build internal capabilities and refine products as well as business models to best serve customers and increase the availability of OGS products in a market.[90] Between 2012 and 2019, OGS companies received US$ 53 million in grant funding, but an estimated US$ 85 - US$ 110 million of additional grant funding will be required from 2020 to 2024 to maintain the sector's current grow th trajectory.[91] Grant funding is best utilized to support early stage companies or incentivize mature companies to undertake riskier business operations, such as expanding into commercially unviable markets.[92]

Case box 5: GSMA's Mobile for Development Utilities Innovation Fund

In 2013, Global Systems for Mobile Communication Association (GSMA) launched the Mobile for Development (M4D) Utilities Innovation Fund in partnership with the UK Government and the Scaling Off-Grid Energy Grand Challenge for Development. This program provided grants for companies to test and scale the use of mobile technology to increase access to energy, water and sanitation services.[93] By 2017, the fund had provided GBP 6 million in grants to over 34 organizations. One of the earlier grantees of the fund was Fenix International; the grant enabled the company to provide 13,000 SHS units across Uganda in 2014. By 2017, Fenix International had reached more than 115,000 households, providing clean energy, payable through small instalments via mobile money.[94]

89 *Africa Enterprise Challenge Fund (AECF), Impact Report, (Nairobi: AECF, 2018), 6 – 10, https://www.aecfafrica.org/sites/default/files/file/knowledge-hub/12%20IMPACT%20REPORT%20small%20size.pdf, Africa Enterprise Challenge Fund (AECF), "Investing in Women", https://www.aecfafrica.org/portfolio/aecf_gender_lens_investment#:~:text=As%20part%20of%20our%20commitment,and%20companies%20that%20make%20significant*

90 *Acumen and Open Capital Advisors, Lighting The Way: Roadmap To Exits In Off-Grid Energy, (Nairobi: Acumen, 2019), 12, https://acumen.org/wp-content/uploads/Acumen-Exits-Off-Grid-Energy-Report.pdf*

91 *Lighting Global, Vivid Economics and Open Capital, 2020 Off-Grid Solar Market Trends Report (MTR), (Amsterdam: GOGLA, 2020), 30, https://www.lightingglobal.org/wp-content/uploads/2020/05/VIVID_OCA_2020_Off_Grid_Solar_Market_Trends_Report_Full_High-compressed.pdf*

92 *World Bank analysis consultations*

93 *Global Systems for Mobile Communication Association (GSMA), "Mobile for Development Utilities Innovation Fund", https://www.gsma.com/mobilefordevelopment/m4dutilities/utitlities-innovation-fund/*

94 *Global Systems for Mobile Communication Association (GSMA), "Catching up with the first energy grantees of the Mobile for Development Innovation Fund",*

Grants are a very important tool to catalyze nascent markets but should be carefully deployed and targeted. Sometimes, eligibility requirements of grant funding can favour larger companies that have a sufficient revenue track-record to apply for and implement the goals of the grant. They can also 'crowd out' equity funding if companies opt to receive grants rather than equity funding. Grant programs need to be cognizant of these distortive effects and carefully targeted to mitigate these risks. Governments should look to maximize the development outcomes of grant programs while also encouraging healthy competition and inclusion in the private sector by pointedly targeting the growth of young, innovative OGS companies. Grant programs can support smaller companies using targeted eligibility requirements such as reduced minimum ticket sizes; internal cash availability; funding from external sources; and upper limits on revenue, number of staff, number of customers served, and geographical presence.

2.2.2. Concessional Financing

Concessional financing for OGS companies provides funding at below market terms to reduce companies' cost of finance, promoting company growth and lowering end user prices. Financing costs are a key cost driver for OGS products, particularly for PAYGo products. Concessionary loans can include lower interest rates, longer tenures or grace periods, and flexible collateral requirements.[95] Flexible collateral requirements can consist of accepting inventory as collateral or even providing unsecured loans. Concessionary working capital loans are especially useful as they buffer PAYGo companies, allowing end users to make affordable instalment payments for OGS products. This is important because these companies have long working capital cycles of up to 36 months in some cases, varying by company and the PAYGo payment plans offered.

Concessional financing can encourage local financial institutions (FIs) to lend to the OGS sector. In most nascent markets, local financial institutions (FIs) are not familiar with the OGS business model, and OGS businesses are perceived as risky investments. As a result, either OGS companies cannot access commercial capital at all or interest rates are prohibitively high, which ultimately increases prices for consumers.[96] In response, DFIs and national development banks have provided lines of credit to financial institutions to promote on-lending to OGS companies with concessionary terms.[97] While DFIs generally cannot reduce interest rates (to prevent market distortion), they provide local FIs with more capital specifically allocated for the OGS sector and sometimes guarantees to encourage lending.

Critically, concessional financing can crowd in commercial lenders to provide capital to OGS companies. Blended finance, where investors take junior or senior tranches depending on their risk appetite, is a growing financing method to crowd in more risk-averse, commercial lenders. This method relies on impact-focused investors with high risk appetites taking on first loss risks in junior tranches, while more conservative investors take on senior tranches for reduced risk. By taking a higher-risk position in a junior tranche, these impact-focused investors have had a multiplier effect in raising capital for OGS companies, as they enable investment from conservative investors that seek greater protection.[98]

95 *World Bank analysis consultations*

96 *Pg 21 and 142 – MTR 2020*

97 *Pg. 245, MTR 2020*

98 *Pg. 10, https://static.wixstatic.com/ugd/06a437_a4f85779cb1544bb99a5e303e18dba78.pdf*

Lucy Sakuda, 47, uses her M-KOPA solar powered light to cook. Photo credit: Power Africa

Case box 6: Taking on risk to crowd-in commercial lenders

In 2017, Stanbic Bank led a US$ 55 million local currency equivalent debt raise for M-KOPA Solar, alongside CDC, FMO and Norfund. Stanbic Bank took the senior tranche while the DFIs took junior tranches in the facility.[99] The facility also provided M-KOPA with flexible collateral requirements by securing the loan using consumer receivables. This example shows how the DFIs can crowd in commercial lenders by taking on first loss risk, while allowing companies to access finance on flexible terms.

One risk of concessionary financing is the 'crowding-out' of commercial lenders who have to compete with concessionary capital providers.[100] Crowding out refers to commercial lenders being squeezed out of lending to OGS companies due to flexible and more attractive concessional finance, particularly lower interest rates. Commercial lenders in countries like Uganda have raised this issue in the past.[101] To mitigate this risk of market distortion, governments and development partners should provide concessionary financing interventions only to fill a market gap where commercial lenders are not present or active.

2.2.3. Results-Based Financing Programs (RBFs)

RBF programs allow governments to steer the direction of a market's development by offering incentives to companies for achieving specific milestones. RBF programs can incentivize companies to enter or rapidly scale their operations in a country, thereby increasing energy access. They can also incentivize OGS companies to provide higher levels of energy service, by incentivizing higher capacity (Tier 1 or Tier 2) OGS systems and appliances, such as large SHS with televisions or solar water pumps,

99 *http://www.m-kopa.com/breaking-records-in-financing-off-grid/*

100 *OCA consultations*

101 *OCA consultations*
http://www.m-kopa.com/breaking-records-in-financing-off-grid/

to increase quality of life and productivity for consumers. Lastly, RBF programs can incentivize companies to increase energy access in hard-to-reach areas, for example by increasing the incentive as the company sells further into rural areas. In all these cases, RBFs enable companies to deliver energy access to customers they would otherwise not reach, by absorbing costs associated with reaching those customers, for example staff training, marketing, or new partnership development.

Depending on working capital availability, governments can structure RBF payments to incentivize companies to move quickly. Most simply, an RBF program pays companies only when the result is achieved, for example upon verification of OGS system installation, which is one of the greatest advantages for governments and donors. This structure requires companies to fully bear the risk of failure (instead of the funder) and cover upfront costs to purchase inventory and set up new distribution networks.[102] This requirement can exclude companies with limited working capital, however RBF programs can also reduce this constraint by more evenly spreading the payments over time. For example, the Kenya Off-Grid Solar Access Project (KOSAP)—a US$ 12 million RBF facility that encourages OGS companies to serve 14 remote and underserved counties in Kenya—offers partial funding upon contract signing and finalization of due diligence to provide funding for initial capital investments by companies.[103]

Upfront payments can alleviate working capital constraints for participating companies and allow them to more quickly implement government goals. The downside is that governments and donors then take on the risk of companies achieving the result. Ideally, companies should have sufficient working capital to participate in RBF programs and governments can set up parallel debt facilities to support companies with any working capital shortfall.

While supply-side RBFs do not explicitly control prices, they do encourage competitive pricing. It is important to foster competition in OGS markets where RBF programs exist, to keep prices down. RBF programs can accomplish this by selecting several OGS companies and encouraging them to sell at prices that they can sustain post-RBF. To assess impact on prices, some but not all RBF programs require companies to provide pricing information during the application process. Though RBF is often a supply-side mechanism, RBFs can also act as a DSS when they explicitly subsidize prices for end users. See Chapter 3 for details on DSS.

Governments can also enhance consumer protection through RBFs. First, they can impose minimum product quality standards as an eligibility requirement. This ensures only quality-verified products reach consumers. Second, RBF programs can link a portion of company payments to satisfactory provision of after-sales support, including repairs or replacements under warranty provisions. This ensures that consumers receive full value for money and are not abandoned after companies make their sales.

Ultimately, RBFs are beneficial for consumers, companies, and governments. Consumers benefit from access to new and more diverse OGS products. Companies benefit because they reach additional consumers faster than without RBFs, especially those in hard-to-reach places. RBF programs can also

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102 Marco Hüls (GIZ), Marcel Raats (RVO), Josh Sebastian and Martijn Veen (SNV Netherlands Development Organisation), and John Ward (Vivid Economics) Results-Based Financing: A Promising New Tool For Energy Access, (Washington, DC: World Bank, 2017), 5,

103 Lighting Global, Vivid Economics and Open Capital, 2020 Off-Grid Solar Market Trends Report (MTR), (Amsterdam: GOGLA, 2020), 175, https://www.lightingglobal.org/wp-content/uploads/2020/05/VIVID_OCA_2020_Off_Grid_Solar_Market_Trends_Report_Full_High-compressed.pdf

help companies build a track record in new markets and attract new investment for further expansion. Finally, governments can deploy public funds in a targeted manner to accelerate energy access with strict monitoring and control mechanisms in place.

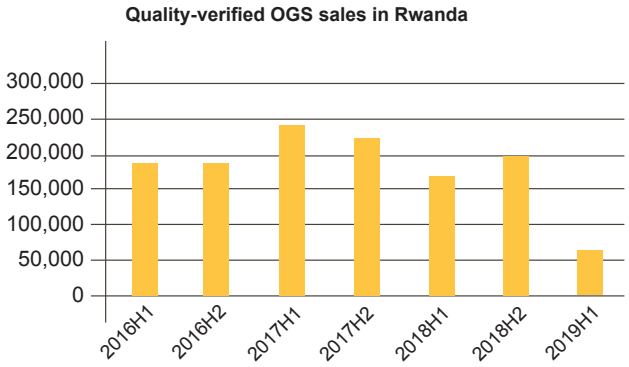
2.3. LIMITATIONS OF ENABLING ENVIRONMENT INTERVENTIONS AND SUPPLY-SIDE SUBSIDIES

Though enabling environment interventions and SSS provide governments with a wide range of tools to increase energy access while also building robust commercial markets, they do not fully address the affordability gap for all customers. Companies can only reach so far in electrifying poor households, given incredibly low expenditure on energy for millions of people.

Enabling environment interventions and SSS primarily help to close the access gap and develop vibrant commercial markets. They also are a great first step in improving affordability, though this may not be enough for the poorest and most vulnerable to gain energy access. To ensure that no is left behind, the OGS sector also needs demand-side subsidies that fully close the affordability gap.

Case box 7: Reaching limits of SSS in Rwanda

Since 2006, EnDev has worked in Rwanda to improve access to energy. The first phase focused on supporting the private sector in developing micro-hydropower plants through public-private partnerships. In 2014, EnDev began the second phase of its program and started a supply-side RBF facility for providing OGS solutions and village grids. The objective of the scheme was to support market development by enabling companies to reach customers willing to pay for OGS products but in commercially unserviceable regions.



As of 2019, the OGS RBF had signed contracts with more than 20 companies, supported the sale of over 140,000 SHSs, reaching more than 553,000 people. The village grids have also provided energy access to 325 local businesses 14 social institutions and more than 5,000 people.

However, despite the significant success of the supply-side RBF facility, there was a steep decline in off-grid sales (see graph on the right) driven mainly by affordability constraints, as companies had reached a large proportion of commercial customers.[104] This led the Rwandan Government, in partnership with EnDev, to introduce a DSS pilot program in 2019 providing OGS products to 31,000 households who are unable to afford systems.[105]

104 *GOGLA, Rwanda country brief, (Amsterdam: GOGLA, 2019), 1 – 3, https://www.gogla.org/sites/default/files/resource_docs/rwanda_country_brief.pdf*

105 *Energising Development (EnDev), Country Project Rwanda, (Kigali: EnDev, 2019), 1 & 2, https://www.giz.de/en/downloads/Factsheet_EnDev_Rwanda_2019.pdf; https://endev.info/images/d/df/Factsheet_EnDev_Rwanda_EN.pdf*

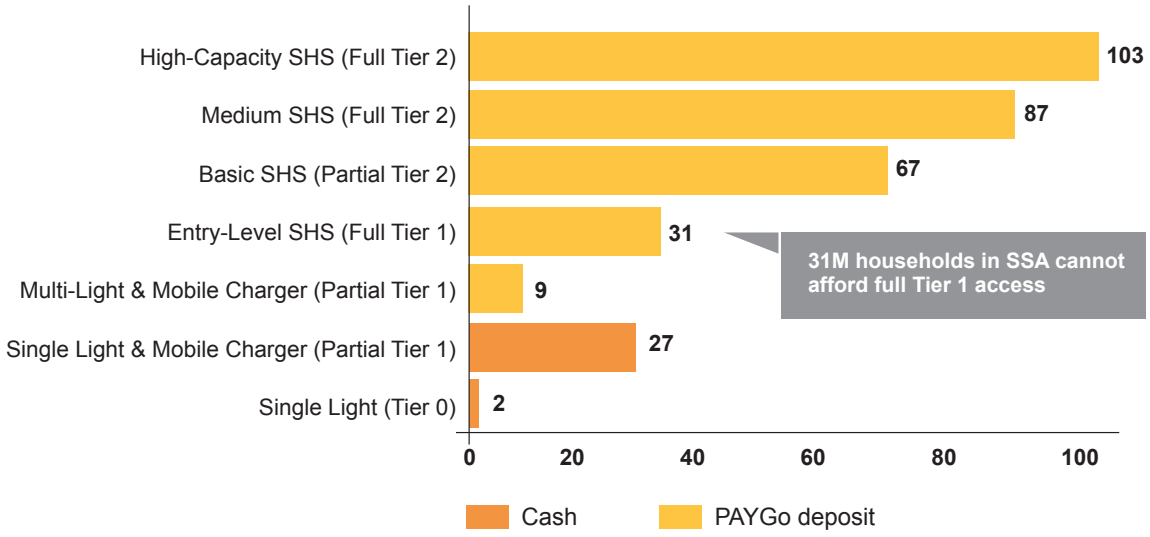
DEMAND-SIDE SUBSIDIES AS A SOLUTION TO CLOSE THE AFFORDABILITY GAP

3

DSS, unlike other subsides, are specifically designed to close the affordability gap by **reducing the price for end users.** Ideally, DSS only reduce the price for end users who cannot afford a product, allowing private companies to continue selling products to those who can pay full price for OGS products. DSS enable companies to maintain profitable margins that keep businesses afloat while ensuring that the poorest populations gain access to electricity. For example, if the retail price of an OGS product is US$ 10 and a consumer can only afford to pay US$ 6, a US$ 4 subsidy allows a consumer to pay only US$ 6 for a product that costs US$ 10. In doing so, DSS close the affordability gap for consumers.

DSS are essential for policymakers if they hope to achieve SDG 7 and ensure 'no one is left behind' on the path to universal access. Across SSA, over 31 million households currently cannot afford the US$ 28 cash deposit for the average Tier 1 PAYGo system. Evidence shows that price reductions can spur the uptake of products. A study in Kenya found that reducing the price of a solar light from US$ 7 to US$ 4 increased household uptake from 37 percent to 69 percent.[106] Subsidies that reduce price, therefore, can accelerate access for currently unserved populations and thus increase OGS product use. DSS in particular can also help increase affordability for typically excluded groups and can target gender or other demographics.

Figure 5: Number of households in SSA that cannot practically afford each system (2019, in millions)[107]



106 *Adina Rom et al, The Economic Impact of Solar Lighting , (Zurich: ETH Zurich, 2017), 11, https://ethz.ch/content/dam/ethz/special-interest/gess/nadel-dam/documents/research/Solar%20Lighting/17.02.24_ETH%20report%20on%20economic%20impact%20of%20solar_summary_FINAL.pdf*

107 *Note: (i) A product is affordable if a household can pay for the cost of the system of the PAYGo deposit by saving 5% of household expenditure monthly over three months. The graph is based on 2019 data; (ii) Customers can either pay for solar products upfront through cash or a in small sums via a PAYGo model. Upfront cash payments are required for relatively smaller products that are too small to be supported under the PAYGo business model and are therefore considered as the price when considering affordability. PAYGo products are paid over time and therefore the deposit is considered as the price when measuring affordability, Lighting Global, Vivid Economics and Open Capital, 2020 Off-Grid Solar Market Trends Report (MTR), (Utrecht: GOGLA, 2020), 104 & 105, https://www.lightingglobal.org/wp-content/uploads/2020/05/VIVID_OCA_2020_Off_Grid_Solar_Market_Trends_Report_Full_High-compressed.pdf*

DSS directly reduce the price of a product to the consumer, irrespective of how they are provided to beneficiaries. Programs can disperse DSS through companies or directly to consumers through cash or vouchers. RBF programs can also act as a DSS where the program directly reduces the end-consumer price to increase affordability. In all cases, the end user receives the full benefit of the price reduction.

DSS are a well-proven mechanism for helping countries pursue a variety of Sustainable Development Goals (SDGs) outside of OGS. In Ghana, the Government launched the *Fertilizer Subsidy Program* (FSP) in 2008 to reduce the cost of fertilizer following the food and fertilizer price spike that resulted from the 2007 - 2008 global financial crises. Since then, the Government has subsidized more than 1.08 million metric tons of fertilizer, thereby increasing nation-wide uptake among smallholder farmers growing staples (e.g., grains, vegetables) and cash crops (e.g., cotton) which ultimately has increased farmer yields and reduced national hunger.[108] In Tanzania, the Government subsidized insecticide-treated mosquito nets through a program called the National Voucher Scheme (TNVS) to combat malaria countrywide. By 2011, the national Government had reached 91.5 percent of all households, helping to contribute to SDG 3, "Good Health and Well-Being."[109]

Stakeholders have at times been concerned about the potential for market distortion of DSS in OGS. If DSS are not administered well, people who would have bought products at commercial prices instead purchase products at the subsidized amount, an issue known as leakage. Leakages reduce program cost-effectiveness by reducing the intended beneficiaries reached. Leakages also spoil commercially viable markets as they displace commercial sales that would have occurred if OGS markets were left to grow and achieve operational efficiency. Market spoilage can be particularly pervasive under large-scale free giveaway programs. For example, the Bangladeshi free-give-away program, Khabika, distributed free SHS in bulk within commercial markets which affected price expectations and spoiled commercially viable sales.[110] In scenarios where DSS induced price reductions are not clearly communicated to beneficiaries, they can create non-commercial price expectations. DSS may also encourage companies to become accustomed to subsidies and develop non-commercial, inflated cost structures. Through careful design and communication of subsidy program timelines, however, policymakers can minimize distortion and support the continued growth of OGS markets.

Despite concerns of market distortion, governments and donors have recently launched several DSS pilots and programs in the OGS sector to achieve the goal of universal energy access. In 2017, the Government of Togo developed the CIZO program, which includes a DSS to increase energy access. In 2018, the Government of Kenya and UNICEF in partnership with implementing organizations including Energy 4 Impact launched a DSS pilot called Energy and Cash Plus aimed at reaching 1,600 beneficiaries. The subsidy covered 100 percent of the retail price of OGS products, excluding a US$

108 *UN, NEPAD & IFDC, Practices and Policy Options for the Improved Design and Implementation of Fertilizer Subsidy Programs in Sub-Saharan Africa, (Alabama: International Fertilizer and Development Center, 2013), 20, https://africafertilizer.org/wp-content/uploads/2017/04/Practices-and-Policy-Options-for-the-Improved-Design-and-Implementation-of-Fertilizer-Subsidy-Programs-in-Sub-Saharan-Africa.pdf*

109 *Karen Kramer et al, Effectiveness and equity of the Tanzania National Voucher Scheme for mosquito nets over 10 years of implementation, (London: Biomedical Central, 2017), 8, https://malariajournal.biomedcentral.com/track/pdf/10.1186/s12936-017-1902-0 , Roll Back Malaria et al, Making Targeted Subsidies*

110 *Fast and Flexible The TNVS e-voucher, (Geneva: Roll Back Malaria, 2017),1, https://www.pmi.gov/docs/default-source/default-document-library/implementing-partner-reports/tanzania2_networks.pdf?sfvrsn=6, Rashia Khatib et al, Markets, voucher subsidies and free nets combine to achieve high bed net coverage in rural Tanzania, (London: Biomedical Central, 2008), 1, https://malariajournal.biomedcentral.com/track/pdf/10.1186/1475-2875-7-98*

2.40 commitment fee. Other recent examples of OGS DSS include programs launched in Uganda, Rwanda, and Myanmar.[111]

Case box 8: Togo CIZO Program[112]

The Government of Togo has defined a NEP that entails the deployment of 555,000 SHS (CIZO program), 300 mini-grids (55,000 connections), and 400,000 on-grid connections between 2018 and 2030 to reach universal electrification by 2030.[113] The strategy was designed using geospatial modelling that assessed the most economical means of electrifying specific households. CIZO uses private sector partners that include BBOXX, Soleva, Fenix, Solergie, and Moon. While the private sector partners are responsible for financing, distributing, marketing, and servicing SHS, the Government has contributed to the enabling business environment via initiatives such as consumer awareness campaigns, VAT exemptions, and the development of lines of credit.

The CIZO program's DSS directly targets the most vulnerable in Togo who cannot afford off-grid energy access in rural areas. Under the DSS scheme, partner companies collect customer information that partnering Telcos and the national postal agency called LaPoste aggregate to create an integrated database of all eligible customers. Eligible customers then receive a US$ 4 monthly subsidy for 36 months.[114] As part of the program guidelines, only companies that can remotely monitor OGS product use are permitted to participate. As a result, the Government is able to verify installations remotely without the need to confirm installations physically.

3.1. DSS COMPONENTS

DSS will be required to meet universal energy access and ensure no one is left behind, therefore stakeholders must ensure DSS components are well-designed to fit a country's unique context. When designing a DSS, a government has to choose (i) a product, (ii) a level of targeting, (iii) companies to partner with, (iv) a subsidy level, (v) a verification system, (vi) a delivery channel, (vii) a subsidy administration system, and (viii) an exit-strategy. This section explores the importance of each design component, elaborates on best practices, and shares considerations for evaluating each option.

3.1.1. Product Selection

Governments need to select products for their DSS that fit their country-specific needs. As a first step, Governments must define a minimum threshold or definition of electrification. Regulations governing OGS or previous DSS programs usually set out the minimum service levels or product

111 *Lighting Global and Dalberg, 2018 Off-Grid Solar Market Trends Report (MTR), (Utrecht: GOGLA, 2018), 159, https://www.lightingglobal.org/wp-content/uploads/2018/03/2018_Off_Grid_Solar_Market_Trends_Report_Full.pdf, PowerForAll, The Poor People's Energy Outlook, (California: PowerForAll, 2018), 1, https://www.powerforall.org/application/files/3615/4390/1736/RS__PPEO.pdf*

112 *Lighting Global, "Togo Electrification Strategy" (presentation, June 2018), https://www.lightingglobal.org/wp-content/uploads/2018/12/Togo-ElectrificationStrategy-Short-EN-Final.pdf.*

113 *Note: The electricity access rate as of 2016 was 35%, "Togo At a Glance", Sustainable Energy for All (SE4ALL), https://www.se4all-africa.org/seforall-in-africa/country-data/togo/*

114 *BBOXX, "BBOXX receive first ever government subsidy", https://www.bboxx.co.uk/bboxx-customers-togo-receive-first-ever-government-subsidy-solar-payments-africa/*

standards for DSS programs, and this benchmark differs across countries and programs. Programs can subsidize larger products that enable greater energy service levels, though this increases the subsidy amount per person due to higher product costs. Alternatively, if governments want to maximize number of connections, they can subsidize smaller products.[115] Even smaller, entry-level products can have a life-changing impact on end users.[116] At a minimum, products that in any way benefit from public funding should always meet minimum product standards for quality.

Table 2: Product requirements by subsidy program*

PROGRAM	KEY PRODUCT REQUIREMENTS
EnDev ProPoor[117]	• Three lamps of at least 120 lumens each, operating at least four hours a day • A mobile charge supply for at least two hours per day • A radio charge supply for at least five hours per night • Supply the above loads for at least one day without input from the solar module when there is no sunshine • Minimum of three years warranty • Minimum of five years after-sales contract for spare parts and technical service • Compliance with IEC and quality-verified by VeraSol
Togo – CIZO program[118]	• Minimum daily consumption of 12 Wh • Minimum installed battery capacity of 20 W with the option to upgrade • Provides lighting for work and phone charging • Compliance with IEC and quality-verified by VeraSol
Kenya – KOSAP (SSS)[119]	• Minimum of Tier 1 equivalent to a pico-solar system with sufficient capacity to provide 1,000 lumen-hours of light and cell phone charging abilities • Compliance with IEC and quality-verified by VeraSol
Note: * Product requirements include minimum service levels, warranty requirements, and product quality requirements	

Governments can choose to subsidize specific products or a range. For example, governments can elect to subsidize a range of products, for example, any Tier 1 product. Setting a minimum or maximum system capacity narrows product choice but can ensure that governments only subsidize products that are typically used by the target population, for example smaller products in low-income households. Instead of subsidizing a range of products, governments can subsidize particular products such as small solar lighting systems or larger solar home systems, perhaps with specific capabilities such as mobile phone charging, or those with a particular appliance. In some cases, subsidizing products with unique product specifications has distorted the market. For example, product specifications in the Togo CIZO

115 *OCA consultations*

116 *Kat Harrison et al, Accelerating access to electricity in Africa with off-grid solar, (London: Overseas Development Institute, 2016), 9 & 13, https://www.odi.org/sites/odi.org.uk/files/odi-assets/publications-opinion-files/10229.pdf*

117 *Ministry of Infrastructure, Ministerial Guidelines on Minimum Standard Requirements for Solar Home Systems, (Kigali: Government of Rwanda, 2019), 15 & 33, https://www.mininfra.gov.rw/fileadmin/user_upload/Ministerial_Guidelines_on_minimum_requirements_for_solar_home_systems.pdf*

118 *Lighting Global, "Togo Electrification Strategy" (presentation, June 2018), https://www.lightingglobal.org/wp-content/uploads/2018/12/Togo-ElectrificationStrategy-Short-EN-Final.pdf.*

119 *World Bank, Project appraisal document on a proposed credit to the Republic of Kenya for an off-grid solar access project for underserved counties, (Washington, DC: World Bank, 2017), 36, 104, & 125, http://documents.worldbank.org/curated/en/212451501293669530/pdf/Kenya-off-grid-PAD-07072017.pdf*

program required Greenlight Planet (distributing through its local partner Soleva) to introduce a new product so that it could comply. Similarly, the Government of Rwanda's Minimum Energy Performance Standards (MEPS) prevented an existing distributer from importing and selling a popular SHS product. Though service level standards can ensure that vulnerable populations are reached, they must be carefully implemented to avoid distorting the market.[120]

3.1.2. Company Selection

Program designers can influence the mix of participating companies with the company selection process to suit the market and the program's goals. Programs may seek to minimize program management costs by providing big DSS allocations to a small number of companies or they can make small allocations to a large number of companies. In situations where OGS markets are nascent and there is an explicit goal to incentivize market entry, governments can utilize large DSS fund allocations to attract large international companies. If local company development is a priority, Governments can limit allocations to (often smaller) local companies. Programs may even want to foster partnerships between international and foreign companies. In almost all cases more than one company should be offered access to DSS funds. For example, for the EnDev ProPoor pilot, a single company can claim a maximum of 30% of the total program fund budget which ensures that multiple companies access and benefit from the funding.

Programs must also set up systems to screen and select partner companies. Private companies typically go through an application or tender process followed by a thorough due diligence to ensure that they can deliver products. Processes for larger companies can be more complex whereas processes for smaller firms can be less onerous since they often have a shorter track record or less-developed recordkeeping. The due diligence process typically evaluates track record, operational capability, sales volumes, and product prices. For PAYGo products, a company's current level of financing is important to ensure that the company can service customers throughout the PAYGo contract. Each of these processes is normally overseen by an impartial evaluation committee, often composed of independent experts. On some occasions, funders may review the work of an evaluation committee to confirm agreement with the committee's recommendations. In situations where a due diligence is not conclusive, funding allocations to a company may be initially smaller and then increased over time as a company demonstrates its ability to deliver on its objectives.

3.1.3. Level of Targeting

Targeted subsidies bound access to specific "target" populations. Subsidies can target specific populations based on factors including geography, demographics, and economic status, among others.[121] Targeted subsidies are theoretically more economically efficient as they ensure that only those who genuinely need a subsidy receive it. As a result, they are less likely to distort commercial markets. Though uncommon to date, programs can also target gender and other vulnerable population needs.[122]

120 *Lighting Global and Dalberg, 2018 Off-Grid Solar Market Trends Report (MTR), (Utrecht: GOGLA, 2018), 160, https://www.lightingglobal.org/wp-content/uploads/2018/03/2018_Off_Grid_Solar_Market_Trends_Report_Full.pdf,*

121 *Sustainable Energy for All (SE4ALL) et al, Energy Safety Nets Guide for Policy Makers, (Vienna: Sustainable Energy for All, 2020), 12, https://www.seforall.org/sites/default/files/2020-02/ESN_policymakers-SEforALL.pdf*

122 *Sustainable Energy for All (SE4ALL) et al, Energy Safety Nets – A Kenya Case Study, (Vienna: Sustainable Energy for All, 2020), 58, https://www.seforall.org/sites/default/files/2020-02/ESN_Kenya-SEforALL.pdf*

Despite targeting benefits, it can be difficult to effectively target, particularly with limited geographic, demographic, or income data on populations, and targeting can increase program costs.

Untargeted subsidies, on the other hand, can reach a wider population but at the cost of deploying capital to those who may not need it. For example, an untargeted DSS in a middle-income country may reach wealthier end users that do not need a subsidy, thereby reducing efficiency and increasing market distortion via non-commercial price expectations. In situations where a high percentage of a total population is eligible for a subsidy, less targeted subsidies may be considered as the administration and verification cost in those scenarios may outweigh the marginal benefit of targeting.

While geographical targeting leverages clearly defined physical borders, populations vary significantly within a given geography and so this form of targeting risks leakage. Geographical targeting is based on existing borders such as regions, districts, or neighborhoods. Geographical targeting is beneficial when a large population of the target geography requires a subsidy. For example, as one of its targeting criteria, the Energy and Cash Plus program targeted individuals that could not afford SHS in the underserved Kenyan counties of Garissa and Kilifi.[123] Even though geographical targeting alone may result in subsidies reaching unintended beneficiaries, it is the simplest targeting mechanism and therefore easiest to administer.

Demographic targeting can make good use of existing demographic data to target end users. Demographic targeting can use a broad range of factors, including age, ethnic group, religious affiliation, gender, profession, and family size.[124] To use demographic targeting, governments must have this data and be able to identify people based on that data. To ensure effectiveness, governments need to understand correlations between demographic groups and affordability to target vulnerable populations. For example, certain demographic groups such as single parent-headed households, the elderly, orphans, and the disabled may be more susceptible to poverty. As with geography, affordability varies within a demographic group, so targeting based on demography similarly risks leakage, and governments must also be aware that demographic targeting is susceptible to allegations of racial, ethnic, or religious discrimination.[125] Governments can reduce this risk by aligning OGS DSS with already established DSS or cash transfer programs.[126]

Economic targeting is arguably the most effective form of targeting as it solely targets those who cannot afford an OGS product or service, though it is the most challenging due to a lack of granular income data. Targeting based on economic status can be done at the household or individual level. The main challenge with economic targeting is that income data is often not available as most countries do not have robust databases containing income data. One exception is in Rwanda, where the Ubudehe program classifies the population into four categories based on income levels. This data enabled the ProPoor DSS program to target people within specific income levels with specific subsidy amounts. This level of data monitoring made for very precise targeting in Rwanda, but it is not easily replicated elsewhere due to data constraints.

123 *OCA consultations*

124 *Sustainable Energy for All (SE4ALL) et al, Energy Safety Nets – A Kenya Case Study, (Vienna: Sustainable Energy for All, 2020), 58, https://www.seforall.org/sites/default/files/2020-02/ESN_Kenya-SEforALL.pdf*

125 *Refer to Case box I: Impact of gender and disabilities on energy access*

126 *Sustainable Energy for All (SE4ALL) et al, Energy Safety Nets – India Case Study, (Vienna: Sustainable Energy for All, 2020), 4, http://seforall.org/sites/default/files/2020-02/ESN_India_Policy-SEforALL.pdf*

Where income data is not readily available, proxy data that leaves a digital trace such as mobile money usage can be leveraged to approximate income levels. For example, to determine creditworthiness, fintech companies such as Tala use social media and mobile money digital receipts as proxies where personal credit scores do not exist.[127] Using advanced data analytics and digital traces, companies can estimate creditworthiness at scale. Governments would need to work closely with the private sector to access and leverage these types of proxies, but digital proxy use may be limited due to data privacy laws or a lack of digital product uptake among vulnerable populations.

3.1.4. Subsidy Level

Theoretically, the most efficient subsidy level for each end user is that which closes the affordability gap between the product cost and the user's ability and willingness to pay for that product. Subsidy levels can be fixed amounts per person or based on a percentage of a product price. Subsidy amounts can be revised annually in case product prices change due to technological improvements or sector maturity. Setting a subsidy level above the affordability gap leads to economic inefficiencies and setting a subsidy level below the affordability gap leads to minimal uptake. In practice, setting the subsidy level on a per-person by person basis is impractical. At best, governments can set different subsidy levels for different incomes bands to more accurately address affordability gaps across a range of income groups. Without fairly granular income data on the population, however, this is not feasible.

Where specific income data is not available, governments can use average data among subsets of target groups to set the subsidy level. For example, this can take the form of measuring average affordability gaps in geographical counties and pegging a subsidy amount to that. To enable average subsidy level targeting, DSS subsidy levels should align with targeting strategies.

Case box 9: Setting the subsidy level in EnDev's ProPoor DSS pilot

To match each persons' income level to a subsidy amount, the EnDev ProPoor DSS in Rwanda provides a unique subsidy amount to each Ubudehe category. For example, Ubudehe 1, which is the lowest income class, receives EUR 90 or 87 percent of the product price, whichever is lower.[128]

Incentives by Ubudehe Category		
Ubudehe category	Absolute incentive level (€)	Relative incentive (%)
1	90	87
2	70	68
3	50	49

In all cases, the DSS applied is the minimum of the absolute or relative percentage incentive. Using a minimum across both levels prevents DSS programs from subsidizing systems that are too large (a risk if only relative percentage incentives were used) or subsidizing smaller systems by too much (a risk if only absolute incentive levels were used).

127 *Sameepa Shetty , "Start-up uses mobile data as a credit score for the global unbanked", CNBC, January 3, 2020, https://www.cnbc.com/2020/01/03/start-up-uses-mobile-data-as-a-credit-score-for-the-global-unbanked.html*

128 *OCA consultations*

If PAYGo systems are chosen for a subsidy, governments should consider full lifetime costs to ensure that beneficiaries can afford ongoing service charges. Since the down payment (often representing 10-20 percent of the total PAYGo costs) often serves as a filter for demonstrating willingness and ability to pay for a PAYGo product throughout the contract, subsidies should not only heavily subsidize the down-payment.[129] If the daily costs associated with a PAYGo system are higher than the daily lighting expenditure of the beneficiaries targeted, governments should subsidize ongoing product costs to minimize defaults that burden private companies.[130] Lastly, where possible, PAYGo repayment schedules should be adapted for more vulnerable populations that may have irregular incomes that are highly exposed to exogenous shocks.[131]

3.1.5. Verification System

Verification systems, either technology-enabled or manual, ensure that subsidized products reach their targeted beneficiary, that beneficiaries receive the correct subsidy amount, and that beneficiaries do not re-sell products for a profit or receive duplicate subsidy amounts. Duplicate subsidy disbursements and the on-selling of products reduce the target outcome of a subsidy, and if pervasive, distort markets by creating leakages that spoil commercially viable markets. Verifications systems also ensure accurate reporting on the part of private companies that share information with implementing organizations on the total amount of subsidies disbursed. In the event of such leakages or misreporting, verification systems provide administrators with data to adjust subsidy design while also providing the information needed to evaluate subsidy performance.

Technology-enabled verification has low administration costs but may not be applicable for all targeting criteria or all products. For example, the CIZO program verifies beneficiaries with GSM data enabled by PAYGo products. GSM data is matched with identifications and internal databases to check if a customer has already received a subsidy. Additionally, GSM data is used to identify the movement of products over time to help signal if products are re-sold. Finally, this system helps to ensure companies are accurately reporting on subsidies disbursed by ensuring the CIZO program itself can monitor subsidy disbursements. This system, however, does not scale to verify other criterion such as demographics, and it only functions for GSM-enabled products that are more expensive on a per-unit basis compared to non-GSM-enabled products.

Manual verification is more common, though costly and logistically challenging to administer. This form of verification uses field officers or community leaders who physically visit or call beneficiaries to verify receipt of a subsidized product. This form of verification is necessary when databases or other monitoring technology do not exist. For example, the National Agricultural Input Voucher (NAIVS) program in Tanzania used physical agents to visit beneficiaries to ensure that they met the eligibility criteria of being a farmer that owned less than one hectare of land. The scalability of manual verification is limited by the number of personnel employed, though governments can reduce costs through sampling.

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129 *BFA Global et al , Briefing note PAYGo Solar: Lighting the Way for Flexible Financing and Services, (Massachusetts: BFA Group, 2017), 1, https://www.gogla.org/sites/default/files/resource_docs/finalfibrbriefingnotepaygosolarjuly2017.pdf*

130 *Similarly, with LPG subsidies in India, the Pradhan Mantri Ujjwala Yogana (PMUY) program saw that despite the poorest households accessing LPG connections through subsidies, they often could not afford the ongoing use of LPG and therefore did not gain as much utility from the subsidy as expected, Sustainable Energy for All (SE4ALL) et al, Energy Safety Nets – India Case Study, (Vienna: Sustainable Energy for All, 2020), 2, http://seforall.org/sites/default/files/2020-02/ESN_India_Policy-SEforALL.pdf*

131 *Sustainable Energy for All (SE4ALL) et al, Energy Safety Nets – A Kenya Case Study, (Vienna: Sustainable Energy for All, 2020),*

Importantly, manual verification sampling is typically used in tandem with technology-enabled verification and is essential for verifying if technology-enabled verification is accurate and producing reliable results.

Verification processes can also occur before subsidy delivery, but they may be expensive. For example, a DSS that wants to verify demographics in areas where demographic data does not exist can pre-verify beneficiaries using distributed verification agents before subsidy delivery. This was the case for the Kenyan Hunger Safety Nets Program (HSNP) which was a cash transfer scheme that provided unconditional cash transfers to households in specific vulnerable Kenyan countries.[132] To create a database to support verification, the HSNP program contracted an NGO to register 374,000 households into a database based on factors such as assets owned, income, age, and disability, all which affect someone's level of extreme poverty.[133] This process can be cost-efficient if there is a small number of subsidy deliveries.

Case box 10: Lessons from AgTech verification systems

To enable verification, an AgTech company financing agro-inputs in Kenya for rural farmers, developed pre-verified databases of creditworthy beneficiaries and shared this database electronically with participating agrovets that deliver physical products to their beneficiaries. The AgTech company developed this database through a proprietary algorithm fed by data obtained from calling specific farmers.

As a result, pre-vetted loan beneficiaries are now able to show their ID to participating agrovet stores, and through shared databases agrovets can verify if a specific beneficiary has been already been pre-approved for a loan. Pre-verification allows the AgTech company to ensure that only those who have been pre-approved for a loan receive one, important in an environment where credit scores do not exist. Post-loan delivery, the AgTech company can perform additional verification checks to ensure that other potential fraudulent behavior (such as identity theft) is monitored.

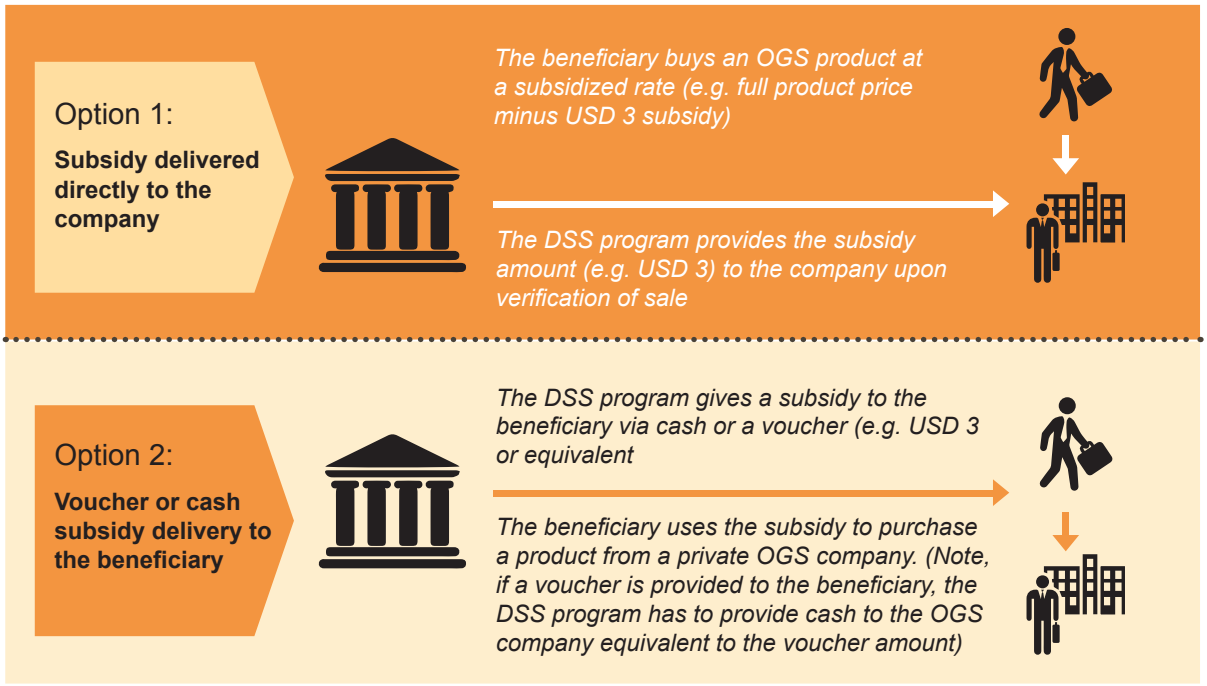
3.1.6. Delivery Channel

DSS can be delivered to private companies or to the beneficiaries themselves (Figure 6). When a DSS is delivered to private sector companies, DSS do not pass through the beneficiary. In those situations, eligible beneficiaries receive a discount on an OGS product from a private company. DSS provided directly to the private company can be easy to administer because subsidies are delivered in bulk to private companies. However, beneficiaries may not be made aware that prices are in fact subsidized. Moreover, delivering subsidies to private companies requires that beneficiaries can be verified as eligible by at the point of sale. Delivery of DSS directly to beneficiaries can be either via a cash transfer or voucher transfer. This ensures that beneficiaries are more aware of the price reduction caused by DSS, however administration and verification of cash or voucher programs can be costly.

132 *National Drought Management Authority (NDMA) et al , Hunger Safety Net Programme 2, (Nairobi: NDMA, 2014), 5, http://www.hsnp.or.ke/filedownload.php?download_file=HSNP2_Presentation.pdf*

133 *National Drought Management Authority (NDMA) et al, Hunger Safety Net Programme 2, (Nairobi: NDMA, 2014), 22*

Figure 6: Benefit flow options for DSS



Cash transfer can be delivered as hard cash, mobile money, or through bank transfers. To restrict cash usage to an OGS product, DSS can provide cash to beneficiaries after they obtain OGS products, or through providing cash in small lump sums and continually verifying customer payments. For example, the Energy and Cash Plus program provided cash to beneficiaries in small lump sums to enable them to make PAYGo payments over time but stopped making payments if certain beneficiary obligations were not fulfilled. Cash delivery can leverage the already well-established methods of delivering cash in-person or electronically. In cases where the target population does not have access to financial services, DSS programs can budget to on-board customers to these services. In Kenya, for example, the HSNP cash transfer program set up bank accounts for recipients to enable cash delivery via electronic bank or agent networks.[134] The disadvantage of cash as a delivery mechanism is that it requires administrators to develop strict financial controls to ensure that cash is not mishandled.

Vouchers can also be used to deliver subsidies to beneficiaries and can be delivered electronically or physically. Vouchers can add additional security features such as watermarks or multifactor authentication to ensure vouchers are not copied or resold. If vouchers are inadvertently leaked, they can be voided by a program administrator. Unlike money, vouchers can only be used for the DSS's specific purpose, an additional benefit. The disadvantage of vouchers is that they require administrators to develop separate creation and management processes which can lead to voucher shortages or other complexities. For example, during the TNVS DSS program, administrators ran out of physical

134 *Gardner et al, Evaluation of the Kenya Hunger Safety Net Programme Phase 2: The legacy of HSNP Phase 2: systems, practices and lessons learned, (Oxford: Oxford Policy Management, 2017), 5, https://www.opml.co.uk/files/Publications/a0013-evaluation-kenya-hunger-safety-net-programme/hsnp-legacy-systems-practices-lessons-learned.pdf?noredirect=1*

vouchers and switched to e-vouchers which left some beneficiaries unreached due to weak mobile penetration among target beneficiaries.[135] Similar to cash delivery, mobile penetration or relevant metrics of technological or financial inclusion among target beneficiaries are important factors to consider when choosing between electronic or physical voucher delivery.

For the cases where vouchers are used or subsidies are delivered directly to private companies, DSS program administrators should quickly pay private companies to minimize working capital constraints. For example, where private companies are paid after verification, minimizing the reimbursement times ensures that working capital constraints are minimized. This is also true for vouchers. In Ghana, a large supplier of agriculture inputs called Yara opted out of the FSP fertilizer program due to repeated subsidy payment delays.[136] To minimize payment delays, DSS programs can set up letters of credit with local banks to temporarily fund private companies' subsidy receivables.[137]

3.1.7. Form of Administration

Subsidy administrators provide oversight for subsidy implementation and program management. Governments may choose government agencies or third-party administrators for a DSS program. Oversight is usually geared towards preventing any system abuse. Types of abuse include the misappropriation of funds due to a lack of stringent financial controls or implementation personnel taking advantage of weak systems and processes for personal gain. For example, reports indicate that implementation personnel working for the HSNP cash transfer program in Kenya demanded additional payments from beneficiaries beyond the required transaction cost.[138]

Government administrators are typically nested in agencies or specific ministries relevant to the DSS program. For example, the Myanmar OGS DSS was administered by the Myanmar Department for Rural Development. Subsidy administration through government agencies can enable programs to leverage existing government infrastructure and human resources. For example, in Ghana, the Ministry of Food and Agriculture worked with its agricultural extension officers to implement the FSP fertilizer program.[139] Institutional capacity for managing subsidies and expertise on OGS markets varies greatly across countries. In all cases, strong institutional capacity is needed to implement any subsidy program effectively and to minimize any delays that may occur due to poor subsidy program management.

Governments can also opt for third-party implementation partners which include the private sector or development partners who can provide unique technical expertise. For instance, the Kenyan Ministry of Energy contracted with SNV to manage component 2 of KOSAP (SSS RBF and

135 *Roll Back Malaria et al, Making Targeted Subsidies Fast and Flexible The TNVS e-voucher, (Geneva: Roll Back Malaria, 2017),1,https://www.pmi.gov/docs/default-source/default-document-library/implementing-partner-reports/tanzania2_networks.pdf?sfvrsn=6*

136 *Nazaire Houssou et al, Can Better Targeting Improve the Effectiveness of Ghana's Fertilizer Subsidy Program? Lessons from Ghana and Other Countries in Africa South of the Sahara (Washington, DC: International Food Policy Research Institute (IFPRI), 2017), 6, http://ebrary.ifpri.org/utils/getfile/collection/p15738coll2/id/131068/filename/131279.pdf*

137 *Nazaire Houssou et al, Can Better Targeting Improve the Effectiveness of Ghana's Fertilizer Subsidy Program?, 6*

138 *Amina Ibrahim Sheikh Abdulla, Cash Transfer Programming In Kenya: A Case Study To Document The Actions Being Taken To Build The Knowledge, Attitude, Practices And Capacity Of The County Governments/State Actors, (Washington, DC: USAID, 2015), 9, https://www.calpnetwork.org/wp-content/uploads/2020/01/cash-transfer-programming-in-the-asals-of-kenya.pdf*

139 *UN, NEPAD & IFDC, Practices and Policy Options for the Improved Design and Implementation of Fertilizer Subsidy Programs in Sub-Saharan Africa, (Alabama: International Fertilizer and Development Center, 2013), 22, https://africafertilizer.org/wp-content/uploads/2017/04/Practices-and-Policy-Options-for-the-Improved-Design-and-Implementation-of-Fertilizer-Subsidy-Programs-in-Sub-Saharan-Africa.pdf*

debt facility). SNV then subcontracted with SunFunder to manage the debt fund, while SNV managed the RBF component. Both SNV and SunFunder have experience managing similar programs, with existing systems and strong relationships with international funders. If governments choose third party implementation partners, they should ensure that they are well-versed in the local context of the subsidy program. Whether choosing government or third-party implementation partners, independent auditors and grant administrators should be utilized to avoid fraud, fund mismanagement, and long payment delays.

3.1.8. Exit Strategy

DSS programs should incorporate an exit strategy to ensure the program fulfils its objectives and makes a successful transition to the private sector. An exit strategy should, from the onset, clearly state to all stakeholders when a program will end based on early projections and provide updates to stakeholders on the amount of funding a program has to deploy. Moreover, an exit strategy should be linked to an overall outcome of a program, for example electrifying a specific geographic region, and should state that it will end after achieving that specific goal. Clear communication of an exit ensures that private sector companies can plan for periods in the future when a DSS will not exist. If there is no exit strategy, DSS may risk renewing each year which leads to budget overrun. For example, the FSP fertilizer DSS in Ghana has continually renewed annually due to high demand, leading to a total overall budget run of US$ 101 million.[140]

Given that a single program may not fully meet the needs of unelectrified beneficiaries, and that some beneficiaries may always require subsidies, DSS programs can utilize a revolving facility that reinvests returned revenues. A revolving facility reinvests a portion of the revenue that an OGS company earns from the sale of subsidized products into a revolving fund which can then be redistributed to new beneficiaries. Where needed, donors can also provide top ups to keep the total fund balance consistent. A revolving facility ensures that DSS funds are not simply a one-off payment, thereby increasing the number of connections per dollar spent. A revolving facility also allows ongoing subsidies for populations who may be unable to afford OGS products both currently or in the medium term. Private companies may be incentivized to join these revolving subsidy facilities to unlock the long-term customer lifetime value of recipients that are otherwise outside of their commercial reach.[141]

Subsidizing high-quality products with after-sales support can also benefit consumers in the long run and maximizes the benefits of the subsidy. While more expensive per beneficiary, high-quality products function long after the end of a program and DSS programs should always subsidize products that meet minimum quality standards. Incorporating after-sales support into program contracts ensures that private companies are aligned with consumer interest in long-lasting products. Where appropriate, end-of-life repurposing can also be incorporated as a program requirement to minimize adverse environmental externalities caused by product disposal, though this places an additional burden on companies if not also subsidized.

140 *Nazaire Houssou et al, Can Better Targeting Improve the Effectiveness of Ghana's Fertilizer Subsidy Program?, 3*

141 *Mansoor Hamayun ,"Op-Ed: This is how Africa can accelerate energy access", CNBC Africa, Februaruy 21, 2020, https://www.cnbcafrica.com/insights/energy-environment/2020/02/21/op-ed-this-is-how-africa-can-accelerate-energy-access/*

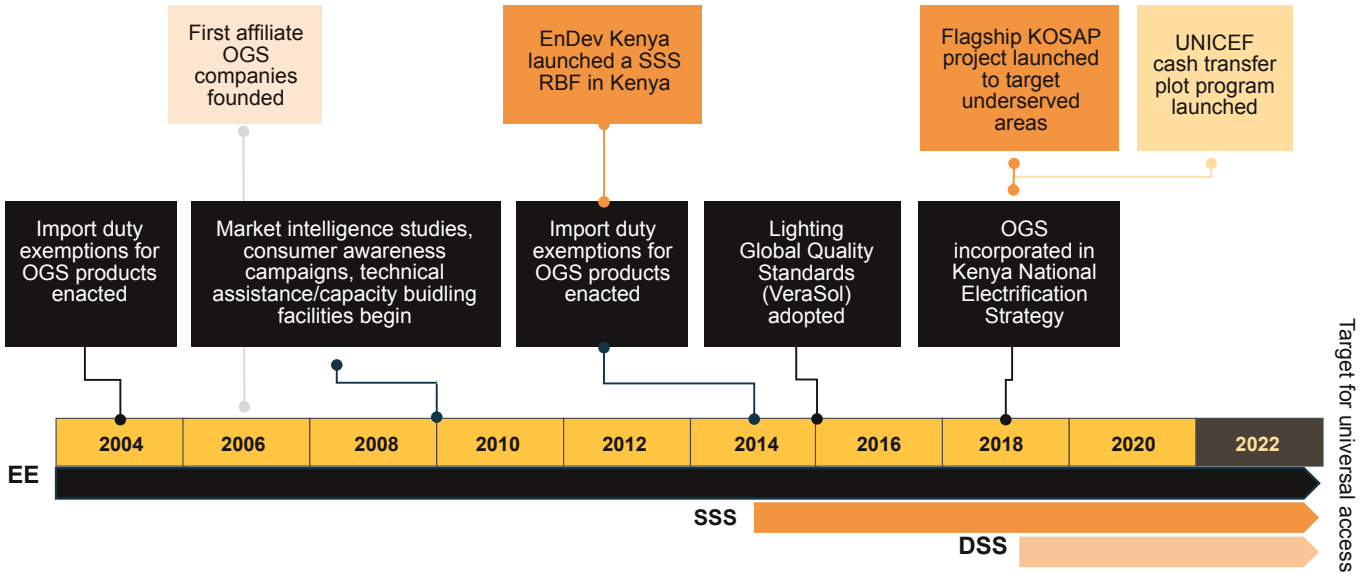
4 WHEN GOVERNMENTS SHOULD DEPLOY DIFFERENT MARKET-BUILDING INTERVENTIONS

Given the many interventions that can accelerate energy access, it is vital to consider the timing of implementing each. There is no one-size-fits-all approach to developing an OGS sector, as each country has a unique set of development goals, timelines, and public and private sector resources available. Though DSS are vital to ensuring universal energy access, it is important to implement them at an appropriate stage in a country's OGS market development. This ensures a robust supply of OGS products and manages end-user expectations for long-term energy provision. This chapter discusses some key considerations for when it is most appropriate to roll out DSS, with careful attention to the stages of market development as outlined in Chapter 2 (Figure 4).

4.1. THEORETICAL IMPLEMENTATION TIMELINE

In a theoretical construct, the interventions should be implemented sequentially. Ideally, countries should first create a robust enabling environment to allow a commercial market to sustain itself. Upon market entry, companies will typically serve the commercially viable consumers within serviceable areas. Governments can then implement SSS to encourage companies to scale up operations and enter logistically challenging areas to ensure all consumers have access to products. Additionally, many of these foundational interventions begin to improve affordability, but do not fully address the affordability gap for the poorest and most vulnerable consumers. So, governments can deploy DSS solely to serve those who cannot afford an OGS product, ensuring no one is left behind. Some mature markets, such as Kenya, have loosely followed this ideal sequencing (Figure 8).

Figure 7: Ideal sequencing of interventions (Kenya)[142]



142 *Africa Clean Energy Technical Assistance Facility (ACE-TAF), Importation Guidelines For Solar PV Products and Systems in Kenya, (Nairobi: ACE-TAF, 2019), 12, https://www.ace-taf.org/wp-content/uploads/2019/10/Importation-Guidelines-For-Solar-PV-Products-and-Systems-in-Kenya-2019-ACE-TAF.pdf, Lighting Africa, "A Thriving Off-Grid Market – With a New Focus on Underserved Areas", https://www.lightingafrica.org/country/kenya/*

Policymakers should first focus on implementing enabling environment interventions that create attractive business environments for OGS companies through supportive policy, ensuring an robust supply of products. Policy interventions clearly outline the role that OGS will play in electrification efforts (incorporating OGS into NEPs) and the laws which will govern OGS companies (tax exemptions and quality standards). These interventions provide clarity on the business environment which encourages companies and investors to deploy resources and capital for OGS products in-country.

Consumer awareness and capacity building are additional non-policy pre-conditions to a robust enabling environment. Consumer awareness programs play a crucial role in educating end users on the benefits of OGS, and more importantly, product quality. They build end user awareness of, trust in, and demand for OGS products, critical enablers in establishing commercial markets. They also save end users money in the long run. These initiatives can reach many more people with government support, through existing national awareness programs in sectors such as health, education, and energy access. Capacity building similarly educates government agencies on OGS products, quality standards, and best practices to promote the sector's growth. They can also provide young companies with the skills needed to raise capital and serve consumers. These interventions set the foundation for a sustainable OGS sector and have minimal market distortion risks.

After establishing a robust enabling environment, policymakers should use SSS to encourage companies to scale up operations and enter logistically challenging markets to increase access for end users. This intervention is necessary since customers need access to OGS products as a pre-condition to receiving a demand-side subsidy for OGS products. In addition, supply-side interventions often also have an indirect impact on price, which benefits low-income consumers living in areas that are commercially accessible. These programs should be designed with sustainability in mind, to support companies until they can establish steady operations in commercially viable and unviable areas.

Lastly, governments should deploy DSS to serve vulnerable populations and those in financially challenged markets to leave no one behind. Leaving DSS to last provides the market time to mature and provide energy access to most of the customers who can be served commercially. It also ensures that there is a well-established and sustainable supply of goods that will be subsidized. This prevents end users that can be served by commercial means from receiving subsidy funds meant for those unable to afford OGS products.

While there are many risks to breaking the ideal sequencing, governments may have to implement interventions simultaneously to achieve universal energy access targets. Failing to establish a robust enabling environment creates a high risk that other interventions will be less effective and take longer to complete their objectives. Failing to implement SSS at the appropriate time can result in markets having the necessary demand for OGS products but cannot be served as the overall business environment is unattractive for companies. Implementing DSS too early risks providing subsidized products to the wrong end users and distorting consumer perspective on price. Despite these risks, governments will likely not have sufficient time to feasibly sequence the interventions in the ideal way. Governments, therefore, will need to balance both creating commercial markets and closing the affordability gap.

Tin Yi Wai and her sisters, dressmakers in Myanmar, Budalin Township, take advantage of solar power light to work at night, which has increased their income. Photo credit: pactworld.org

Case box 11: Lessons from Myanmar on implementing competing interventions

In Myanmar, the Department for Rural Development (DRD) began to provide subsidized OGS products in geographical areas that were designated for commercial operations only. These products were subsidized by 80 to 90 percent and sold to end users who could have afforded systems at commercial prices. Companies relied on the Myanmar Government's promises to provide subsidies in specific areas only. But when the Myanmar Government started providing subsidized products in areas designated for commercial operations, private companies could not compete and exited from the country.[143]

4.2. REALISTICALLY ACHIEVING THE DUAL GOALS – UNIVERSAL ENERGY ACCESS AND COMMERCIAL MARKETS

While the ideal sequencing can reduce market distortion, most governments do not have the benefit of time. Kenya's OGS market, as an example, developed for over ten years before significant SSS and DSS subsidies were introduced. Yet there are 17 million people who are still unserved in Kenya due to both access and affordability gaps, which has led the Kenyan Government to vigorously pursue both SSS and DSS in the past few years.[144] The reality is that most Sub-Saharan African countries face a ticking clock to achieving their universal access goals and still have a substantial way to go (Table 3). Therefore, it is pivotal for governments to implement the right interventions which will both catalyze commercial markets and achieve energy access goals.

143 *Next Billion, "The Danger of Subsidized Solar: How Government and Donors Unwittingly Hobbled Our Business", https://nextbillion.net/danger-subsidized-solar-government-donors-unwittingly-hobbled-business/*

144 *Africa Clean Energy Technical Assistance Facility (ACE-TAF), Kenya Off-grid solar sector factsheet, (Nairobi: ACE-TAF, 2019), 1, https://www.ace-taf.org/kb/kenya-fact-sheet/*

Table 3: Progress towards universal access in ACE-TAF Sub-Saharan Africa countries[145]

	Population (2017)[146]	Electrification rate (2017)[147]	Universal energy access target[148]	Off-grid population (people) (2017)[149]
Ethiopia	106 million	44%	2025	61 million
Ghana	29 million	79%	2020	5 million
Kenya	50 million	64%	2022	17 million
Malawi	18 million	13%	2030	16 million
Mozambique	29 million	27%	2030	21 million
Nigeria	191 million	54%	90% by 2030 100% by 2040	87 million
Rwanda	12 million	34%	2024	8 million
Senegal	15 million	62%	2025	6 million
Sierra Leone	8 million	23%	92% by 2030	6 million
Somalia	15 million	33%	N/A	9 million
Tanzania	55 million	33%	75% by 2030	37 million
Uganda	41 million	22%	60% by 2025	33 million
Zambia	17 million	40%	51% rural and 90% urban by 2030	11 million
Zimbabwe	14 million	40%	90% by 2030, 100% by 2040	11 million

With limited time, policymakers could adopt multiple interventions simultaneously to quickly drive their countries towards universal energy access. This requires creating a robust plan towards universal access that includes a careful understanding of a country's current OGS market and key gaps to achieving universal access. Governments must strive to develop capacity and consumer awareness, create an attractive market for OGS companies, and address the affordability gap. While these interventions can happen simultaneously, they should also build upon each other.

145 *The countries listed above are participants of DFID's Africa Clean Energy program.*

146 *World Bank, Total population: All countries and economies, (Washington, DC: World Bank, 2015), https://data.worldbank.org/indicator/SP.POP.TOTL*

147 *World Bank, Access to electricity (% of population): All countries and economies, (Washington, DC: World Bank, 2018), https://data.worldbank.org/indicator/EG.ELC.ACCS.ZS*

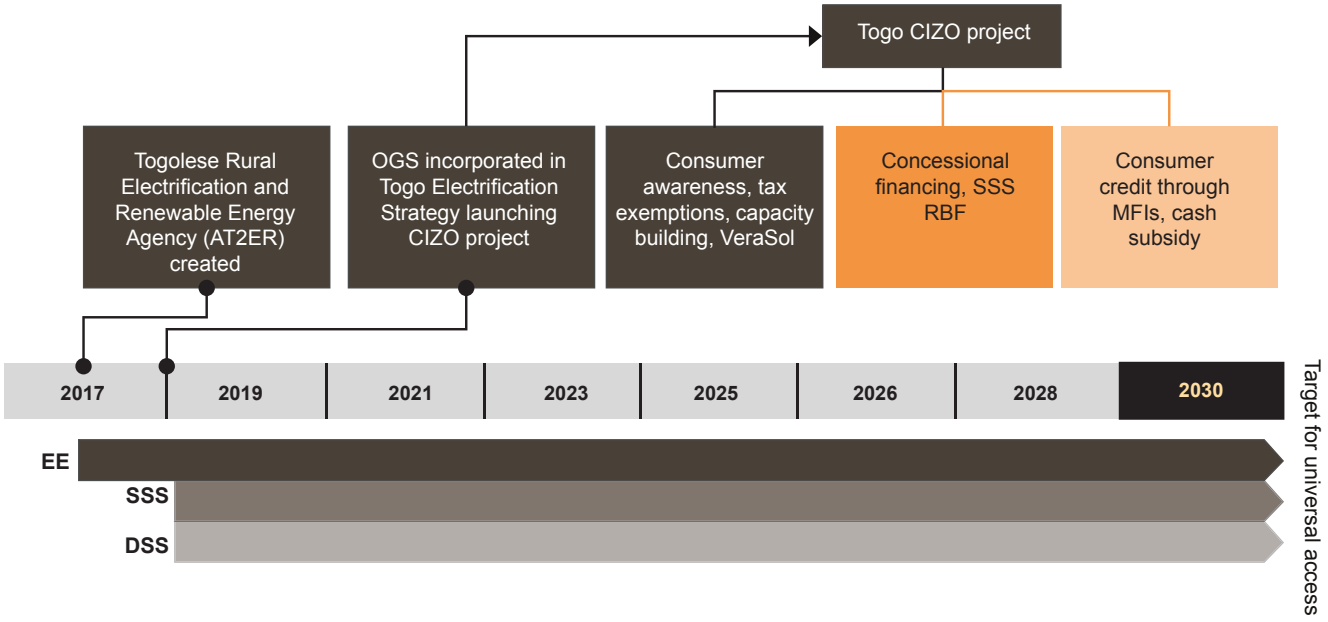
148 *Note that some countries do not define 100% as universal access. For instance, Uganda is targeting 60 percent electrification by 2025 as their target, Africa Clean Energy Technical Assistance Facility (ACE-TAF), Markets Data, (Nairobi: ACE-TAF, 2019), https://www.ace-taf.org/kbtopic/market-data/*

149 *Africa Clean Energy Technical Assistance Facility (ACE-TAF), Markets Data, (Nairobi: ACE-TAF, 2019), https://www.ace-taf.org/kbtopic/market-data/*

Governments should develop national electrification plans that integrate on-grid and off-grid solutions utilizing geospatial mapping to inform least-cost planning. Governments should always work towards developing a robust enabling environment as the building blocks of any strategy. In reviewing their NEP and putting in place targets for achieving universal access, governments should understand both the current and future state of on-grid and off-grid solutions. This process should make use of tools such as geospatial mapping to segment on-grid and off-grid populations appropriately. A further best practice would be to identify regions that are commercially viable and those that require subsidies. This will allow governments to identify geographies and populations where neither the grid nor OGS products will reach without additional support.

Governments can then design appropriate subsidies to drive universal energy access. By understanding the hard to reach areas, governments can create SSS to incentivize companies to reach these areas and improve affordability in commercially viable areas. And by understanding consumer affordability, governments can identify the most vulnerable populations who cannot afford OGS products without direct subsidies and tailor DSS towards them. It is pivotal for governments to carefully design these interventions following the design principles laid out in this paper (see further Chapter 5). This is to ensure the interventions catalyze, rather than distort, commercial markets. Togo is an example of a nascent market that is carefully considering how to leverage different interventions to meet their energy access targets (Figure 8). Given the limite time available, relatively small population, low-income levels, and nascency of the OGS sector in the country, the Togolese Government launched the CIZO project to utilize all the interventions at the same time.

Figure 8: Merged sequencing of interventions in Togo



5 RECOMMENDATIONS FOR GOVERNMENTS ON HOW BEST TO DEPLOY DSS TO ENSURE EFFECTIVENESS AND SUSTAINABILITY

There are a few key areas for policymakers to consider even before embarking on subsidy design. Once design begins, there are several best practice principles that policymakers can follow to optimize a DSS. These principles are based on a synthesis of best practices from literature and views of stakeholders across the OGS sector throughout Sub-Saharan Africa.

5.1. PRE-DESIGN CONSIDERATIONS

Prior to full subsidy design, policymakers should align on specific pre-design considerations that bound the scope of DSS design and enable them to assess the trade-offs of different designs. DSS pre-design considerations include subsidy goals, the funds available for the program, beneficiary context, the level of private sector maturity, and the availability of data. While decisions on these parameters are made prior to the design process, they can be revisited and modified throughout the process.

As a first step, policymakers should define the high-level goals they aim to achieve with a DSS through initial conversations with sector stakeholders. Though achieving universal access is the ultimate goal, policymakers will likely have to implement different interventions to achieve this goal. Therefore, they must identify the purpose and success factors for a DSS after taking stock of existing sector interventions to ensure that programs are complementary. Example goals include reaching a certain number of connections, subsidizing an amount of energy (in kWh), electrifying a specific vulnerable population to increase gender and social inclusion, or other objectives. The more specific the goals, the easier it will be to design a subsidy that successfully achieves those goals. Designing a DSS program serving a refugee camp, for example, will require different design considerations than a DSS serving orphans in a large and dispersed community. Initial consultations with donors, private sector companies, and fund managers can provide early insights into a feasible approach and potential risks to mitigate.

Total funds will dictate the scale that a DSS can achieve and relevant subsidy components. Target beneficiaries and subsidy design components such as subsidy level, delivery channel, subsidized product, administration, and verification (covered in section 1.2 on design principles), all dictate how much funding is required. For example, a smaller DSS program targeting several hundred beneficiaries may only require in-person verification from a small team rather than an expensive verification system that leverages unique databases and location tracking. The amount of funding for a DSS program will also determine if DSS goals needs to be re-visited or if additional fundraising is needed to ensure that the total funding amount is not too small or too large. Governments can first assess existing funds or raise funds from donors based on their goals and design.

The beneficiaries' context also influences design requirements. Policymakers must carefully design DSS to avoid exclusion, given the vulnerable nature of these beneficiaries. In the case of delivery channel, if the target population does not have smartphones, USSD-enabled applications should be

used. Additionally, if no phones are available, physical vouchers can be considered. Moreover, OGS companies do not market to vuknerable popualtions. As a result, investments in marketing and product education may be needed. For example, a DSS program in Ghana for LPG gas saw low uptake of the poorest households due to reasons including a lack of public awareness of the program.[150]

Private sector maturity determines what is possible in terms of product offering and reach. Policymakers rely on existing private sector partners to deliver subsidized products and therefore should consider the current reach of the private sector and the products currently available to off-grid customers. Private companies or industry associations can often help inform where to target, and what incentives or additional support will be required to reach any unserved markets.

Existing data influences the viability and cost of different approaches to targeting and verification. Collecting data is expensive, so policymakers must often use existing data to guide their design phase. Taking stock of the granularity and accuracy of specific data for attributes helps inform the need for the use of proxies or investments in data generation to reach program goals. While there are unique cases such as the Ubudehe program in Rwanda where income data is linked to unique beneficiary identification documents, this is not the status quo, and countries with large populations without energy access often have fragmented or inaccurate data.

Pilots enable policymakers to test design options, develop processes, and gain valuable experience prior to full-scale launch. Given the many stakeholders involved in DSS programs, pilots allow for test-runs of stakeholder coordination. Policymakers should consider pilots to gather feedback where there is uncertainty around design options.

5.2. DESIGN PRINCIPLES

Design principles are fundamental guidelines that ensure a program meets development objectives and maintains best-in-class standards. Given the imperative to achieve universal access while not distorting commercial markets, it is essential to structure DSS soundly. This section outlines eight design principles that can be used as guides for policymakers as they develop a DSS program to fit their country's unique set of resources and challenges.

▶ 5.2.1. Design principle 1: DSS should be developed through extensive discussions with relevant stakeholders and be clearly communicated to ensure stakeholder alignment

Extensive stakeholder consultation during the design stage can help ensure both stakeholder buy-in and effective subsidy design. Each stakeholder group provides valuable perspectives needed to operationalize a program. For example, private sector companies offer insights around on-the-ground

> "DSS conversations should be inclusive of all stakeholders from the concept phase to bring together all potential solutions to the energy access challenge"
>
> **– Private sector stakeholder**

150 *Sustainable Energy for All (SE4ALL) et al, Energy Safety Nets – A Ghana Case Study, (Vienna: Sustainable Energy for All, 2020), 4, https://www.seforall.org/sites/default/files/2020-05/ESN_Ghana_Policy_SEforALL.pdf*

operational realities; other government departments ensure the use of all applicable government data, safety net programs, and resources; and beneficiaries provide insights to make a program user-centric.

Clear communication strategies are also necessary for smooth implementation. Beneficiaries must be aware of their eligibility and the process to obtain a subsidy, otherwise the subsidy may not reach its intended target population. Communication methods should consider marginalized populations. For example, television adverts may not be effective if beneficiaries do not have access to electricity or television. Clear communication is also necessary to ensure that populations clearly understand whether they are eligible for products, and what is the purpose of the program to avoid unrealistic expectations about the OGS market. Finally, subsidy administrators must communicate clearly to implementing partners both within government and the private sector about the importance of their roles to avoid risks such as non-payment or failure to deliver quality service to beneficiaries. Where possible, stakeholders should agree upon strategies to mitigate these risks during the design phase.

5.2.2. Design principle 2: DSS should be efficiently targeted based on available data

> *"Targeting costs can become very high, increasing product costs and program budgets"*
>
> ***- DFI representative***

Where data is available, DSS should target beneficiaries based on clearly defined and specific criteria. Targeting should consider whom the commercial markets can serve and whom will be left behind so there is no competition between commercial and subsidized populations. Targeting criteria can include income levels, demographic characteristics, and geographical location, among others. Subsidies can consider socially differentiated targeting mechanisms, as different groups have varied, and gendered energy needs that make a one-size-fits-all approach troublesome. Targeting criteria should be reflective of program goals. For example, a DSS with the goal of reaching elderly women should ensure that gender and age feature as part of its targeting criteria. In countries that have limited end user data, a high percentage of unelectrified people, and a high percentage of recipients requiring a similar subsidy level, less targeted subsidy approaches such as targeting all rural beneficiaries can be considered to minimize targeting costs.

Targeting criteria should leverage existing data where possible to reduce costly data collection processes. Existing sources of data include government databases or data from other, large-scale data collection efforts such as censuses or other household surveys. Gender disaggregated data can improve targeting for gendered outcomes. Data on the specific energy needs of the poor helps to identify who needs a subsidy, making policies more efficient. Where data is limited, policymakers should rely on proxies, for example, relying on the mobile network tracked locations as a proxy for physical addresses.

5.2.3 Design principle 3: The level of subsidy should reflect the affordability gap

The subsidy paid to each beneficiary should close the affordability gap for beneficiaries by subsidizing the difference between the commercial price of an OGS product, and the target group's willingness and ability to pay. Policymakers can use current household energy expenditure as a proxy for willingness to pay and compare this to the average costs of the chosen OGS product to determine the affordability gap. When considering how much to subsidize per each beneficiary, minimizing the subsidy level per user enables a DSS program to reach more beneficiaries while ensuring

that market price expectations remain commercially realistic. In reality, however, providing different subsidy amounts to each beneficiary based on unique affordability gaps is difficult. Therefore, subsidy amounts can reflect average affordability gaps for target population segments.

> *Subsidy amounts should cover the cost of a product based on what customers can afford. This amount should change proportionally with changes in the market price of products"*
>
> ***- Government policymaker***

To minimize price distortions, DSS programs should avoid giving away products for free unless necessary. Giving away products for free assumes there is no willingness to pay for products when, in most cases, beneficiaries have a willingness to pay proportionate to their existing energy expenditure. Minimizing free product giveaways enables programs to subsidize more people as well and to therefore make better use of existing, and possibly scarce, subsidy funds. Requiring customers to contribute to subsidized products may also lead to an increased sense of ownership for the product, ensuring sustained use and potentially increasing interest in subsequent energy services.[151]

5.2.4 Design principle 4: Verification systems should be robust to minimize leakages

Verification systems should ensure that only targeted beneficiaries receive a subsidy. Verification system should also ensure that beneficiaries receive no more subsidy than stipulated and that beneficiaries do not on-sell products into commercial markets. Without verification, a DSS program risks significant leakage which distorts markets by subsidizing customers who can afford non-subsidized products. Minimizing leakages is especially important in high-growth markets where leakages can prevent future growth.

> *In small countries, large amounts of leakages can easily kill the market and prevent commercial players from entering*
>
> ***- Private sector stakeholder***

Verification systems should leverage the best available data and technology where feasible. Well-developed systems that track subsidy recipients and disbursements can help program administrators to verify that eligibility criteria are met. These systems do need to be augmented with manual verification to ensure data accuracy. Verification also increases accountability by allowing for real-time assessment of leakages which permits administrators to adjust systems if needed. Administrators can leverage mobile network numbers, ID databases, geolocation tags from GSM-enabled PAYGo products, and other unique identifications to verify beneficiaries and ensure outcomes.

5.2.5. Design principle 5: Programs should allocate enough resources to build the capacity of all stakeholders, including beneficiaries, government agencies, and the private sector

Policymakers should develop the capacity of beneficiaries to maximize OGS uptake and ensure that beneficiaries can seamlessly access the subsidy. Capacity building can take the form of

151 *Consumers often acquire / stack new energy products on top of each other rather than purchase new systems to replace old ones., Omar R. Masera et al, From Linear Fuel Switching to Multiple Cooking Strategies: A Critique and Alternative to the Energy Ladder Model, (Utrecht: Elsevier Journal, 2000), 1, https://www.sciencedirect.com/science/article/abs/pii/S0305750X00000760?via%3Dihub,*

consumer education, for example educating illiterate and elderly beneficiaries on the harmful health effects associated with kerosene-fueled lighting and the benefits of switching to OGS products. Additionally, if programs are implemented with mobile money or via bank accounts, many customers may need support in understanding how to open their accounts and access them when needed.

> *To manage funds at scale, [fund administrators] need the capacity to do so effectively*
>
> ***– Private sector stakeholder***

Policymakers should also budget for capacity development for the implementing parties. Dedicated technical assistance (TA) facilities can support private and public implementers or additional resources can be allocated to the implementing organization to up-skill stakeholders. Examples of support include helping a private OGS company and government ministry set up an API to enable data sharing that allows for more granular targeting or helping local government officials and community leaders understand OGS products and their benefits so that they can share them with their respective communities.

5.2.6. Design principle 6: Processes should be efficient to maximize value for money for governments, donors, and consumers

> *Optimal subsidy schemes should minimize costs on targeting and overheads and channel those savings to the actual subsidies*
>
> ***– Private sector stakeholder***

Policy makers should identify efficient methods for subsidy provision. Minimizing operational costs frees up funds to reach more beneficiaries or increase the subsidy benefit per beneficiary. DSS programs can reduce costs by leveraging existing datasets rather than creating new ones, funneling payments through existing government channels, or using technology to efficiently deliver or verify subsidy payments.

However, program efficiency should not come at the cost of excluding vulnerable populations. For example, if physical identification cards are needed by a program to verify subsidies and portions of the population do not have them, other forms of verification should be offered or explored. In those situations, where required, the provision of identification cards can also be bundled as part of a DSS.

5.2.7. Design principle 7: Processes should be transparent to promote accountability

DSS should be transparent to encourage robust stakeholder participation and maximize outcomes for beneficiaries. Stakeholders, from administers to private companies, should be clearly aware of their specific roles to ensure that processes are not delayed. Processes for selection should also be transparent. For example, when choosing private company partners, programs should use supplier selection processes that are transparent to encourage a high number of competitive applications. Beneficiary criteria, particularly for pilots which may have a smaller number of beneficiaries, should also be transparent and fair to avoid any conflict between end users.

> *[We need] to ensure situations where a customer gets a subsidy that is not contentious with his or her neighbor*
>
> ***– Government stakeholder***

Policymakers should incorporate robust monitoring and evaluations (M&E) processes and financial audits to enhance accountability and ensure that funds are correctly managed. M&E programs evaluate performance against subsidy goals, and audits ensure financial accountability.[152] To encourage continued funding, it is important to show both positive outcomes but also the responsible management of funds. Where possible, impartial and independent M&E evaluators or auditors should be used.

5.2.8. Design principle 8: DSS should be designed with the long-term sustainability of both the program and of commercial markets in mind

> *On an exit strategy, [we] need to concentrate on what happens to the customer when the subsidies go away. Are people still being left behind?*
>
> ***– Development partner***

Where possible, DSS programs should include a clear exit strategy to ensure a sustainable market post-subsidy. A DSS may not solve universal access for a country, but it can meet a target that it sets out to achieve. As most programs are finite, they should have a clearly communicated end date to minimize private-sector distortion post-DSS. Where programs are extended or evolve, this evolution should also be communicated to all stakeholders in advance. To increase the impact of funds and to avoid abrupt exit dates, alternative fund structures such as a revolving fund that reinvests revenue from each subsidized product can be considered.

DSS programs should be designed to provide good value for customers after programs end. DSS programs should subsidize long-lasting, high-quality products that create a positive consumer perception of OGS products. At a minimum, products that in any way benefit from public funding should always meet minimum product standards for quality. Products should also be coupled with warranty protection and easily accessible after-sales support to ensure the functioning of the subsidized products over their useful life. Finally, end-of-life programs can recycle components to reduce wastage.

> *Consumers need to have good quality products that last*
>
> ***– DFI representativer***

152 *M&E programs can also be used to evaluate and measure the effectiveness of subsidy design and user impact. There are often lessons learned from programs that are not extensively shared. The OGS sector and DSS programs in general should leverage one another and ensure lessons from specific programs are not lost, Sustainable Energy for All (SE4ALL) et al, Energy Safety Nets – A Kenya Case Study, (Vienna: Sustainable Energy for All, 2020), 58, https://www.seforall.org/sites/default/files/2020-02/ESN_Kenya-SEforALL.pdf*

CONCLUSION

It is time for stakeholders to recognize demand-side subsidy (DSS) programs as a vital tool for achieving universal electrification. 2030 is not long away, and research predicts that at least 112M people, mostly in Sub-Saharan Africa, will not have access to electricity because they will not be able to afford an off-grid solar (OGS) product. Nations are racing to reach universal electrification and therefore might need to implement DSS simultaneously alongside other interventions such as supply-side subsidies to ensure that everyone can afford basic access to electricity.

DSS programs directly close the affordability gap for end-users and complement other sector interventions such as supply-side subsidies (SSS) that have accelerated access and improved affordability. DSS directly and proportionately reduce the cost for end users, while ensuring that private companies receive adequate compensation to sustain their businesses. DSS have long been used to address other sustainable development goals, and has gained some early traction in OGS that governments can build upon by piloting their own initiatives and then scaling them in new markets.

To design DSS that lead to efficient use of funding and that contribute to developing commercial markets, governments should consider the following design principles:

1. **DSS should be developed through extensive discussions with relevant stakeholders and be clearly communicated to ensure stakeholder alignment**
2. **DSS should be efficiently targeted based on available data**
3. **The level of subsidy should reflect the affordability gap**
4. **Verification systems should be robust to minimize leakages**
5. **Programs should allocate enough resources to build the capacity of all stakeholders, including beneficiaries, government agencies, and the private sector**
6. **Processes should be efficient to maximize value for money for governments, donors, and consumers**
7. **Processes should be transparent to promote accountability**
8. **DSS should be designed with the long-term sustainability of both the program and of commercial markets in mind.**

With 2030 fast-approaching, there is an urgent need to make sure the most vulnerable populations are not left behind during the global push for universal electrification. More than ever before, there is a viable path to ensuring basic universal access to electricity through the OGS sector. For counties with significant access deficits, using SSS to accelerate organic market growth is often the quickest, most efficient, and sustainable way to reach as many people as possible. However, for those countries with a significant affordability gap, DSS may also be needed. DSS can provide equitable access to those that cannot afford even the most affordable and basic access to electricity. A multi-stakeholder effort with governments and donors at the forefront is needed to deploy smart DSS and ensure that no one is left behind in the race to universal energy access.

APPENDIX

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