Designing Responsible End-User Subsidies for Energy Access:

A toolkit featuring case studies for the design of subsidies in off-grid solar and clean cooking

GOGLA

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endev

LIGHTING GLOBAL
Catalyzing markets for modern off-grid energy
AN INNOVATION OF
THE WORLD BANK IBRD • IDA
ESMAP Energy Sector Management Assistance Program

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Lighting Global is the World Bank's initiative to rapidly increase access to off-grid solar energy for the hundreds of millions of people living without electricity world-wide. Managed by the Energy Sector Management Assistance Program (ESMAP), we work with governments, the private sector, development partners, and end-users, continually innovating to unlock key market barriers and enable access and affordability to those that would otherwise be left behind. Our support has expanded to technologies that go far beyond lighting, including stand-alone solar systems to power the needs of households, farms, businesses, schools, health centers, and more. We operate with funding gratefully acknowledged from ESMAP and their donors.

The **Energy Sector Management Assistance Program (ESMAP)** is a partnership between the World Bank and over 20 partners to help low- and middle-income countries reduce poverty and boost growth through sustainable energy solutions. ESMAP's analytical and advisory services are fully integrated within the World Bank's country financing and policy dialogue in the energy sector. Through the World Bank (WB), ESMAP works to accelerate the energy transition required to achieve Sustainable Development Goal 7 (SDG7) to ensure access to affordable, reliable, sustainable, and modern energy for all. It helps to share WB strategies and programs to achieve the WBG Climate Change Action Plan targets. Learn more at https://esmap.org.

The **End-User Subsidy Lab** is a platform to promote the uptake of responsibly-designed and well-informed end-user subsidies that are effective in reaching the poor, use public resources efficiently and minimize market distortion The End-User Subsidy Lab crowds in knowledge, resources and expertise from all stakeholders interested in participating; offers a platform for exchange, dialogue and extensive consultation among stakeholders; shares lessons learned, tools, and information; and tests prototype end-user subsidy designs. The lab is coordinated by ESMAP, EnDev, GOGLA and the Clean Cooking Alliance. For more information, visit: www.gogla.org/what-we-do/policy-regulations/end-user-subsidy-lab.

Energising Development (EnDev) is an international flagship programme for providing energy access. EnDev works in more than 20 countries across Africa, Asia and Latin America. The driving force behind EnDev is the partnership of Germany, the Netherlands, Norway and Switzerland: donors who are committed to accelerating energy access. EnDev's Demand-Side Subsidies (DSS) component is funded by the Directorate-General for International Cooperation (DGIS) of the Netherlands Ministry of Foreign Affairs. DSS enables low-income and displaced populations to sustainably improve their lives and livelihoods in Liberia, Malawi, Niger, and Uganda.

GOGLA is the global association for the off-grid solar energy industry. Their almost 200 members provide millions of low-income and climate-vulnerable people with affordable, high-quality products and services; rapidly increasing customers' productivity, connectivity, and resilience. To enable sustainable businesses and accelerate energy access, they provide market insights, standards and best practice, and advocate for catalytic policies, programmes and investment. To find out more, visit www.gogla.org.

The **Clean Cooking Alliance (CCA)** works with a global network of partners to build an inclusive industry that can make clean cooking accessible to all. Established in 2010, CCA is driving consumer demand, mobilizing investment, and supporting policies that allow the clean cooking sector to thrive. To find out more, visit cleancooking.org.

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Key definitions

Terms	Definitions
Affordability gap	Difference between the market price of a product and a consumer's ability to pay.
Clean cooking solutions	Cooking technologies that either reduce, eliminate, or support the transition away from the use of biomass, such as charcoal or firewood, or other polluting fuels, such as coal and kerosene. These technologies range from Tier 4 to Tier 5 of the Multi-Tier Framework for clean cooking (refer to definition below), which are the technologies providing significant health benefits.
Connections	Households that have access to electricity through either a connection to an electricity distribution network or off-grid electricity providing Tier 1 or above access, as defined in the Multi-Tier Framework for electricity access. Refer to the definition below.
Disposable income	The amount of money that an individual or household must spend or save after income taxes, if any, have been deducted.
End-user	Final consumer of an energy product or service (either off-grid solar or clean cooking solution). In this report, it typically refers to an individual or a household. The terms end user and consumer are used interchangeably in this report.
End-user subsidies (EUS)	Subsidies are provided to directly reduce the price of a service or product for the end user, primarily aimed at bridging the affordability gap. Also known as demand-side subsidies (DSS), consumer subsidies, or price subsidies.
Energy as a Service	Energy as a service (EaaS), also referred to as fee-for-service, is a model in which customers pay periodically for a service, instead of purchasing a product or device. The product or device (e.g., a solar home system) in this case is owned by the company or service supplier, who sells electricity to the customer.
Hard-to-reach communities	Communities that are challenging to serve via commercial means due to being remote and/or because a large portion of the population is poor.
Improved Cookstoves (ICS)	Cookstoves are commonly called "improved" if they are more efficient, produce lower emissions, or are safer than the traditional cook stoves or three-stone fires. Tier 2 and 3 of the of the Multi-Tier Framework for clean cooking are also referred to as Improved Cookstoves.
Leakage	Situation where beneficiaries who could otherwise afford a product receive it through a subsidy.
Market distortion	A situation in which the prices of goods and services on the market are influenced by anything other than the principles of supply and demand, or in which competition amongst companies is distorted. It is viewed as any interference that significantly affects prices or market behavior. Subsidies, regulations, taxes and tariffs could represent sources of market distortion. In the case of end-user subsidies, they may distort a consumer's perception of price, thus decreasing willingness to pay.
Market maturity	Degree of market development for off-grid solar products and clean cooking solutions in a given country or region. This report uses the classification of market maturity proposed in the Off-grid *Solar Market Trends Report 2022: State of the Sector*. Market maturity is classified in four categories, based primarily on a combination of cumulative sales penetration and recent sales growth rates: nascent, emerging, mature, and peaked.

Multi-Tier Framework for clean cooking	The Multi-Tier Framework (MTF) for clean cooking measures the dimensions of access to modern energy cooking services in various levels (tiers). The MTF for clean cooking includes six attributes: (i) exposure, (ii) efficiency, (iii) convenience, (iv) safety, (v) affordability, and (vi) fuel availability. To measure progress, each attribute has six Tiers, ranging from 0 to 5.
Multi-Tier Framework for electricity access	The Multi-Tier Framework (MTF) for electricity access measures electricity access on a tiered spectrum, from Tier 0 (no access) to Tier 5 (the highest level of access) It provides a multi-dimensional definition for electricity access as 'the ability to avail energy that is adequate, available when needed, reliable, of good quality, convenient, affordable, legal, healthy and safe for all required energy services.'
Off-grid solar (OGS) solutions	Solar powered energy products, such as solar lanterns, multi-light kits, and solar home systems (SHS), including solar-powered appliances which are energy efficient.
Pay-as-you-go (PAYGo)	PAYGo is a form of consumer financing that allows users to pay for their products in small installments. It is commonly associated to selling OGS or clean cooking products through **rent-to-own** or lease-to-own contracts, i.e. the customer makes a down payment, followed by regular payments for a term ranging from six months to eight years, after which they own the product. The PAYGo business model is often technology-enabled, with payments usually made via mobile money (although other approaches exist i.e., payments done through scratch cards and cash) and a mechanism for the product to be "locked" in case payments are not made. PAYGo technology can also enable **energy-as-a-service** (EaaS) or fee-for-service models. EaaS is not as widespread as rent-to-own for OGS and clean cooking. For that reason, in this report PAYGo is used as a synonym for rent-to-own, and EaaS as an alternative business model.
Results-based financing (RBF)	Financing instrument that provides financing (typically grants) based on achieving specific and pre-agreed milestones.
Supply-side subsidies (SSS)	Financial incentives for companies to reduce risks or costs of operations, typically used to incentivize them to serve a market segment that is not commercially attractive.
Vulnerable groups	In this report, vulnerable refers primarily to people experiencing poverty or extreme poverty and other forms of marginalization often correlated with poverty, such as displacement or refugee status, gender, climate impact vulnerability, and so on.
Willingness to Pay (WTP)	The price that a person is willing to pay for a good or service.

List of abbreviations

AMPERE	Accessing Markets through Private Sector Enterprises for Refugees Energy
ATP	ability to pay
BEAM	Bangladesh Energy Access to Modernisation Fund
BRD	Development Bank of Rwanda
CRM	customer relation management
DSS	demand-side subsidies
EASP	Energy Access Scale Up Project (Uganda)
EDCL	Energy Development Corporation Limited
EEAS	energy as a service
EnDev	Energising Development
ESMAP	Energy Sector Management Assistance Program
EUS	end-user subsidies
EUSL	end-user subsidy lab
FBAE	Free Basic Alternative Energy Program (South Africa)
FBE	Free Basic Electricity Program (South Africa)
ICS	improved cookstoves
IDCOL	Infrastructure Development Company Limited
IEC	International Electrotechnical Commission
IVA	independent verification agent
LCY	local currency
LPG	liquefied petroleum gas
GOGLA	Global Off-Grid Lighting Association
GRM	grievance redress mechanism
LODA	Local Administrative Entities Development Agency (Rwanda)
MEAP	Malawi Electricity Access Project
MINALOC	Minstry of Local Government (Rwanda)
MMP	Mwangaza Mashinani Program (Kenya)
MTF	Multi-Tier Framework
MSME	micro, small and medium enterprises
MTR	Off-Grid Solar Market Trends Report
NASSP	National Social Safety Net Project (Nigeria)
NGO	non-governmental organization
NNNF	Ngwee Ngwee Ngwee Fund (Malawi)
NEP	Nigeria Electrification Project or National Electrification Plan (Rwanda)
OGS	off-grid solar
PAYGo	pay as you go
PUE	productive use of energy
PV	photovoltaic (solar technology)
RBF	results-based financing
REF	Renewable Energy Fund (Rwanda)
REG	Rwanda Energy Group
RREA	Rural and Renewable Energy Agency
SDG	Sustainable Development Goal (United Nations initiative)
SHS	solar home systems
SNV	Netherlands Development Organisation
SSS	supply-side subsidies
UBR	Unified Beneficiary Registry
UECCC	Uganda Energy Credit Capitalization Company
UNHCR	United Nations High Commissioner for Refugees
VAI	vulnerablilty access index
Wh	watt hour
Wp	watt peak
WTP	willingness to pay

All currency is in United States dollars ($, US$, or USD) unless otherwise indicated

Executive Summary

The Need for End-User Subsidies

End-user subsidies, alongside other public financing mechanisms, have a key role to play in accelerating global energy access in line with SDG 7.

Off-grid solar (OGS) and clean cooking solutions have played a significant role in accelerating universal energy access. However, based on current projections, by 2030, 660 million people will be without access to electricity, and 1.8 billion people without access to clean cooking, mostly in Sub-Saharan Africa (SSA).[1] To ensure no one is left behind, households must be reached with OGS and clean cooking solutions at an accelerated rate.[2,3]

Affordability remains a key barrier in preventing more people from accessing energy solutions.[4] This has been exacerbated by inflation and local currency depreciation in several key markets. In addition, the majority of people without energy access live in hard-to-reach areas, where markets for off-grid solar products and clean cooking solutions are only nascent or emerging. These affected populations might not have access to clean energy products, even if they could afford them.[5,6]

An integrated approach, leveraging end-user subsidies (EUS) alongside other public financing mechanisms[7], is needed to overcome these challenges. Over $60 billion will be required for OGS and clean cooking solutions between now and 2030, of which $12 billion are needed to address the affordability gap alone.[8] EUS bridges the affordability gap by directly lowering the price of a service or product for the end-user. They are also known as demand-side subsidies (DSS), consumer subsidies, or price subsidies. Other public financing mechanisms include supply-side subsidies, lines of credit for companies to finance working capital and receivables and guarantees. Coordination between end-user subsidies and other public financing mechanisms can support the development of markets for clean energy, while addressing affordability challenges simultaneously.

End-user subsidies are an essential instrument to close the affordability gap and have been implemented at a greater scale in recent years. This report builds on the experience of ten countries having deployed or adjusted EUS programs within the last decade. Notable examples include Rwanda, where the government deployed targeted subsidies for Solar Home Systems (SHS) reaching 330,000 households (more than 10 percent of the population) whom otherwise would be unable to afford those products, thus significantly contributing to the country's National Electrification Plan.[9] In the case of Nigeria, the introduction of an end-user subsidy for SHS was critical to the acceleration of growth in an emerging market despite widespread affordability challenges, reaching over one million households within one year of implementation.[10]

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1 International Energy Agency, 2023. SDG7: Data and Projections. Projections under Stated Policies Scenario.

2 Lighting Global/ESMAP, GOGLA, Efficiency For Access, Open Capital Advisors (2022), Off- Grid Solar Market Trends Reports 2022: Outlook. Washington, DC: World Bank.

3 International Energy Agency 2023, A Vision for Clean Cooking Access for All.

4 Affordability refers to the difference between the market price of a product and a consumer's ability to pay.

5 Emerging OGS markets are characterized by both high penetration of sales and a large remaining electricity access gap.

6 Nascent markets refer to markets that have low adoption rates for OGS solutions, with OGS sales being less than 10 percent of market potential.

7 The linkages between end-user subsidies and other public finance mechanisms are explored in this toolkit and presented in more detail in ESMAP publication 'Designing Public Funding Mechanisms in the Off-Grid Solar Sector'

8 OCA Analysis. The financing gap related to affordability for OGS is taken from [Lighting Global/ESMAP, GOGLA, Efficiency For Access, Open Capital Advisors (2022), Off- Grid Solar Market Trends Reports 2022: Outlook. Washington, DC: World Bank report] and is 20% of the total financing gap. We applied the same estimate (20%) for clean cooking using the overall financing need from [International Energy Agency 2023, A Vision for Clean Cooking Access for All].

9 Subsidy window under Rwanda's Renewable Energy Fund (REF), funded by the World Bank and managed by the Development Bank of Rwanda (BRD). A case study of this subsidy is available in section 3.4.

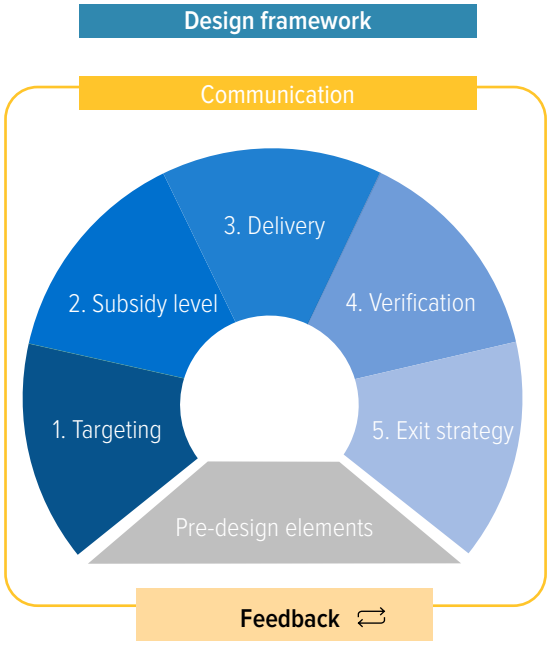
10 Output-Based Fund (OBF) for SHS under Nigeria Electrification Project (NEP), funded by the World Bank and managed by the Rural Electrification Agency (REA). A case study of this subsidy is available in section 3.5.

End-user subsidies must be designed 'responsibly' to be effective in reaching the poor, to use public resources efficiently and to avoid market distortion. As end-user subsidies directly influence pricing, they carry a risk of distorting market dynamics, as well as political challenges. For example, subsidies may affect consumers' value perception of OGS and clean cooking products and services, reducing their willingness to pay unsubsidized prices. A subsidy program may favor certain companies selected for the implementation, leaving companies that do not participate in the subsidy program at a significant disadvantage. Companies participating may also become reliant on subsidy revenue and find it difficult to operate after subsidies are removed. Another important risk is the political challenge of removing or restructuring subsidies, even when this is economically justified. **These risks can be mitigated by designing responsible programs, with learning and adaptive mechanisms embedded in them, which this toolkit sets out to support.**

This toolkit provides a framework to design responsible subsidies, building on lessons learned, considering different contexts and objectives, and balancing trade-offs. The way a subsidy is designed will have an impact on the cost to the government, the speed of rollout, the number of people reached and its scalability, as well as the market-distortion and political risks discussed above. The toolkit provides recommendations on how to inform the subsidy design, options to set specific parameters (targeting, subsidy level, delivery, verification, exit or adjustment), as well as guidelines for communication about subsidies. It also provides recommendations on monitoring, evaluation, and adaptation mechanisms.

This toolkit is primarily focused on subsidies for the purchase of off-grid solar products and clean cookstoves; it is limited in its application to fuel or electricity subsidies. Off-grid solar electrification is making the most progress through the selling of devices to end users (on cash or credit through mechanisms such as Pay-As-You-Go). This toolkit draws primarily from the experience of subsidizing such sales and is therefore most applicable for the design of subsidies for product purchase. The report however acknowledges the importance of emerging Fee-for-Service or Electricity-as-a-Service models, and most of the recommendations in this toolkit are also suitable for these models. However, they are not cited as prominently. Similarly, this toolkit is most applicable to subsidies for the purchase of improved and clean cooking devices. Less so for subsidies for fuels, such as liquefied petroleum gas (LPG), or the electricity consumed by electric cooking devices.

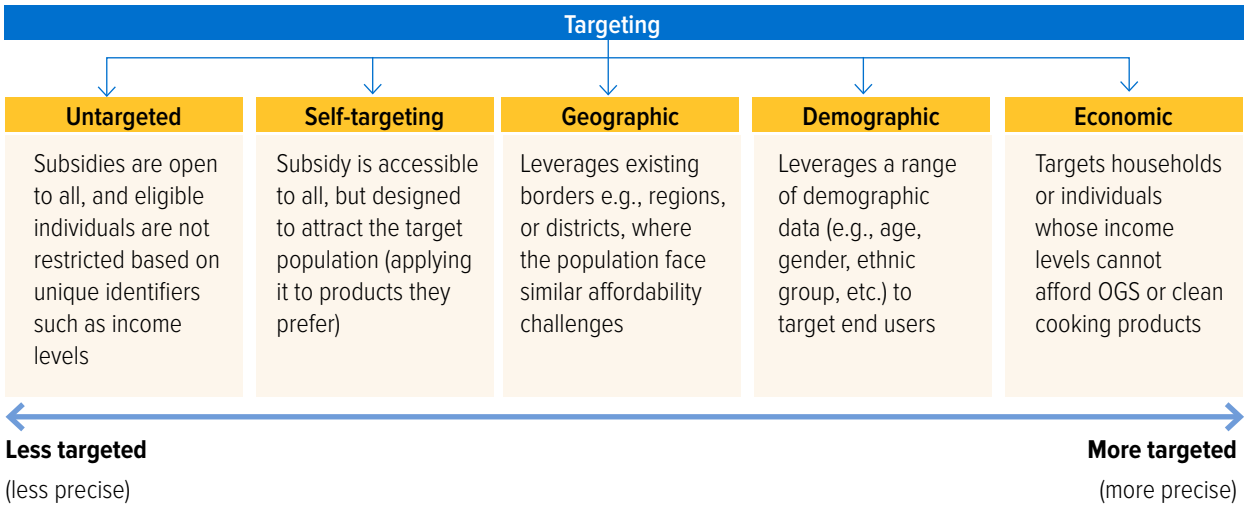
The EUS Design Framework



This paper presents a toolkit for designing EUS programs for off-grid solar and clean cooking solutions across different markets to address the affordability gap.

This design framework consists of pre-design elements, five design components, communication, and feedback. The pre-design elements are grouped into two main categories: 1) conducting market assessments and 2) determining program goals and resources. Market assessments aim to better understand the beneficiaries' context, ongoing initiatives, and the maturity of the clean energy market. The second category looks at defining the program goals, funding amount and the type of pilot required, if any. An example of a program goal may be for the EUS to focus on providing first-time access to basic energy solutions for the 'poorest' of the population. A different program goal may be to support the growth of the clean energy market by addressing widespread affordability challenges. Collectively, the pre-design elements set important program and market-specific contexts to support the design of effective EUS programs. They help inform the design of the program more broadly, as well as the prioritization of resources, and ensure that the EUS program is complementary to other energy access initiatives in the market.

Targeting



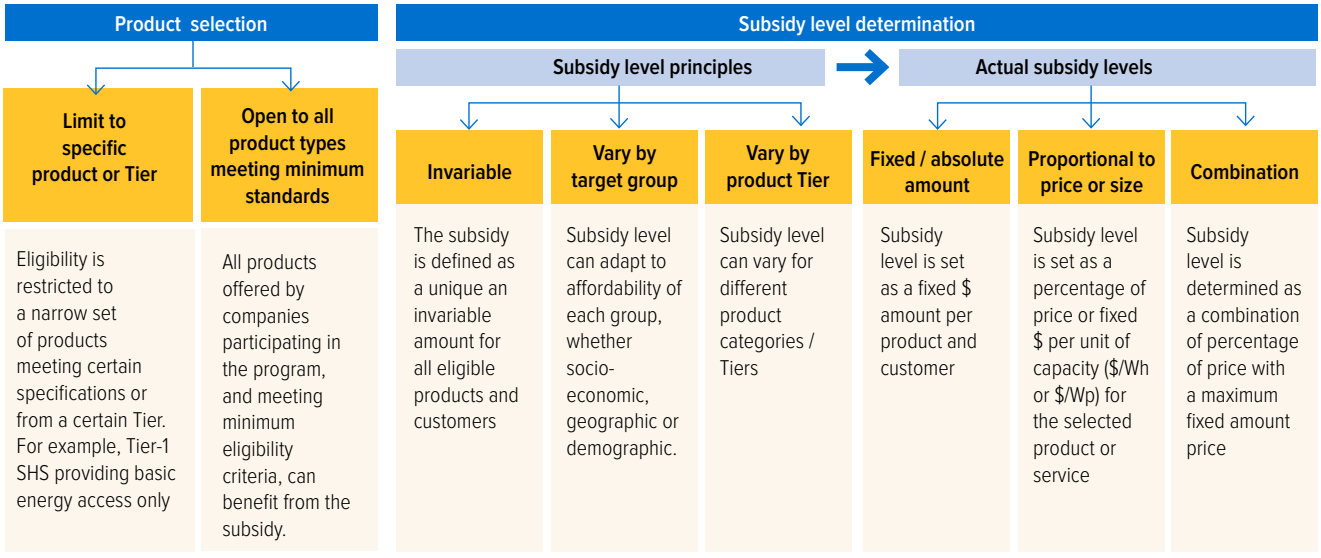
Targeting identifies which individuals qualify for subsidies. While there is not a single perfect design option, designers may opt for one or more of the five options, ranging from less targeted to more targeted.

More targeted approaches enable designers to reach specific target populations more effectively, but require more data, and can be more costly and complex to implement. Assuming the target population is defined as the people that cannot afford clean energy products at unsubsidized prices, the most precise way of targeting subsidies to them is to use data on income or expenditure at the household level (economic targeting). Such was the case of the end-user subsidy for SHS deployed in Rwanda, which leveraged the country's "Ubudehe" categorization of household socio-economic status. However, this data is often unavailable, inaccurate, or outdated. As such, designers may consider other targeting approaches, such as using demographic characteristics or geographic location, provided such characteristics have some correlation to income. Programs may also refine their targeting approach by leveraging additional data sources that can complement one of the targeting approaches, such as mobile money usage or satellite imagery, or by using data from other programs or organizations serving similar beneficiaries.

Alternatively, designers may opt for less targeted approaches, particularly where the majority of the population is facing affordability constraints. For example, the end-user subsidy for SHS introduced in Nigeria was untargeted, with the main objective of addressing widespread affordability issues. Self-targeted subsidies refer to subsidies accessible to all but designed to attract the voluntary participation of the target population. Limiting the subsidy to specific product tiers is one technique for self-targeting.

The decision on the targeting approach will depend on the objective of the subsidy, on context factors, as well as on trade-offs related to complexity of implementation, cost, scalability, and market distortion and political risks. More targeted approaches are suitable when the target population is a relatively small portion of the total population, who need to be accurately identified. Accurate targeting will help minimize the leakage of subsidies to people that do not need them, as well as mitigate risks of market distortion or political challenges. On the other hand, targeted approaches can be costly and complex to implement, requiring extensive monitoring and verification mechanisms. Such complexity may also affect companies participating in the subsidy program (who may need to develop mechanisms to make sure they sell subsidized products only to eligible individuals), and end-users (who may need to fulfill more burdensome administrative requirements to demonstrate eligibility). Untargeted (or self-targeted) subsidies have the potential to reach a broader population, they are easier and faster to roll out, but they also carry the risk of allocating support to people who do not need it, leading to resource inefficiencies and market distortion.

Subsidy determination



Subsidy determination involves selecting the products and services eligible for a subsidy and determining the subsidy amount for each end-user. When determining the subsidy amount, it is important for designers to set a reasonably simple subsidy structure that will be easy to communicate, understand, and manage.

An important design choice is to determine which products and services are eligible for the subsidy. Designers can restrict eligibility to specific products or tiers, or open eligibility to all products meeting minimum specifications, quality standards, and after-sales service.[11] These choices are driven by what the target population needs, what products are available in the market, and what type of products and services the program wants to incentivize.

Designers also need to define the subsidy level, which is the process of defining how much subsidy each beneficiary will receive. This choice depends on the price of the product and the amount the beneficiary can pay. The difference between the two represents the affordability gap. Ideally, the subsidy level matches the affordability gap. However, this can be difficult in practice, as affordability will vary by beneficiary and product. Therefore, designers need to decide on a structure to set the subsidy level, which can be based on a fixed amount, a percentage of the price, or a combination of both methods. As an alternative to program designers setting the subsidy level, this could be done by companies through a reverse-auction process.

Overall, it is important to set the subsidy levels not too low and not too high to ensure the most efficient and effective use of limited resources. Over-subsidizing products can lead to market distortion and depletion of program resources. On the other hand, setting a subsidy too low may result in limited adoption, as beneficiaries may still be unable to pay. Beyond these subsidy level options, designers can further differentiate the subsidy level, for example, by varying the subsidy level by product tiers or by target group.

The decision on eligible products and subsidy levels is typically linked to the targeting approach. As a general guideline, subsidy levels are higher for more targeted subsidies, and lower for less targeted subsidies. When subsidies are targeted to the poorest, they need to be high to fill a wider affordability gap. When subsidies are untargeted, they are usually kept lower, recognizing that a significant portion of subsidies will benefit people who do not need them. Making subsidies eligible for only certain product categories (e.g., basic features, entry level) better suited to the poor is an alternative to keeping untargeted subsidies pro-poor (referred to as 'self-targeting' under targeting approaches).

11 Energy Sector Management Assistance Program, Multi-Tier Framework

Delivery

Subsidy delivery

Delivery channel

Through companies

Subsidy amount is given to the participating company, which in turn sells the product at a discounted price to eligible consumers.

Direct to beneficiaries

Subsidy amount is given to eligible beneficiaries through either vouchers or cash transfers (conditional or unconditional).

- Cash transfers (conditional or unconditional)
- Vouchers (paper or digital)

Company selection

Open to all companies meeting minimum criteria

All companies are eligible for participation provided they meet minimum criteria on quality, after-sales service, and environmental and social safeguards

Restrict through competitive process

Designers issue a competitive call for proposals and select a limited number of companies that are best placed to deliver the subsidy (e.g., that can deliver at scale)

A well-designed subsidy delivery mechanism aims to promote transparency and accountability, encourage stakeholder participation, and maximize outcomes for end-users. Designers need to balance ease of access, robustness of approach, and cost-effectiveness when selecting an approach across the five delivery components: 1) delivery channel, 2) company selection, 3) subsidy disbursement, 4) fund management, and 5) claim management.

Subsidies can be delivered directly to beneficiaries or through a company. The choice of approach will depend on factors such as the size of the target population and the targeting approach, availability of quality products, the market maturity and structure, and beneficiary characteristics. Delivery through companies can be simpler for the government and has lower administrative costs, since subsidies are provided in bulk. It is usually much easier and cheaper to channel a subsidy to a small number of companies rather than channeling a cash transfer, or a voucher, to potentially tens or hundreds of thousands of households. Because of these advantages, delivery through companies is the most widely used approach, often in the form of results-based financing (RBF). **A clear challenge with delivering through companies is that beneficiaries may not be aware that the prices are subsidized or carry a temporary discount.** However, direct delivery to end users may work well when the target population is more narrowly defined and relatively small, and allows for direct communication, better data collection on end users, and opens an opportunity to provide additional support if needed. For example, in some situations such as refugee camps, mechanisms may already be in place to distribute cash or vouchers, making this approach preferable.

Company selection is usually done either through an open call to all companies meeting certain minimum eligibility requirements or through a competitive process aimed at selecting only a few companies. The most appropriate approach depends on the program goals, targeting approach and size of the target population, maturity of the market, and product selection. Opening participation to all companies is effective for growing local markets and encouraging competition, which helps keep prices low. On the other hand, designers may want to restrict participation to a limited number of companies when the target population is relatively small (e.g., if targeting remote areas where high costs would make it difficult for multiple companies in competition to profitably serve them), or when they want to minimize transaction costs by working with only a few firms that can achieve economies of scale.

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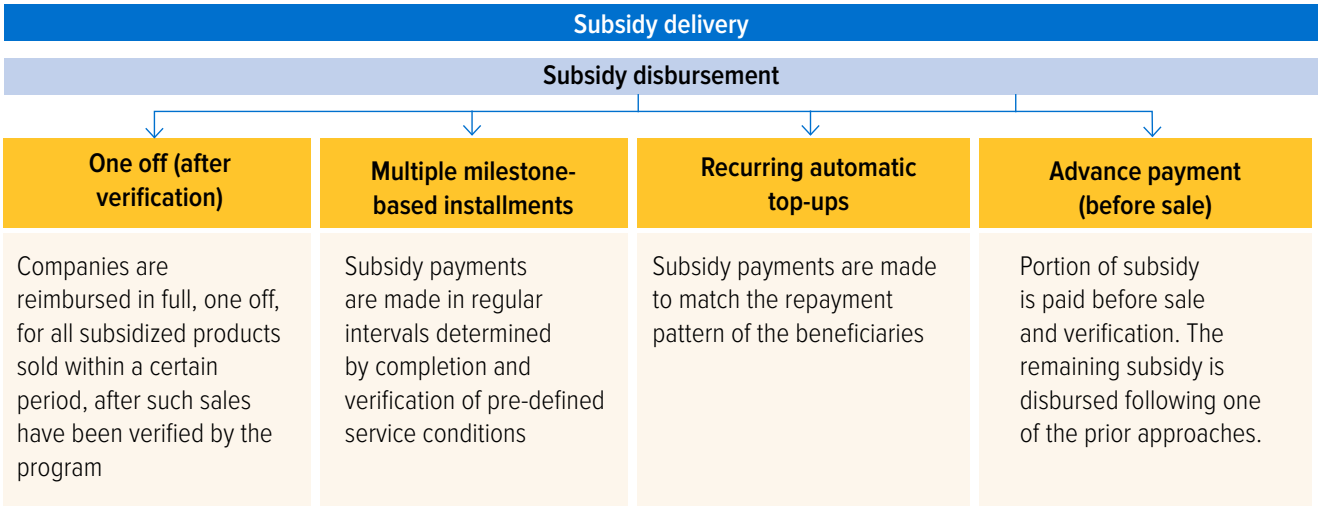
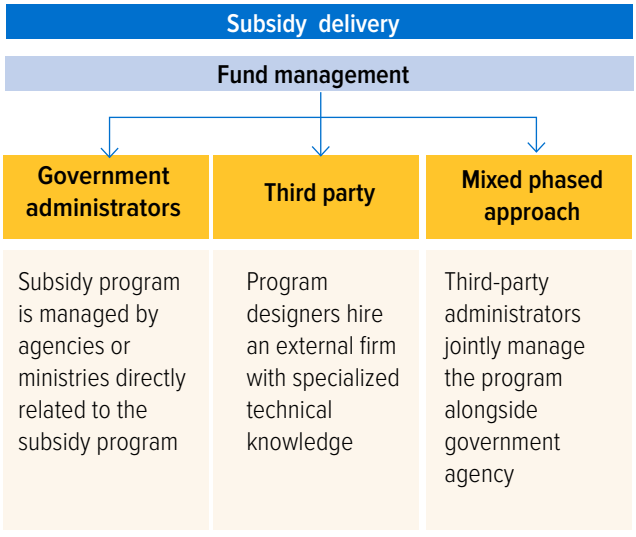


When working with companies to deliver subsidies, there are various approaches for disbursement, which guide the payment schedule (or cadence) of subsidies. Selecting the disbursement approach depends on the mode of sale of the subsidized products (e.g., cash, credit, leasing, rental, or service fees), the level of need to incentivize companies to provide after-sales services, and the operational capacity of the participating companies. A one-off payment approach minimizes both transaction costs and administration. Disbursement through multiple payments allows implementors to ensure that companies provide after-sales services to beneficiaries. Recurring top ups are a suitable method for PAYGo payments and for monitoring companies' after-sales services. Finally, providing some advance payment may improve cashflows for companies to purchase stock in advance, when other forms of finance are limited.

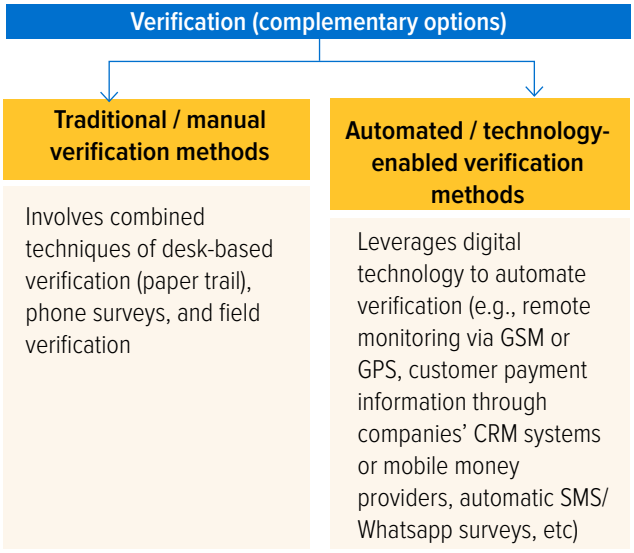


Fund management can be done by government agencies, third-party administrators, or a combination of both. Strong administration structures consist of defined roles and responsibilities for the players involved in the implementation and clear processes and procedures for claiming and disbursing funds. Deciding whether to involve a government agency is often dependent on whether the relevant government agency has adequate institutional capacity and infrastructure to manage the subsidy program. Other approaches designers may opt for include engaging a third-party administrator or taking a mixed approach that involves a third-party working alongside the relevant government agency. Third-party administrators can often bring best practices that allow for efficient program delivery while building local capacity, but this can also lead to increased administrative costs. Regardless of the approach adopted, it is advisable to engage independent auditors to review the management of funds periodically.

Claim management involves coordinating with the participating companies to submit information about the sale of a product. A claim form is typically submitted electronically, by email, or uploading it onto an online IT platform. It is important for program designers to keep the claim management procedure simple, set realistic timelines, and document all requirements for companies to submit claims.

Verification

The verification process allows to confirm that subsidies were used as planned (i.e., that products claimed are real, and that they were sold at the agreed subsidized price, to eligible end users). Verification in EUS programs informs the subsidy disbursement.

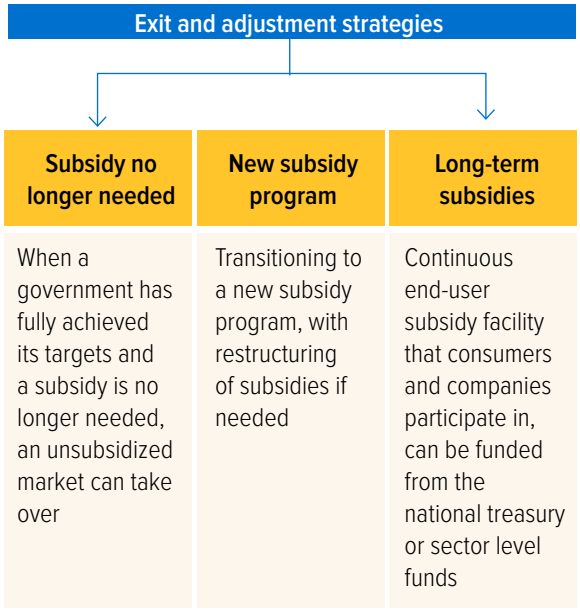


There are multiple options and tools to carry out verification, ranging from more traditional or manual forms of verification to more automated verification leveraging data and technology. Verification is typically done by independent verification agents (IVAs). The more traditional or manual approach typically involves the IVA investigating companies' subsidy claims through documentation checks and conducting a combination of phone and field surveys of a sample of customers. The automated verification refers to leveraging data and technology, such as using information on the use of products (if they are equipped with remote-monitoring technology) and customer payment information drawn from companies' customer relation management (CRM) systems or mobile money operators (if such payments are primarily done through mobile money). Manual verification can be used across all types of products and regions as it does not require any form of remote connectivity. However, manual verification processes are labor-intensive, costly, and more prone to human error. Automated technology-enabled verification can provide quick results and lower transaction costs. But it may not work in all situations today, for example, projects delivered in remote areas where connectivity is an issue and projects involving lower-tier products that are not equipped with remote monitoring technologies. Often, a system needs to be tailored to each program's operations and unique needs, and this comes at a high cost that only makes financial sense for programs of a large scale.

There is a trend for subsidy programs to integrate automated verification features where this is possible, to improve the speed and accuracy of the verification process. Where possible, program designers should try to use technology as much as possible but leverage manual methods as a complement.

Exit and adjustment strategies

A program-level exit strategy addresses what the next step is once the specific program comes to an end. It is critical to define this next step from the program's start to ensure program objectives, timing, and funding are aligned with what will follow.



When a government has fully achieved its targets, and a subsidy is no longer needed, a non-subsidized market can take over. In this scenario, the exit strategy should ensure program goals are met and that there is a successful transition to the non-subsidized market for products or services after a subsidy is withdrawn. Market monitoring is critical to understand changes in market dynamics that may impact the subsidy scheme and to identify when subsidies are no longer needed.

The need for end-user subsidies will, at some level, continue until market developments (such as economies of scale, technology advances driving cost reduction, and economic development) reduce the affordability gap to the point where access is achievable on a purely commercial basis. When designing a subsidy, it is important to consider what recurring subsidies, if any, may be needed to sustain universal energy access. Where long-term subsidies are envisioned, programs should consider how these can be sustainably funded and operated. This may mean transitioning into new programs, or a long-term facility funded by the government or development partners.

Other funding options may include integration into a social protection program, an energy sector fund operating cross subsidies, or carbon finance.

Based on the identified exit or adjustment strategy, designers also need to consider how to stop subsidies within the specific program. This can either be outright or through a gradual phase-out process, for example, by reducing the subsidy level over time or incrementally narrowing the target group. Ideally, the exit strategy is thought through from the program's start and actively communicated throughout implementation to both households and participating companies.

Communications and Feedback

Communications involve developing a plan to guide stakeholder interactions before and during program implementation. Feedback refers to the monitorting and evaluation of the program's results and impacts, used for learning and adaptation of the program's design as needed.

The framing of the subsidy is important to set the right expectations for all stakeholders involved. Key stakeholders include end users, participating companies, and government entities in the program areas. Communication ought to be tailored to suit the context of intended audiences with the goal of achieving transparency. It is very important to ensure that intended beneficiaries are well informed about the subsidy, with campaigns tailored to them, on the right channels and in the culturally appropriate media. Beyond communication plans for intended beneficiaries, it may be important to develop clear messaging for non-target populations to help them understand why they are excluded.

Designers must continuously monitor the program's performance against its set goals, remain aware of current market contexts and dynamics, and create a framework for program adaptation. Creating feedback loops, periodical program reviews and subsidy redesign when necessary is crucial for subsidy programs to remain successful over time. Subsidies may need revision if uptake is too low or too high. Macroeconomic factors like currency fluctuations, inflation, and global supply chain costs can significantly influence program implementation. In addition, it is helpful to continuously engage end-users, companies, governments, and development partners through channels such as round tables and one-on-one check-ins to gather feedback on how the program can improve. This may include changes in the targeting approach, increasing or decreasing subsidy levels, engaging additional companies, streamlining procedures, etc. For a subsidy to remain effective and efficient, it needs to be able to adapt.

A call to action

As we draw closer to 2030, urgent action is required to ensure the most vulnerable populations are not left behind in the journey to energy access.

End-user subsidies are an essential instrument to close the affordability gap. More well-designed EUS, tailored to varying market contexts, are needed to address the affordability gap. Governments, development partners, and the private sector must come together to pool resources and leverage knowledge to scale these programs and ensure no household is left behind. This toolkit provides guidance on the design of responsible end-user subsidies, building on lessons learned in recent EUS programs. It also provides examples to illustrate how the design framework for EUS programs can be used in practice.

01. Introduction

This report targets stakeholders active in the energy sector, such as governments, development partners, companies, and industry experts. The report's primary objective is to serve as a toolkit, offering insights into the design and implementation of end-user subsidy programs for off-grid solar and clean cooking solutions. The document is centered around a design framework that has been developed based on learnings from end-user subsidy (EUS) programs to date and uses examples and case studies where relevant. The toolkit is not meant to be prescriptive; it is designed to provide the design options available to support program designers.

1.1 Role of decentralized energy in universal energy access

Off-grid solar (OGS) and clean cooking solutions (collectively clean energy solutions) have already played a significant role in accelerating global energy access in line with SDG 7. Between 2010 and 2022, OGS solutions (Tier 1 and above) provided energy access to 493 million people, and 700 million people accessed clean cooking solutions (Tier 3 and above).[12,13] Traditionally, governments have provided access to electricity via the national grid. However, grid connections are predominantly found in urban and peri-urban areas, and grid extension is often a costly solution for remote and sparsely populated regions.[14] Decentralized systems such as OGS are, therefore, essential tools for providing first-time access to electricity, and they can also serve as backups for unreliable grid electricity. Based on geospatial least-cost analysis, OGS is expected to account for 41 percent of all new global connections by 2030.[15] Meanwhile, clean cooking stoves and clean fuels reduce dependency on biomass such as firewood and charcoal. In line with SDG 7, improved cookstove solutions (ICS) increase access to clean energy and decrease fuel requirements by 20 to 75 percent, reducing harmful smoke and emissions. Higher-tier clean cooking technologies provide a large decrease in hazardous pollutants and deliver significant health benefits.[16]

Progress in expanding energy access has slowed down in recent years, and the world is at serious risk of not achieving universal energy access by 2030. As of 2022, an estimated 760 million people globally lack access to electricity, while 2.3 billion people do not have access to clean cooking solutions[17]. Affordability, impacted by inflation and local currency depreciation in several key markets, excludes people from access to clean energy solutions. **Under current projections, by 2030, there will be approximately 660 million people without access to electricity and 1.8 billion people without access to clean cooking, mostly in Sub-Saharan Africa.[18] To reverse this trend, households must be reached at an accelerated rate.**

Progress in expanding energy access has slowed down in recent years, and the world is at serious risk of not achieving universal energy access by 2030. As of 2022, **an estimated 760 million people globally lack access to electricity, while 2.3 billion people do not have access to clean cooking solutions.**

12 IEA, IRENA, UNSD, World Bank, WHO, 2023 Tracking SDG 7: The Energy Access Report,

13 International Energy Agency 2023, A Vision for Clean Cooking Access for All.

14 Africa Clean Energy (ACE) Technical Assistance Facility (TAF) and Open Capita 2020, Demand-Side Subsidies in Off-Grid Solar: A tool for achieving universal energy access and sustainable markets.

15 Lighting Global/ESMAP, GOGLA, Efficiency For Access, Open Capital Advisors 2022, Off- Grid Solar Market Trends Reports 2022: State of the Sector. Washington, DC: World Bank.

16 International Energy Agency 2023, A Vision for Clean Cooking Access for All.

17 International Energy Agency, 2023. SDG7: Data and Projections.

18 International Energy Agency, 2023. SDG7: Data and Projections. Projections under Stated Policies Scenario.

Under current projections, by 2030, there will be **approximately 660 million people without access to electricity and 1.8 billion people without access to clean cooking, mostly in Sub-Saharan Africa.** To reverse this trend, households must be reached at an accelerated rate.

1.2 Challenges and interventions for closing the energy access gap

The majority of people without energy access live in underdeveloped markets. For OGS solutions, over 80 percent of the unserved today are in markets that may be categorized as "nascent" and "emerging," as defined in the Off-Grid Solar Market Trends Report (MTR) 2022.[19] Most of these markets are in Sub-Saharan Africa, which accounts for 77 percent of the electricity access gap. In addition, around half of unconnected households live in fragile and conflict-affected countries.[20] For clean cooking solutions, the gap also occurs more strongly in challenging markets. This is illustrated by 29 countries in Sub-Saharan Africa with access to clean cooking below 20 percent.[21]

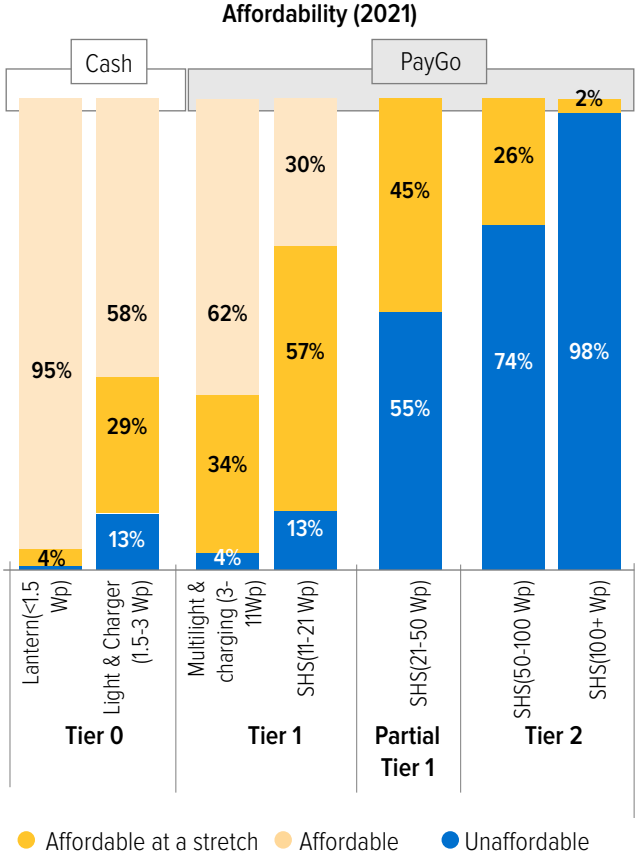
Populations across these markets remain unserved for one of two reasons[22]:

1. The "**availability or access gap"** refers to the situation where individuals have no practical ways of obtaining OGS or clean cooking products despite some having the ability and willingness to pay. These individuals are usually in remote and hard-to-reach areas where the market for decentralized clean energy solutions has not taken off. This may be due to remoteness, lack of infrastructure, low population density, and perceived affordability issues, making some markets not commercially viable for companies. Some individuals may also lack access due to experiencing different forms of marginalization, for example, due to gender and disabilities.

2. The **"affordability gap"** refers to the situation of individuals who are unable to afford clean energy products, regardless of whether or not they have access to purchase them. Affordability is a factor of both low consumer ability to pay, especially among the most vulnerable households, and high product prices coupled with the lack of consumer financing options.

Zooming in on the affordability challenge, even assuming universal availability, a significant portion of the population would not be able to afford clean energy products. The uptake of the PAYGo business model, which allows customers to pay with an upfront down payment and installments, has been crucial in reducing the affordability gap, but a significant gap remains. For illustration (see Figure 1 below), only 62 percent of unelectrified households could afford a multi-light and mobile charging system providing basic Tier-1 access to electricity, and only 30 percent could afford a SHS under current prices and over typical PAYGo repayment periods. Higher-tier products are unaffordable for most unelectrified households.

Figure 1: Affordability of off-grid solar technologies for the bottom of the pyramid[23]



Note: graph shows the percentage of the unelectrified households that can afford different off-grid solar products based on their income and market prices (cash prices for Tier-0 products, and PAYGo prices for products of tier-1 and above). For PAYGo products, 'affordable' is defined as a household spending up to 5%of monthly income on PAYGo repayments. Affordable at a stretch as spending up to 10% of monthly household income.

19 Lighting Global/ESMAP, GOGLA, Efficiency For Access, Open Capital Advisors (2022), Off- Grid Solar Market Trends Reports 2022: Outlook. Washington, DC: World Bank.

20 IEA (2021), Tracking SDG 7: The Energy Progress Report 2021.

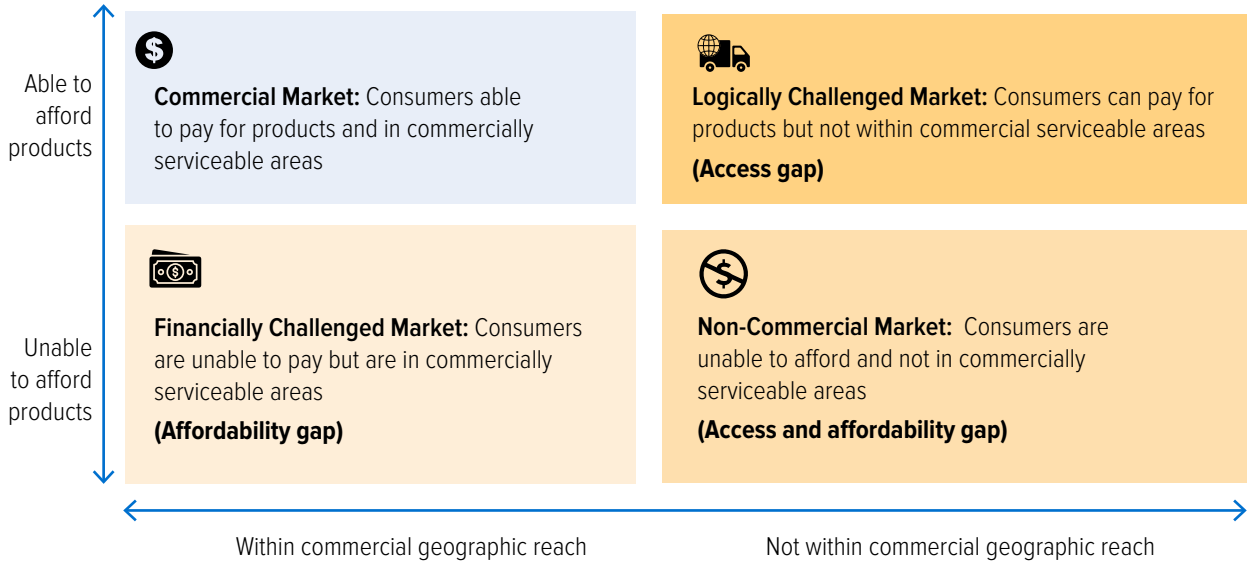
21 International Energy Agency 2023, A Vision for Clean Cooking Access for All.

22 Africa Clean Energy (ACE) Technical Assistance Facility (TAF) and Open Capital 2020, Demand-Side Subsidies in Off-Grid Solar: A tool for achieving universal energy access and sustainable markets.

23 Lighting Global/ESMAP, GOGLA, Efficiency For Access, Open Capital Advisors 2022, Off- Grid Solar Market Trends Reports 2022: State of the Sector. Washington, DC: World Bank. The methodology for this analysis is presented in detail in Annex 4 of the Market Trends report.

Considering the access and affordability gaps, the unserved population can be divided into four segments (see Figure 2). Even in commercial markets (top left segment), there will be people without access to energy, but these can be served by the market. Market-building interventions, including supply-side, demand-side, and enabling environment interventions, are needed for the other three segments to help consumers and companies alike.

Figure 2: Energy access market types with a focus on the access and affordability gaps[24]



Governments and development partners have a range of instruments available to address these gaps. Supply-side instruments aim to incentivize companies to serve more people in a particular market, thus addressing the access gap. These typically take the form of financial incentives for companies to enter a market or expand their consumer base, such as grants, results-based financing, credit lines, and risk-sharing instruments. Demand-side instruments are designed to support the consumer and are often aimed at addressing the affordability gap. These may include end-user subsidies, concessional consumer financing, and public procurement of energy access solutions on behalf of end-users.[25] In addition to these financing mechanisms, governments may further enable the market by providing an enabling environment (adopting favorable policies such as tax exemptions or setting up national energy agencies), raising consumer awareness, and building infrastructure (for example, roads and connectivity), among other solutions.

A holistic approach, leveraging multiple instruments, is typically needed to overcome the affordability gap. Supply-side instruments can indirectly bring down market prices by supporting technology and business model innovation, fostering competition, and lowering costs through scaling. They could provide support or incentives to companies that sell products on a PAYGo basis. Alternative models may also be incentivized, such as 'Energy-as-a-Service' (EaaS), in which the company maintains ownership of the system, which helps reduce the price levels for consumers and enhances the quality of the system and service levels provided. Increased consumer awareness may further increase customers' willingness to pay. In addition to other demand-side instruments, end-user subsidies may be used to further bridge the affordability gap by directly reducing the price of a product.

24 GOGLA 2018, Providing Energy Access through Off-Grid Solar: Guidance for Governments.

25 Energy Sector Management Assistance Program (ESMAP) 2022. Designing Public Funding Mechanisms in the Off-Grid Solar Sector.

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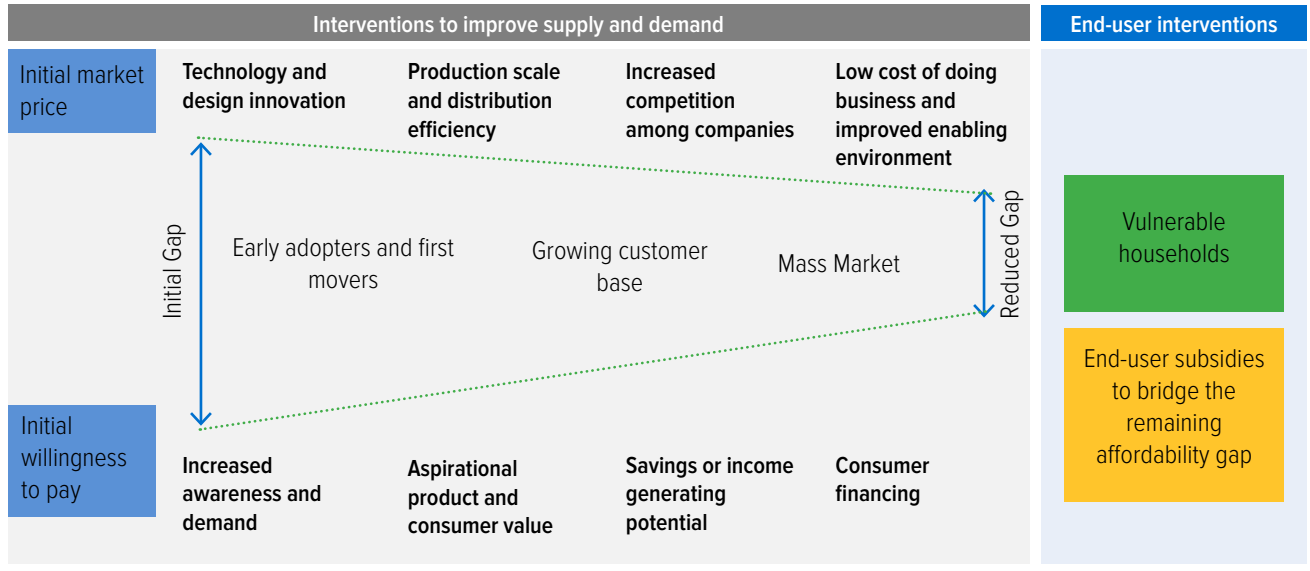
When both supply-side and demand-side instruments are needed, they can be deployed sequentially or in parallel, depending on the needs of the market. In an ideal scenario, an enabling environment is first developed, followed by supply-side interventions to address the accessibility of products and reduce costs (see Figure 3 below), with EUS saved as a last option to bridge the remaining affordability gap. This ensures the efficient use of public funds and reduces the risk of market distortion.[26] With only six years left to achieve SDG 7, some countries and stakeholders are thinking through how to responsibly implement interventions in parallel. Several subsidy projects cited in this report are implementing supply-side interventions coupled with end-user subsidies; such as the Renewable Energy Fund (REF) in Rwanda, the Output-Based Fund for SHS under the Nigeria Electrification Project (NEP), the Electricity Access Scale-up Project (EASP) in Uganda, and the Ngwee Ngwee Ngwee Fund under the Malawi Electricity Access Project (MEAP). Using these and other examples, this toolkit includes specific guidance to assess in what cases both supply-side and end-user subsidies are needed in simultaneously, and how these interventions can be designed to effectively complement each other while avoiding over-subsidization.

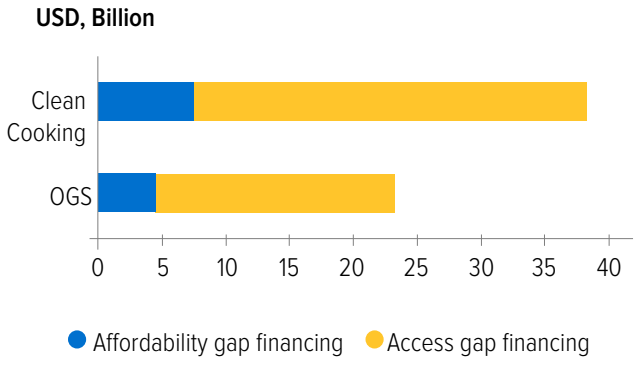
Figure 3: Interventions to close the affordability gap



26 Energy Sector Management Assistance Program (ESMAP) 2022. Designing Public Funding Mechanisms in the Off-Grid Solar Sector.

Across instruments, significant funding will be required to address the access and affordability gaps and ensure that hundreds of millions of people, especially in Africa, are not left behind. Over $60 billion is required for OGS and clean cooking solutions between now and 2030 to reach SDG 7, of which $12 billion is needed to address the affordability gap alone.[27] Approximately 90 percent of this funding is required in emerging and nascent markets, especially in fragile and conflict-affected regions.[28]

Figure 4: Total funding required to provide universal access to energy by 2030[29,30,]



1.3 End-user subsidies as a solution to close the affordability gap

End-user subsidies are an essential instrument to close the affordability gap. End-user subsidies bridge the affordability gap by directly reducing the price of clean energy products below commercial rates for eligible customers. For OGS, end-user subsidies can help drive electricity access among the 760 million unserved people, 280 million of whom cannot afford a Tier 1 system even on PAYGo.[31] EUS are an effective tool to support the segment of the population that simply cannot afford these products, and they have proven to drive significant impact. A notable example is Rwanda's *REF Window 5*, which has deployed targeted subsidies for SHS reaching 330,000 households (more than 10 percent of the population) otherwise unable to afford those products. In the case of Nigeria's NEP, the introduction of an end-user subsidy for SHS was critical to accelerate growth in an emerging market despite widespread affordability challenges, realizing over one million SHS sales within one year. Both case studies are presented in detail in this toolkit[32], and used to illustrate subsidy design decisions and trade-offs.

End-user subsidies for OGS and clean cooking products have been implemented at a greater scale in recent years. Since 2017, there has been an acceleration in the development of programs providing subsidies for off-grid solar and clean cooking devices, the majority of which are in Sub-Saharan Africa (see Figure 5 below for select EUS programs). While the reach of these programs has varied across markets, development partners and governments increasingly recognize the potential for EUS to work alongside other supply- and demand-side initiatives to ensure no one is left behind.[33]

End-user subsidies **bridge the affordability gap** by directly reducing the price of clean energy products below commercial rates.

27 OCA Analysis. The financing gap related to affordability for OGS is taken from [Lighting Global/ESMAP, GOGLA, Efficiency For Access, Open Capital Advisors (2022), Off- Grid Solar Market Trends Reports 2022: Outlook. Washington, DC: World Bank report] and is 20% of the total financing gap. We applied the same estimate (20%) for clean cooking using the overall financing need from [International Energy Agency 2023, A Vision for Clean Cooking Access for All].

28 Lighting Global/ESMAP, GOGLA, Efficiency For Access, Open Capital Advisors (2022), Off- Grid Solar Market Trends Reports 2022: Outlook. Washington, DC: World Bank.

29 Lighting Global/ESMAP, GOGLA, Efficiency For Access, Open Capital Advisors 2022, Off- Grid Solar Market Trends Reports 2022: Outlook. For OGS, funding needs are estimated on the basis of reaching 1.1 billion people with Tier 1 and above OGS products by 2030. This includes current users, new primary connections, and 'new weak' grid connections. To achieve SDG 7, OGS electrification needs to be complemented with new grid and mini-grid connections.

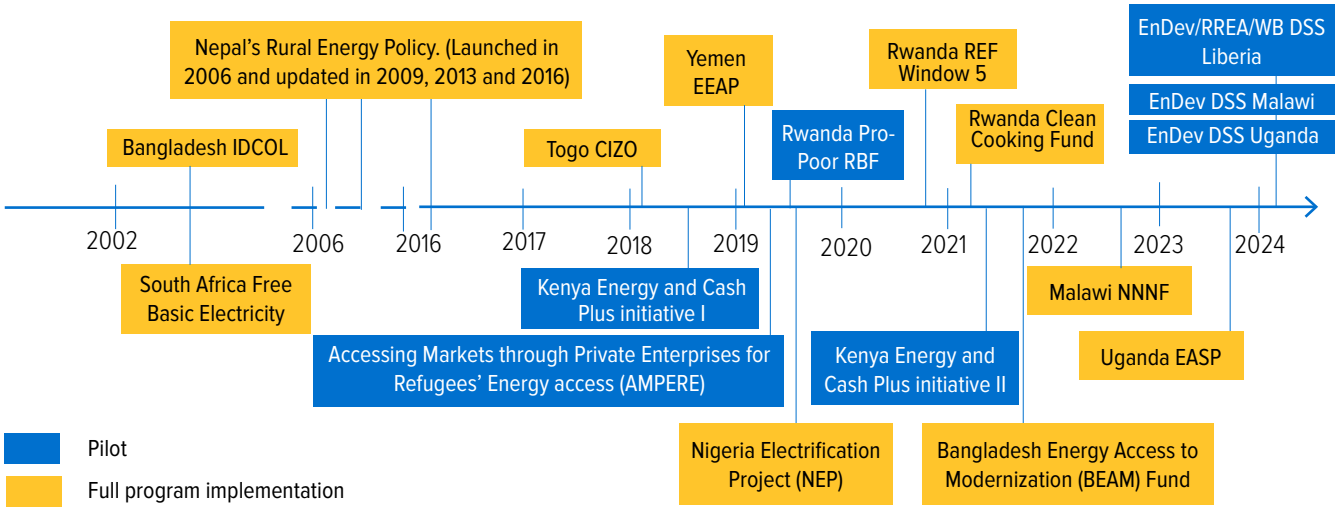
30 International Energy Agency 2023, A Vision for Clean Cooking Access for All

31 Lighting Global/ESMAP, GOGLA, Efficiency For Access, Open Capital Advisors 2022, Off- Grid Solar Market Trends Reports 2022: State of the Sector. Washington, DC: World Bank.

32 Refer to section 3.4 for a detailed case study on Rwanda REF Window 5 and to section 3.5 for a detailed case study on Nigeria's output-based fund for SHS under the Nigeria Electrification Project (NEP).

33 Open Capital Advisors Consultations

Figure 5: Launch dates for selected OGS and clean cooking end-user subsidy programs[34]



1.4 The need to design responsible EUS programs

While end-user subsidies are a critical tool to address affordability, it is important to recognize their potential risks, such as market distortions, political challenges, and issues of fairness and transparency. Given that subsidies directly influence pricing, they may lead to market distortion, whereby supply and demand for energy solutions are negatively affected and hinder the ability of companies to sustainably serve customers in the long run. Some of the issues that can arise are[35]:

- On the demand side: subsidies may affect consumers' value perception of OGS and clean cooking products and services, reducing their willingness to pay unsubsidized prices. Subsidies may also change consumer behaviors, altering preferences for products and services depending on whether they are subsidized or not.

- On the supply side: companies and products that do not participate in the subsidy program will be at a significant disadvantage. Companies intending to enter the market, may see a subsidy program as a market entry barrier if they cannot participate in it. In addition, companies may be tempted to increase their prices ahead of a subsidy program, to increase margins or to compensate for the costs associated with the subsidy management (administrative costs, delays in reimbursements, etc.). **Companies participating may also become reliant on subsidy revenue and find it difficult to operate after subsidies are removed.**

Another important risk associated with subsidies is the **political challenge** of removing them. Many developing countries have decades of experience subsidizing bottled gas for cleaner cooking, for example. When trying to restructure or remove these subsidies, governments have faced significant opposition.[36]

With regards to perceived **fairness and transparency,** subsidies that are targeted to certain populations (and thus exclude others) or provide different subsidy amounts to different population groups may be economically justified but a very sensitive issue from a social perspective. These issues need to be considered in the design and the communication of subsidies.

34 End-user subsidies for LPG, which have been deployed in multiple countries in Latin America and Asia over the last decades, have been excluded from this figure. Refer to limitations of this report in section 2.1.

35 These issues are well documented. For example, issues of price increases or companies struggling to self-sustain once subsidies were withdrawn are reported in IIED's discussion paper Energy for all: Better use of subsidies to achieve impact (chapter 3, demand-side subsidies in Nepal). Similar issues were reported after the subsidy under Nigeria's output-based fund for SHS was removed (case study in section 3.5).

36 World Bank, ESMAP, 2022. Reforming Subsidies for Bottled Gas: Recent Experience in Developing Countries

While the risks of subsidies cannot be fully eliminated, EUS programs can be designed in a responsible way that minimize and mitigate them. While sometimes challenging to implement, if designers are mindful of the risks and 'smart' in mitigating them, then effective EUS programs can have a strong impact and make a major contribution to SDG 7. This toolkit provides guidance on the design of 'responsible' end-user subsidies, i.e. subsidies that are (i) effective in reaching the poor, (ii) efficient in terms of use of limited public resources, and (iii) that minimize market distortion and political challenges. **The tools in the report can be used to target subsidies effectively, set the right subsidy levels, and establish suitable monitoring and evaluation mechanisms to adapt the subsidy design when necessary.**

End-user subsidies are complex and thus may require more capacity to design and implement than other support mechanisms. Designs need to be well informed and frequently adapted to the context. Some concepts may need to be piloted before they can be taken to scale. And linkages with other market-building activities need to be carefully considered. Building capacity and establishing partnerships is essential for subsidy projects to be successful. It is helpful to establish partnerships with government institutions across ministries, departments and agencies (covering energy, financial inclusion, social protection, and digital development), development partners with strong presence on the ground, and financiers such as the World Bank.

It is critical for a feedback mechanism to be embedded in the design of subsidy programs and to have the capacity to adapt the subsidy design when needed. The design of a subsidy program will never be perfect, and learning and adapting through its implementation is critical. Subsidy levels may need to change in response to changes in market dynamics, or the targeting strategy improved if an evaluation reveals that most of the subsidy is being captured by wealthy individuals. Continuous monitoring, regular evaluations, and a framework for the adaptation of the subsidy need to be built into the design. This toolkit also contains recommendations for monitoring, evaluation and adaptive management.

This toolkit also acknowledges the trade-offs when designing end-user subsidies. Very targeted subsidies designed to be most effective in reaching the poor and efficient in their use of limited public resources may become very complex to implement, increasing administrative costs and limiting the speed of rollout and scalability. Depending on the context and subsidy program objectives, effectiveness and efficiency need to be balanced with simplicity and management costs. The toolkit builds on lessons learned from a wide range of EUS programs having considered these trade-offs to make design choices.

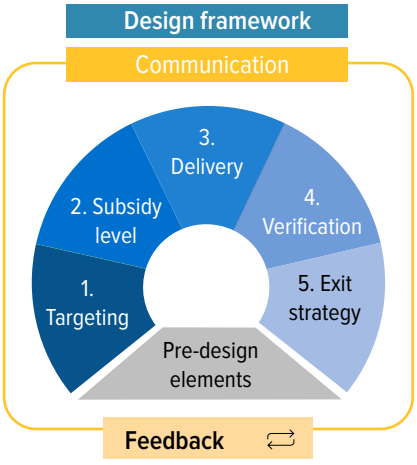
End-user subsidies are a vital tool for achieving SDG 7, which the global community has pledged to do by 2030. EUS programs help overcome one of the key barriers to electrification and clean cooking – **affordability**. The affordability gap is significant and puts hundreds of millions of people, mostly in sub-Saharan Africa, at risk of being left behind. Governments and companies are increasingly deploying EUS programs to bridge this gap. More well-designed EUS programs will be needed to achieve SDG 7.

02. Design framework for responsible end-user subsidies

2.1 Introduction

This design framework consists of pre-design elements and design components. It builds on existing literature on designing EUS programs, the combined experience of End-User Subsidy Lab (EUSL) member organizations[37], and knowledge from other stakeholders currently designing and implementing EUS. The toolkit includes considerations of each of the pre-design elements, design components, and communication, and feedback (see Figure 6 below) that may be used for applying the framework across different markets.

Figure 6: Design framework for EUS programs[38]



This toolkit is primarily focused on subsidies for the purchase of off-grid solar products and clean cookstoves; it is limited in its application to fuel or electricity subsidies. Off-grid solar electrification is making the most progress through the selling of devices to end users (on cash or credit through mechanisms such as Pay-As-You-Go). This toolkit draws primarily from the experience of subsidizing such sales and is therefore most applicable for the design of subsidies for product purchase. The report however acknowledges the importance of emerging Fee-for-Service or Electricity-as-a-Service models, and most of the recommendations in this toolkit are also suitable for these models. They are however not cited as prominently. Similarly, this toolkit is most applicable to subsidies for the purchase of improved and clean cooking devices. Less so for subsidies for fuels, such as liquefied petroleum gas (LPG), or the electricity consumed by electric cooking devices.

2.2 Pre-design elements

The pre-design elements inform the detailed design of an end-user subsidy program. They set important program and market-specific context to support the design of responsible EUS programs. The pre-design elements are grouped into two main categories: conducting market assessments and determining program goals and resources, as depicted below:

Figure 7: Pre-design elements

Market assessment

- Understand the beneficiaries' context
- Evaluate ongoing government initiatives and national electrification plans
- Assess the maturity of the private sector
- Determine the availability of data

Program goals and resources

- Define EUS goals
- Determing funding amount
- Establish the need for and type of pilot necessary
- Establish long-term goals and plans for continuity

37 The End-user Subsidy Lab is integrated by ESMAP/Lighting Global, EnDev, GOGLA and the Clean Cooking Alliance.

38 End-user Subsidy Lab and Open Capital Analysis

2.2.1 Market assessment

A good market assessment is a pre-requisite for the design of a subsidy. It should include both demand-side and supply-side assessments, as well as research on the enabling environment. The market assessment should provide information on (i) how many people can afford what product at what price; (ii) what products, services are available in the market and at what prices; (iii) government and development-partner plans and initiatives for energy access; and (iv) other context factors, such as access to consumer finance and digital infrastructure.

Understand the beneficiaries' context[39]

A key starting point of the program design is ascertaining the access and affordability gaps among the intended beneficiaries. Understanding the current energy landscape involves an assessment of intended beneficiaries' specific needs, preferences, and constraints around energy access. Beyond this, it is important to assess any social, economic, cultural, and environmental factors that drive the affordability gap and may impact the program design. A good understanding of beneficiaries' context enables designers to develop a cost-effective, accurately targeted program that helps minimize risks of market distortion.

Important aspects to cover in the market assessment regarding the beneficiaries' context are:

- **The number of households that could benefit from OGS and clean cooking products,** by providing estimates of market size (existing and potential) and mapping areas that could be economically appropriate. This assessment can be guided by government plans and least-cost electrification analysis.
- **Segmentation of that potential market** from a geographical, demographical, socio-economical and behavioral point of view.
- **Ability and willingness to pay for energy products and services, for each of these segments.** Guidance on methodologies to estimate the ability and willingness to pay is provided in this toolkit in section 2.4.2.
- **Awareness, perception and interest of the potential and current customers of OGS and clean cooking products,** including regarding different product features and quality of such products.
- **Access to consumer finance for OGS and clean cooking products,** whether provided by clean energy companies (through mechanisms such as PAYGo or Energy-as-a-Service) or financial institutions.
- **Factors which may constrain subsidies' reach to target groups,** for example, having an official identification document, a fixed address or a mobile phone. Subsidies can be designed to minimize the impacts of these factors, and also to set realistic expectations of how many are likely to be reached through a subsidy program[40].

For this part of the market assessment, designers may leverage available knowledge in the market and complement this with targeted research. Available sources may include socio-economic censuses, poverty mapping, MTF country-specific surveys where available[41], and other research conducted by the government or development partners. Complementary research may include household surveys for a sample representative of the intended beneficiaries, or other mechanisms to estimate socio-economic indicators described in section 2.4.2.

Market assessments require additional and proactive efforts to reach marginalized populations living in remote areas or settings of fragility, conflict and violence (FCV). These are populations with extremely low affordability, who are likely to face multiple challenges to benefit from a subsidy program. For example, in refugee settings people may not have a permanent address, have limited access to government ID, limited access to products and services, and further challenges. In Mercy Corps' AMPERE program in Uganda[42], substantial market research was conducted prior to the design of a subsidy, to understand not only affordability barriers but all other constraints to accessing clean energy products (such as product appropriateness and availability, consumer awareness, market linkages and last mile distribution infrastructure). The AMPERE case study is described in more detail in section 2.5.1.

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39 WFP 2022, Clean and Modern Energy for Cooking: A Path to Food Security and Sustainable Development.

40 Practical Action, 2023. Can market mechanisms enable energy access for people living in extreme poverty?

41 Multi-Tier Framework (MTF) Surveys

42 AMPERE: Accessing Markets through Private Sector Enterprises for Refugees Energy. The results of their market analysis can be found here.

Understand the maturity of the private sector

Programs should make sure they have a clear understanding of the private sector market within the targeted regions. Program implementors may benefit from understanding which players are active in the country, their products and services, pricing, and their current traction. It is important to leverage the knowledge, capacity, and interests of active and interested companies during program design. This will enable the subsidy program to reach those currently not served by these companies in a responsible manner.

Information to collect on the state of the market includes:

- **Characterization of OGS and clean cooking companies**. This will include the analysis of international and local companies and their market shares, business models, financing strategies, manufacturing and import strategies, etc. As part of this analysis, assess leading international companies present in the region but not in the country, and their interest and capacity to enter the country.
- **Products available in the market,** including quality-verified and non-quality-verified products.
- **Companies' existing distribution channels and geographical coverage,** to understand to what extent clean energy products are available for the population, including in hard-to-reach areas.
- **Cost structure and pricing of OGS and clean cooking products and services,** for sales made on cash, PAYGo, or energy-as-a-service packages.

Understand ongoing government initiatives and national electrification plans

It is important to align the subsidy program with existing government initiatives. The government or other players in the market may be implementing several market-building initiatives to promote the sector's development, such as supply-side financing or adopting favorable policies. An EUS program will be more effective when it complements other existing initiatives in the market.

Subsidy programs are advised to align with national electrification strategies or national electrification plans (NEPs). Governments develop such plans to guide their approach to achieving universal energy access. As of 2017, 77 countries in regions with significant energy access gaps had outlined the role of OGS in their NEPs. Where these plans are available, end-user subsidies need to be designed to feed into these strategies.[43] For example, in the case of Rwanda's Renewable Energy Fund (REF), a subsidy for OGS products was designed specifically for areas identified for off-grid electrification in the National Electrification Plan. The Rwanda example is presented in detail in section 3.4.

In addition to energy-sector initiatives, governments implement various relevant programs across ministries, departments and agencies, such as poverty safety nets, climate vulnerability support, and many others. Energy subsidies could be paired with these types of programs to better complement the support. For example, Kenya's Mwangaza Mashinani Program (MMP), an end-user subsidy scheme targeting the poorest households, was integrated in Kenya's National Safety Net Program, a cash transfer system implemented by the government and supported by various funders and partners. This kind of integration with other government-led activities in the targeted area increases the chances of long-term success.[44]

Understand the availability of data for targeted subsidies

It is important to understand what data is available to inform the EUS program design. Program designers need data to identify the target population and set subsidy levels, facilitate companies to identify eligible customers, and verify sales. Designers may leverage data available from government repositories or related programs. If not available, designers may need to conduct data gathering or consider alternative data approaches, such as using proxy data to assess poverty levels.

Data may be available (or generated) at the household level. Household-level data from censuses or social-protection programs may be useful for economic targeting of subsidies, provided it is regularly updated and comprehensive. Such is the case of Rwanda's Ubudehe program, used for subsidies designed under REF[45].

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43 World Bank 2022, Designing Public Funding Mechanisms in the off-grid Solar Sector

44 End-user Subsidy Lab, Case study: Mwangaza Mashinani Program

45 A detailed case study on Rwanda REF Windows 5 is available in section 3.4.

In Malawi, EnDev used the Unified Beneficiary Registry (UBR) – a government database that classifies households into five income categories – to inform the targeting approach of the EUS pilot.[46]

Where adequate household-level data is not available, geographic and demographic data can be a good alternative. Poverty maps, for example, may have been developed by social protection programs to identify the specific communities in which poor people live. For example, in Nigeria, only 1.6 percent of households are enrolled in the National Social Safety Net Project (NASSP), the country's flagship social protection program, and the most recent census dates back to 2006[47]. To provide up-to-date and granular poverty estimates for Nigeria, a high-resolution poverty map has been constructed on the basis of geo-located household surveys, satellite imagery and other sources of geospatial data[48].

Where no comprehensive social protection systems or population data sources are available, an energy subsidy program has different alternatives for its targeting strategy. These are covered under targeting mechanisms, in section 2.3.

2.2.2 Program goals and resources

Define EUS goals

Setting clear and specific goals complementary to other initiatives within each market is necessary. EUS goals are important as they signal the government's commitment to the program, serve as guiding principles throughout the project, and inform all decisions. These goals may facilitate first-time connections or support the ongoing adoption of OGS or clean cooking solutions. In the case of clean cooking, for instance, facilitating first-time access to liquefied petroleum gas (LPG) requires ensuring that customers have a gas cylinder, an appropriate stove, or a burner. On the other hand, facilitating ongoing consumption involves supporting households to refill LPG at a lower cost.[49]

Examples of subsidy program goals include:

- Providing first-time access to a target population
- Providing higher-tier energy products to a target population
- Providing energy access to a population in a poor or vulnerable context (for example, extreme poverty or refugee setting)

Beyond the primary goal, designers may have secondary goals for their EUS program. Additional goals may include supporting specific technologies, reducing the ongoing costs of energy consumption, increasing gender or other social inclusion criteria, or other considerations.

Determine funding amount

The funds available for the subsidy program depend on government budgets or donor funding. The available funding influences all design components, including which beneficiaries can be targeted, the product selection, the subsidy levels, and how verification is conducted.

Program designers ought to identify funding needs, sources, and potential funders. Each of these elements may be refined when the components are fully designed. However, it is important for program goals to be set and communication with key stakeholders to be done with the available funding in mind to avoid setting the wrong expectations. Programs should avoid running out of money unexpectedly, which can send beneficiaries back into energy poverty, reduce trust in future programs, in government, energy enterprises, and more, thus reducing future program efficacy. If funding is expected to be raised in tranches, programs can be designed in phases.

Establish the need for and type of pilot necessary

A pilot project will be helpful to test the design and inform the full-scale rollout of the subsidy scheme. A pilot helps designers test their design choices and assess the program's impact on the market, both for consumers and companies. A pilot may also help ensure alignment between key stakeholders, such as government and private companies, and allow the refinement of key processes, such as subsidy disbursement and verification. Feedback gathered during

46 EnDev 2023, Demand-side subsidy pilot – Malawi: Concept note. This case study is discussed in more detail in section 3.2.

47 At the time of writing, the 2023 census of Nigeria had not been completed.

48 World Bank blogs, 2021. Using Big Data and machine learning to locate the poor in Nigeria.

49 Sustainable Energy for All (SEforALL) 2020, Energy safety nets: A guide for policy makers

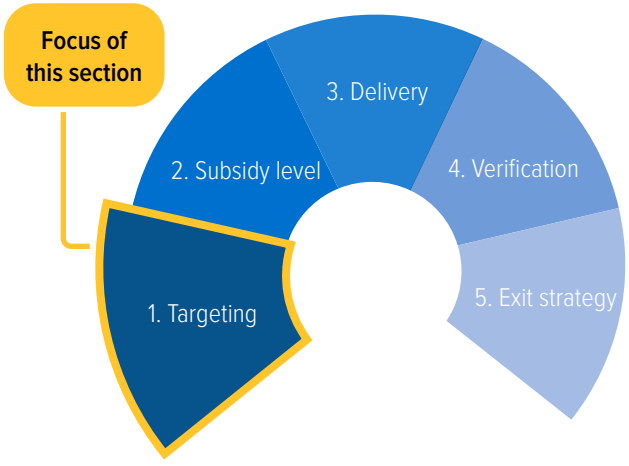
this pilot stage may inform the full-scale project rollout and help convince funders that the program is efficient and responsible in its design. For example, in Rwanda, EnDev piloted the Pro-Poor RBF subsidy scheme[50], which informed a subsequent government-implemented national roll out of the program under the REF[51].

Establish long-term goals and plans for continuity

When introducing complex and risky interventions such as end-user subsidies, it is important to plan beyond a single project. This is key in ensuring the government can ultimately reach its goal, but also in ensuring participating companies know what to expect. A big risk to the market is a situation where a subsidy abruptly stops as there is no adequate plan to bridge subsidy from one project cycle to the next. In the pre-design phase, designers should ask themselves: What can we accomplish now? What would a *transition* to a next phase have to look like? And how can we prepare today to ensure the next phase comes on stream without delay that could cause gaps?

In the pre-design phase, designers should ask themselves: What can we accomplish now? What would a transition to a next phase have to look like? And how can we prepare today to ensure the next phase comes on stream without delay that could cause gaps?

2.3 Eligible Households and Targeting Mechanisms



©GIZ EnDev

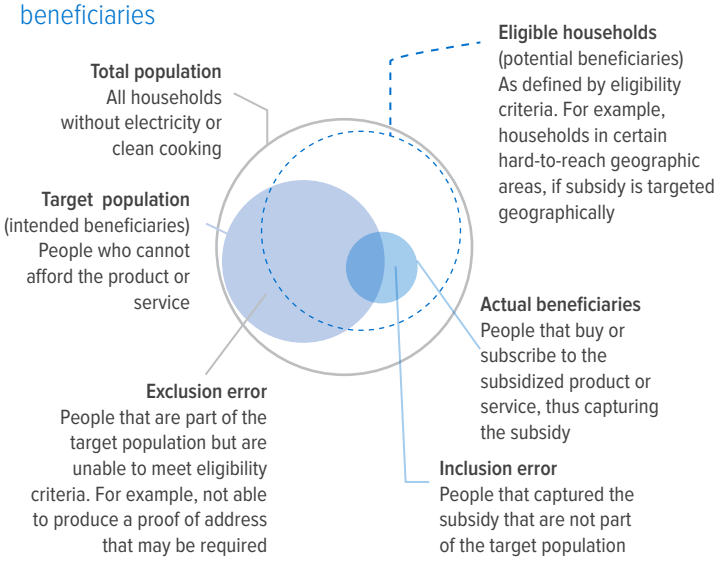
50 End-User Subsidy Lab 2022, Case study: EnDev's Pro-poor Results Based Financing in Rwanda

51 A detailed case study of the REF Window 5 subsidy is available in section 3.4 of this report.

The first step in the design framework is to select the targeting approach. This is the process of identifying which individuals qualify for subsidies. For EUS programs, the target populations are those who cannot otherwise afford the product or service without a subsidy. However, identifying this population can be difficult in practice. Targeting is the process of directing subsidies to specific population groups, by defining criteria that make them eligible. Targeting may be more or less accurate depending on how closely eligible households match the target population (see Figure 8):

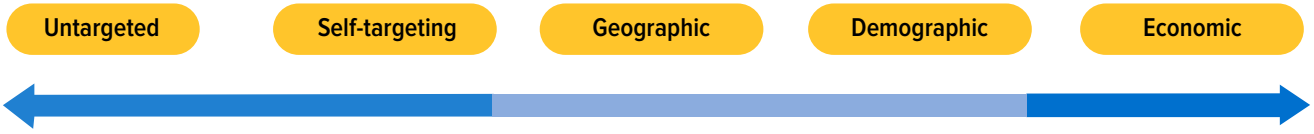
- Targeting is said to be accurate if all or most of the subsidies reach those who need it (i.e., the target population)
- Targeting is not accurate if a significant portion of the subsidies do not reach the target population, or there is a significant loss or leakage of subsidies to other groups. Having people who don't need subsidies but do receive them is also known as inclusion error.
- It is also important to highlight that targeting mechanisms may result in exclusion errors (people who need subsidies but don't receive them), due to not being able to meet eligibility criteria.

Figure 8: Target population, eligible households, and actual beneficiaries



Designers may use one of several targeting approaches (untargeted, self-targeting, geographic targeting, demographic targeting, and economic targeting). These range from **less targeted to more targeted**, as shown in Figure 9.

Figure 9: Illustrative decision options based on the level of targeting[52]



Less targeted

(less precise)

Does not define beneficiaries based on specific data points but rather rely on implicit characteristics (e.g assumed product preference of individuals who are unable to afford) or other assumptions to identify individuals who are unable to afford energy product or services.

More targeted

(more precise)

Utilizes income or expenditure or proxy data with strong correlation to ability to pay to identify individuals who are unable to afford energy product or services.

Untargeted: No specific criteria are required for selecting beneficiaries. As such, anyone can theoretically benefit from the subsidy program.

Self-targeting: The subsidy criteria naturally favor a certain segment of the population that correlates with the intended beneficiaries. For example, a subsidy may be linked to a low-priced energy product popular among the most vulnerable people in a society. If more affluent populations do not widely use the product, they may "self-select" out of the subsidy.

52 Demographic targeting is not always more precise than geographic targeting but depends on the degree of correlation of the geographic or demographic group to the intended beneficiaries

Geographic: Beneficiaries are selected based on their location in a geographic area that program designers believe predominantly consists of the targeted population. This area is defined using an administrative boundary (a district, county, village, or region), a climatic zone, a settlement type, or the distance from regions well-covered by energy solutions.[53]

Demographic: In some cases, the intended beneficiaries may share some demographic characteristics that enable designers to allocate subsidies based on these. The categories typically used are age, civil status, and gender. Female-headed households, family size, veteran status, ethnicity, and refugee status may also be employed, but this list is not exhaustive.[54,55]

Economic: This approach defines the target beneficiaries by income level, occupation, energy expenditure, or energy consumption levels. It is often considered the method that most closely correlates with affordability.[56]

The more targeted an approach is, the more accurately designers can use it to identify the program's target population (that is, those who cannot afford an energy product without subsidies). The most precise way of targeting is to use data on income or expenditure amount at the household level. In practice, most EUS programs have taken a geographic approach to targeting. Lack of household-level expenditure data has rendered more targeted approaches unfeasible. Geographic targeting is sometimes combined with self-selection through higher subsidies for smaller products, and sometimes combined with untargeted tax exemptions.

There is not one perfect targeting approach. Designers may explore what works best, considering the market context, available resources, administrative costs, and the program objectives. In addition, designers are invited to consider each approach's feasibility, accuracy, and cost-effectiveness. Targeting can also exclude some of the very people intended as targets, because they lack the means (e.g., documentation) needed to demonstrate eligibility or because demonstrating eligibility carries costs (monetary, time).

It is also possible to use more than one approach. For instance, designers may use geographic targeting to define the administrative region where the subsidy will be provided and then leverage economic targeting through proxy data (for example, household consumption) to identify eligible households within that region.

Table 1: Questions to help determine the targeting approach

What proportion of the market is made up of the target population?

- The target population for end-user subsidy programs are households who might remain unelectrified or without access to clean cooking without a subsidy.
- A low proportion of the target population in a given country or region favors a more targeted approach, whereas a widespread affordability gap will favor less targeted approaches.

What data is available and what is its quality and relevance? What mechanisms can be leveraged to complement this data?

- Designers may retrieve data through national social registries, online demographic data tools, or similar databases. In the absence of this data, designers may leverage data from other programs or mechanisms (e.g., social safety program).
- In some cases, designers may choose to collect new data for a program, which can be a lengthy and costly process. Designers need to weigh the trade-offs of gathering this information as they determine the most appropriate targeting approach.
- When data needed for targeting is not available or unfeasible to generate, designers may opt for less targeted mechanisms.

What limitations does the target population have to access targeted subsidies?

- More targeted subsidies may require individuals to produce documentation (e.g., ID, proof of permanent address, proof of refugee status or female-headed household) to prove eligibility. If a large portion of the target population cannot do this, then less targeted approaches may be warranted.

53 Sustainable Energy for All (SEforALL), 2020, Energy safety nets: A guide for policymakers

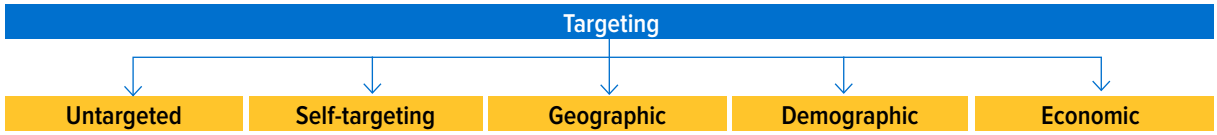
54 Sustainable Energy for All (SEforALL), 2020, Energy safety nets: A guide for policymakers

55 World Bank, 2022, Full Report: A New Look at Old Dilemmas: Revisiting Targeting in Social Assistance

56 Sustainable Energy for All (SEforALL), 2020, Energy safety nets: A guide for policymakers

The diagram in figure Figure 10 provides a summary of the context factors or considerations, pros and cons, of the different targeting mechanisms. Each of these is explained in more detail and with examples in the following sub-sections.

Figure 10: Summary of targeting mechanisms



	Untargeted	Self-targeting	Geographic	Demographic	Economic
Description	Subsidies are open to all, and eligible individuals are not restricted based on unique identifiers such as income levels	Subsidy is accessible to all, but designed to attract the target population (applying it to products they prefer)	Leverages existing borders e.g., regions, or districts, where the population face similar affordability challenges	Leverages a range of demographic data (e.g., age, gender, ethnic group, etc.) to target end users	Targets households or individuals whose income levels cannot afford OGS or clean cooking products
Considerations	• Target population is a large portion of the population (e.g., low electrification rates, widespread poverty) • No robust data sets	• Same as untargeted • Subsidy program intended to be pro-poor	• Marked energy access and poverty differences across geographies • Existing poverty maps or data to construct them	• Marked energy access and poverty differences across demographic groups • Poverty and access data across different demographic groups	• Target population is a small portion of the population (e.g., high electrification, low poverty) • Adequate social registries / protection systems that can be leveraged • Other adequate income / proxy data
Pros	• Easiest to administer • Quickest to deploy and reach high number of beneficiaries	• Easy and quick to deploy • Lower risk of leakage and market distortion than untargeted subsidies	• Simplest and least-costly targeted method to roll out to a high number of beneficiaries • Compared to untargeted subsidies: more accurate and lower risk of market distortion	• Can promote access across marginalized groups, such as refugees or female-headed HH • Compared to untargeted subsidies: more accurate and lower risk of market distortion	• Most accurate targeting method (provided suitable targeting systems are in place) • Minimizes leakage and market distortion risks

Cons	• Highest risk of subsidy leakage • Population may be unaware of existence of subsidies • Highest risk of long-term market distortion • Political challenge of ending untargeted subsidies	• More complex subsidy structure than untargeted subsidies • Compared to more targeted approaches: higher risks of leakage, market distortion, and political pressure to keep subsidies	• Prone to inclusion errors if eligible geographic areas are large and diverse • Prone to complexity in eligibility criteria and verification, and exclusion errors, if geographic areas are narrowly defined • Complexity results in higher cost and longer timelines	• May create social tension among demographic groups • Prone to exclusion errors if individuals cannot demonstrate being eligible (e.g., refugee status, or female-headed HH) • Complexity results in higher cost and longer timelines	• Highest complexity and administrative costs • Slow rollout • Prone to exclusion error if systems like national IDs, civil registry, and social protection are not comprehensive

2.3.1 Less targeted approaches

Designers may consider less targeted approaches, such as **untargeted and self-targeted subsidies**, when quality data is unavailable or unfeasible to capture or when there is limited correlation between geographic and demographic characteristics and the ability to pay. Less targeted approaches may work in nascent markets where a large portion of the population has affordability challenges, and the risks of market distortion are lower. For mature markets, self-targeting or untargeted subsidies aimed at the lower-tier solutions may also work to reach those groups of people left behind who truly cannot afford the available products.

Untargeted subsidies have the potential to reach a broader population, but they also carry the risk of allocating support to people who do not need it, which can lead to resource inefficiencies and market distortion. Designers should be careful in selecting situations where an untargeted subsidy is considered. In these cases, the risks of market distortion may be outweighed by the lower administrative and verification costs of less targeted subsidies.[57] This may allow programs to channel these costs into additional subsidies, reaching more people. In less targeted approaches, it may be enough to verify that a sale has been made and the product is in use rather than needing to provide proof that the product is being used by the intended beneficiaries. For example, the untargeted subsidy for SHS provided under the Nigeria Electrification Project (NEP) was very successful in scaling the off-grid solar market, reaching one million households within one year. However, the majority of subsidy beneficiaries were in the top wealth quintile of the population. Details of the NEP subsidy are provided in section 3.5.

Another important risk of untargeted subsidies is the political challenge of removing them. For example, many developing countries have provided untargeted subsidies for bottled gas for decades to promote clean cooking. Advances in digital technology and evidence of market distortions caused by the untargeted subsidies have led some governments to instead use targeted cash transfers, slashing illegal diversion and fiscal costs. But the recent rise in fuel prices has put pressure on governments to reinstate universal price subsidies. A review by ESMAP of the experience of five countries providing subsidies for cooking LPG[58] reveals difficulties of ending price subsidies once started, and the high risk of a return to universal price subsidies despite their well-documented and widely acknowledged shortcomings.

57 Africa Clean Energy (ACE) Technical Assistance Facility (TAF) and Open Capital 2020, Demand-Side Subsidies in Off-Grid Solar: A tool for achieving universal energy access and sustainable markets.

58 World Bank, ESMAP, 2022. Reforming Subsidies for Bottled Gas: Recent Experience in Developing Countries.

One way to minimize the risk of untargeted subsidies is through self-targeting, where the subsidy is accessible to all but designed to attract the voluntary participation of the target population. Limiting the subsidy to specific product tiers and varying the level of the subsidy across product tiers is one technique for self-targeting. For instance, a program with the goal of providing first-time access to low-income households in a region with a flourishing off-grid market might opt to limit subsidies to Tier 1 OGS products.[59] The Uganda EASP program follows this logic, providing different subsidy amounts based on the product tier, with lower-tier products attracting higher subsidies (see Case study 1). Higher-income households who can afford an energy product are likely to have one already and, therefore, less likely to take advantage of the subsidy.[60] In this scenario, the targeting approach and the eligible products (lower-tier) are complementary.

Another way to minimize market distortion when using less targeted approaches is to provide relatively low subsidy amounts. One approach is to begin with a lower subsidy amount, even if the affordability gap is high. This provides a window to monitor how the market reacts and to explore other options for making products more affordable (for example, tax exemptions). Over time, the subsidy amount may be gradually increased based on feedback from companies or if the intended impact (that is, an increase in OGS or cleaning cooking access rates) has not been achieved. Taking this approach ensures longer-term sustainability of commercial markets as it minimizes over-subsidizing products and sets a more realistic value perception for customers. This has been the approach chosen for the Ngwee Ngwee Ngwee Fund under the Malawi Electricity Access Project (MEAP), which is described in sub-section 2.4.1.

Finally, in less targeted approaches, ensuring an appropriate communication strategy is critical. When beneficiaries are not aware of the extent of the subsidy, they may undervalue the system and be unwilling to pay the full cost in the future, even if they can afford it. This can be particularly challenging when the subsidy is delivered through a company because end-users do not directly engage with the subsidy and therefore, may not know the product's actual market price.

CASE STUDY 1

Self-targeting in the Energy Access Scale Up Project (EASP)

Program objectives: To increase access to energy for households, commercial enterprises, and public institutions.

Overview: With funding from the World Bank, the government of Uganda set up the Energy Access Scale Up Project (EASP) to increase energy access. The financial component of the program is implemented by Uganda Energy Credit Capitalization Company (UECCC), and its goals include the provision of end-user financing for solar home and commercial systems, as well as results-based grants to facilitate access to Tier 1 solar lanterns, clean cooking, and productive use of energy (PUE).[61]

Targeting approach: Self-targeting
The consumer subsidy is applied to all customers in all communities in Uganda equally. The customer pays the balance of the cost, either in cash or through a credit PAYGo mechanism, depending on the terms of the customer's preferred energy supply company (ESCO). The lower-tier SHS and clean cooking equipment benefit from higher percentage contributions from the subsidy compared to higher-tier products.

The program is available to all customers equally, but the differing percentage contributions per tier incentivize the most vulnerable households more than those purchasing higher-tier products.

Key insight on untargeted approaches: Self-targeting, coupled with appropriate communication, may be an effective way for designers to take advantage of the greater simplicity of less targeted approaches while also managing the risk of market distortion.

2.3.2 More targeted approaches

Designers may consider **more targeted approaches**, such as geographic, demographic, and economic targeting, in scenarios where good data is available and can be correlated to the ability to pay.

59 Given that the principle of self-targeting is based on assumed preferences of the target population, it is important to validate such assumptions. Subsidized products can be labelled as undesirable by more affluent families, so self-selection might work well in these contexts. These families don't want to be seen with 'subsidized' products, which may have a distinct color, branding, etc. On the other hand, this might also affect the desirability for target households, as community perceptions and norms can be very important drivers of behavior. Targeted individuals or families may not want to display 'subsidized' products for fear that others will judge their status.

60 Open Capital Advisors analysis

61 Uganda Energy Credit Capitalization Company, 2023, Results Based Finance Manual (Part C of EASP Project Operations Manual)

Targeted approaches also work in markets with a mix of individuals who can and cannot afford electricity access or access to clean cooking, as these may be more prone to leakage (i.e., significant inclusion errors). **More targeted approaches aim to provide subsidies to a select population segment based on a shared set of factors.** Subsidies can be directed toward groups by considering factors such as location, demographics, and income level, among others.[62]

Given the complexity and higher administrative costs of more targeted mechanisms (whether geographic, demographic or economic targeting), some important considerations include:

- **Collaboration with social protection programs** which allow energy subsidy programs to leverage existing data and delivery mechanisms. This has been the case in Rwanda's REF Windows 5, Endev's demand-side subsidy pilot in Malawi, and Kenya's Mwangaza Mashinani Program[63].
- **Developing suitable eligibility tools and streamlined verification mechanisms** will simplify the identification of eligible households and reduce verification costs, such as explained in the Rwanda and Malawi case studies.
- **Eligibility and verification requirements need to be taken into consideration to minimize possible exclusion errors,** if a significant portion of the target population is unable to meet them.
- **Speed of rollout and number of beneficiaries reached with a given budget will be lower than for untargeted subsidies,** necessitating clear political will for pro-poor subsidy approaches.

Geographic targeting utilizes existing borders such as regions, districts, or neighborhoods to target beneficiaries with similar affordability challenges. Since the geographic area is pre-established, this method is relatively easy to implement. **Geographical targeting is beneficial when a large share of the population in the target geography requires subsidies to afford products.** For example, in the World Bank's KOSAP program, fourteen significantly underserved counties were identified in Kenya's north and northeastern regions, where nearly 70 percent of residents lived in poverty and had poor access to basic services.[64,65]

In cases where there is a need for more narrow targeting, geographic targeting may be refined using various methods. Poverty maps may have been produced by governments to estimate poverty of small areas or administrative boundaries, based on household surveys and censuses. More recently, such maps may be produced through satellite imagery and machine learning algorithms. With the increased availability of big data through satellite imagery, mobile phones, or digital content (and appropriate data protection mechanisms), the applicability of geographic targeting has increased dramatically. Poverty maps can be developed based on satellite images by focusing on night lighting or housing characteristics (for example, the type of roof), coupled with geo-located household surveys to confirm patterns of poverty. The Togo Novissi program demonstrates the use of satellite images to map areas of interest (Case study 2).[66] Mapping exercises like that of Togo's Novissi program, layered with electrification data, may be used to target energy subsidies.

CASE STUDY 2

Geographic and economic targeting in Togo's Novissi program

Overview: In 2020, the government of Togo sought to provide emergency assistance to the most vulnerable households. Collaborating with a team of researchers from the Center for Effective Global Action at UC Berkeley and Innovations for Poverty Action, the government initiated the "Novissi" program using a contactless, digital system to transfer a monthly stipend of $15 directly to beneficiaries' mobile phones.[67]

62 Sustainable Energy for All (SEforALL) 2020, Energy safety nets: A guide for policy makers

63 More information on these projects is available in sections 3.4, 3.2, and the End-User Subsidy Lab website, respectively.

64 Lighting Global 2018, Kenya Off-Grid Solar Access Project for Underserved Counties

65 Norken International 2017, Kenya Off-grid Solar Access Project (KOSAP) for 14 underserved counties: Social assessment report

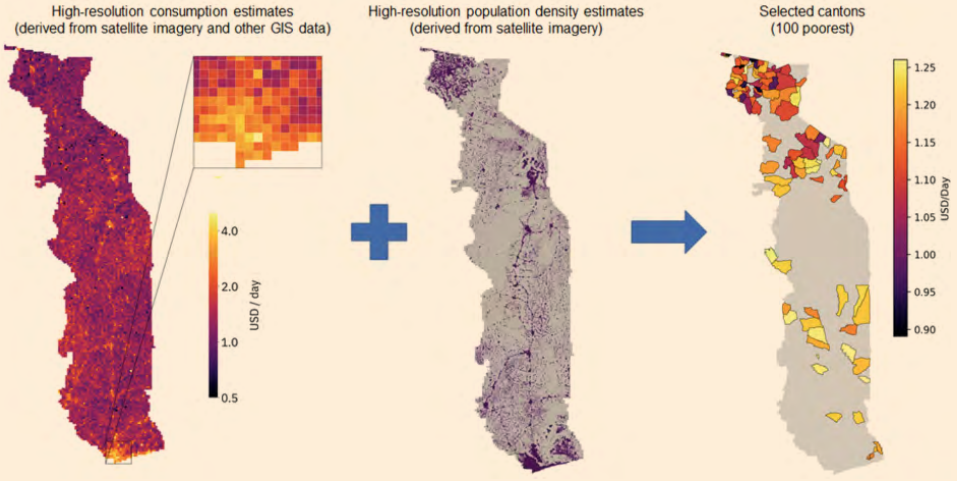
66 World Bank, 2022, Full Report: A New Look at Old Dilemmas: Revisiting Targeting in Social Assistance

67 Innovations for Poverty Action, Using Mobile Phone and Satellite Data to Target Emergency Cash Transfers in Togo

Targeting approach: Geographic and economic (with phone usage as proxy for income)

Accurate targeting of these households posed a significant challenge. To address this, the government engaged a team of researchers, who leveraged Togo's recently concluded representative household survey, satellite imagery, and mobile phone data. This research team used satellite imagery to map out the geographic locations of the most impoverished villages and leveraged results from the survey to provide ground truth and machine learning to inform expenditure partners.

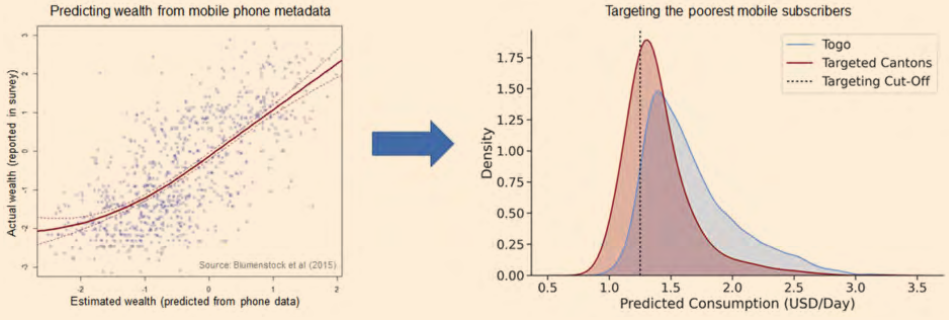
Figure 11: Mapping poor villages using machine learning-enhanced satellite imagery



Estimates of wealth were determined for each 2.4km grid cell by applying deep learning to satellite images (left) with estimates of population density (center) to arrive at the 100 poorest cantons (right).

Second, in order to target the poorest individuals within the selected geographical areas, the team used mobile phone metadata to identify the individuals within these villages with the greatest need, analyzing their mobile phone usage as a proxy for income[68].

Figure 12: Image showing results of analyzed mobile phone metadata for target locations



The team then trained machine learning algorithms to predict consumption and 'wealth' of each mobile phone subscriber based on mobile phone data and surveys. Within the 100 identified cantons (red distribution in the right), those consuming less than $1.25 a day (dashed vertical line) were prioritized for Novissi.

68 For this program, one important concern is exclusions that occur for people who don't have mobile phones. However, the only way the government could quickly distribute cash en masse during the pandemic was by using mobile money. Based on the research team's analysis of recent nationally-representative household survey data, roughly 90% of households in Togo have at least one mobile phone, which might limit the scope of such exclusions.

Where such mapping tools are not available, an energy subsidy program may choose to create its own using available data. For example, as part of the supply-side subsidy program "RBF for Rural Market Development of Off-Grid Solar in Tanzania," (RBF) EnDev developed a vulnerability access index (VAI) to determine regions with the poorest populations, and sales in these regions received an additional subsidy. This led to 128,000 solar product sales to 570,000 individuals, the most vulnerable within six regions in the Lake Zone in Tanzania (see Case study 3).[69]Together with the Rural and Renewable Energy Agency (RREA) and the World Bank, EnDev is also piloting end-user subsidies in Liberia using locally available data and a similar VAI methodology.

CASE STUDY 3

Geographic targeting in EnDev's Tanzania RBF

Program objective: To incentivize OGS suppliers of certified OGS products to serve the most vulnerable households.

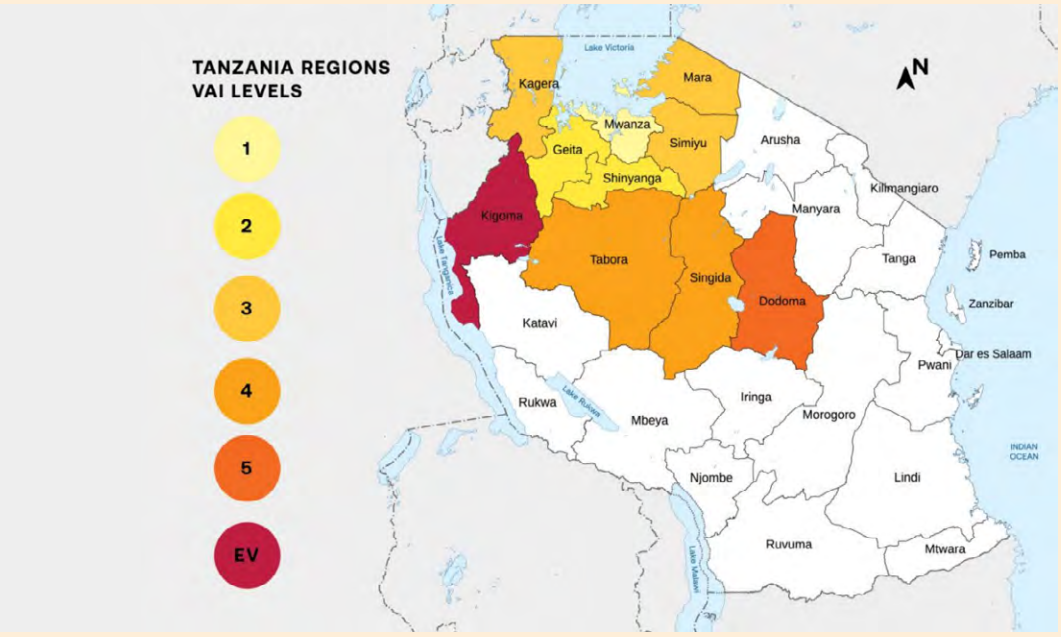
Overview: The goal of the RBF project in Tanzania was to provide quality off-grid solar products for low-income, rural households. During the second phase of the RBF, SNV developed a vulnerability access index (VAI) to incentivize the distribution of solar products to the most vulnerable regions in Tanzania. It covered six regions of the Lake Zone and three regions of the Central Zone.

Approach: Geographic targeting

This index combined socioeconomic data (such as population density, electrification rates, energy access, biomass usage, gender equity, child and maternal health, and access to water supply and sanitation) from Tanzania's National Bureau of Statistics with market performance data (including historical sales) gathered from solar companies. The program scored the regions on a scale of 1 to 5, with the higher-scored regions being the most vulnerable and attracting higher subsidies.

Introduction of the VAI led to a shift in distribution patterns to the more vulnerable regions. A total of 128,000 solar products were sold to these regions between January 2019 and September 2020, impacting 570,000 people. Amongst these sales, more vulnerable regions realized a 24% increase in share of total sales compared to periods before the VAI was implemented.

Figure 13: Vulnerability Access Index in Tanzania



69 EnDev Nov 2021, The Vulnerability Access Index (VAI) A Pro-Poor Approach to Develop Solar Markets in Rural and Vulnerable Areas of Tanzania

Key insight on geographic targeting: Geographic targeting may be the simplest and least costly targeted method to serve a high number of beneficiaries. Designers may benefit from developing mapping tools that use demographic data and market information from companies participating in the subsidy program, enabling greater accuracy when identifying underserved regions and vulnerable households.[70]

Geographic targeting may come with operational challenges depending on how geographic areas are defined. Geographic targeting is prone to significant inclusion errors if eligible geographic areas are large and diverse in terms of household wealth. On the other hand, narrowly defined geographic areas bring complexity in implementation; for companies, for the target population, and in terms of verification. The latter is explained in more detail in the verification section (section 2.6).

Demographic targeting uses existing demographic data to target end-users. **This approach is beneficial when people with affordability challenges share specific demographic characteristics,** for example, women-led households or refugee status. Similar to geographic targeting, program designers need to verify, through a third party, the accuracy of the demographic data of targeted beneficiaries. In Uganda's EASP program, implementors used additional data from the UNHCR to authenticate beneficiaries residing in refugee settlements.[71] With demographic targeting, there is also a risk of social tensions owing to allegations of discrimination on racial, ethnic, or religious grounds. It is crucial to (i) consider whether this approach is feasible at all, and (ii) if it is, develop a communication strategy that explains to stakeholders the rationale for selecting the demographic group to target. Lastly, leakage of subsidies may be mitigated by combining demographic targeting with other approaches, such as geographic targeting. Nepal's Renewable Energy Subsidy Policy has used a mix of demographic targeting (which identified women-led households, earthquake victims, and endangered indigenous communities) with geographic targeting based on level of remoteness (see Case study 4).

CASE STUDY 4

Demographic targeting in Nepal[72,73]

Overview: The government of Nepal has provided subsidies to accelerate access to renewable energy technologies since the 1970s. In 2006, the government developed the Rural Energy Policy. It updated this policy as Renewable Energy Subsidy Policy in 2009, 2013, 2016 and 2021. The policy provided guidance to accelerate access to renewable energy technologies for the most remote and marginalized communities. Over time, the government refined the targeting approach, combining demographic, geographic, and economic targeting to better identify and reach intended beneficiaries.

Approach: Demographic, geographic, and economic targeting

The updates in 2013, 2016, and 2021 included additional subsidy amounts linked to target beneficiary groups (demographic targeting) and remoteness (geographic targeting). The range of eligible products encompasses solar PV systems, solar pumping systems, micro hydro operated lift irrigation, biogas systems, and improved cook stoves of various varieties. Up to 90% of the product cost is subsidized for the targeted population in marginalized and hard-to-reach communities.

The latest subsidy policy, from 2021, defined target beneficiaries as "women-led households with dependent children, earthquake victims from earthquake-affected districts, endangered indigenous communities identified by the government, and Dalit." In addition, the program set geographical parameters of remoteness defined across three levels: very remote, remote, and accessible.

Lastly, the policy used local government registries to identify the most vulnerable people (that is, economic targeting). The progressive changes to targeting helped increase overall access to energy while helping to reduce market distortion. By 2023, 98% of households in Nepal had access to electricity (95% connected to the grid and 3% to decentralized renewable energy systems).

70 Project 90 by 2030, 2021 ,Have you heard about Free Basic Electricity?

71 UECC, 2023, Result Based Financing Manual

72 Nipunika Perera, Kevin Johnstone, Ben Garside, 2020. Energy for all: Better use of subsidies to achieve impact. Chapter 3: Demand-side subsidies: Lessons from Nepal.

73 End-user subsidy lab webinar: Targeting: Designing subsidies to prioritize the most vulnerable, 12 September 2023.

Key insight on demographic targeting: Demographic targeting can offer a more targeted approach when a correlation between demographic characteristics and affordability is present and when relevant data is readily available. In addition, demographic targeting can complement geographic targeting for a more precise identification of beneficiaries.

Economic targeting identifies beneficiary households or individuals who cannot afford off-grid energy solutions based on income or expenditure data. Due to the direct correlation between these data points and affordability, economic targeting is often considered the most accurate form of targeting, if data is accurate and recent.[74,75] In many cases, designers leverage existing economic data from other government social assistance programs. For example, the Rwanda's Renewable Energy Fund (REF) Window 5 leverages the government's "Ubudehe" classifications, which categorize households by socioeconomic factors (see Case study 5).[76,77] This case study is presented in detail in section 3.4.

However, economic data is often not available and/or difficult to gather, making use of this approach difficult in practice. When available, designers can leverage proxy data sources, or data sources which closely correlate with income or expenditure to mitigate this challenge. For example, mobile money usage or current lighting and cooking expenditure, obtained from telecom operators or energy companies. However, even where such data exists, companies are often reluctant to share or restricted in doing so by privacy laws.

Economic targeting also requires extensive monitoring and verification methods to ensure that the right beneficiaries receive the product, which can be costly. Therefore, it is important to ensure that available data can be independently verified in an efficient manner. In addition, without appropriate communication strategies, potential customers may find it confusing to determine their eligibility.

CASE STUDY 5

Economic targeting in Rwanda Renewable Energy Fund (REF) Window 5

Program objective: To increase electricity access in Rwanda through SHS.

Overview: In 2020, the Rwanda Energy Access and Quality Improvement Project (EAQIP) together with the Renewable Energy Fund (REF) launched a $30 million RBF subsidy called REF Window 5 with a goal to connect 370,000 households. REF Window 5 builds on learnings from EnDev's Pro-Poor RBF pilot, which looked to accelerate access to off-grid solar products to the poorest households through a subsidy mechanism.[78,79]

Approach: Economic targeting

REF Window 5 aims to benefit the poorest households, specifically those in areas where the government has not yet prioritized grid extension. The economic targeting approach previously used was based on the socioeconomic categories known as "Ubudehe".

Through various survey data on disposable income and energy expenditure of households in the target areas, the program estimated end-users' ability to pay and calculates the affordability gap that informs the subsidy level for each Ubudehe category[80].

Building on the success of EnDev's pilot, which provided access to 22,000 low-income households, REF Window 5 achieved 330,000 connections by August 2023.

74 Africa Clean Energy (ACE) Technical Assistance Facility (TAF) and Open Capital 2020, Demand-Side Subsidies in Off-Grid Solar: A tool for achieving universal energy access and sustainable markets. (Page 24)

75 World Bank, 2022, Full Report: A New Look at Old Dilemmas: Revisiting Targeting in Social Assistance

76 World Bank and Development Bank of Rwanda, 2021, Window 5 Operations Manual

77 End-User Subsidy Lab, Case study: EnDev's Pro-poor Results Based Financing in Rwanda

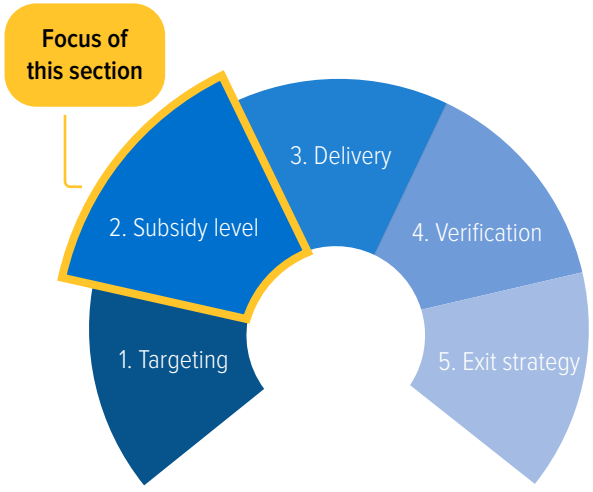
78 End-User Subsidies Lab, 2022, End-User Subsidies Lab Official Launch Session: Rwanda End-User Subsidy

79 Gogla, Africa Clean Energy, World Bank, 2022, End-User Subsidies lab Official Launch: Session 1

80 Note: The use of the Ubudehe classification has been suspended in the program, and a new approach is currently in development

Key insight on economic targeting: Economic targeting may be the most accurate form of targeting to ensure that intended beneficiaries who otherwise cannot afford a product receive a subsidy. However, designers need to assess the availability, reliability, and accuracy of economic data and the ease of verification to determine how feasible it will be to implement this approach.

2.4 Eligible Products and Subsidy Level



Subsidy determination involves selecting the products eligible for a subsidy and determining the subsidy level. This is the process of defining how much subsidy each beneficiary will receive. This choice depends on the price of the product and the amount the beneficiary is able to pay. The difference between the two represents the affordability gap. Ideally, for EUS programs, the subsidy matches the affordability gap. However, this can be difficult in practice, as affordability will vary by beneficiary and product, which means that designers may need to make several choices regarding subsidy levels.

It is important not to set the subsidy too high to avoid over-subsidizing the selected products, which can lead to market distortion and depletion of program resources. Setting a subsidy too low may result in limited adoption, as beneficiaries may still be unable to pay. A good practice is to gradually phase in subsidies, starting with a lower subsidy amount and adjusting the subsidy level over time. This enables companies to take the next step in reaching slightly lower-income and more rural households since companies are unlikely to reach the poorest households from the start. While balancing these complexities, it is important for designers to set a simple subsidy structure that will be easy to communicate, understand, and manage.

As indicated, the **subsidy level** is related to the **affordability gap**, which is a function of the **product price** and the **ability to pay,** as shown below.

Price of Product - Ability to pay = Affordability gap => Subsidy Level

2.4.1 Selection of eligible products and services

An important design choice is to determine which products and services are eligible for the subsidy. To specify eligible products, designers can leverage the tiered frameworks available for both OGS products and clean cooking solutions, which identify different levels of functionality, ranging from Tier 0 to Tier 5.[81] Additionally, product selection may be based on quality standards such as certification by VeraSol for solar home systems and Burn design lab, Centre for Integrated Research and Community Development Uganda, Centre for Research in Energy and Energy Conservation for clean cooking stoves, among others.[82,83] Beyond products, designers may opt to limit eligibility to certain business models, for example, around the payment model (cash versus PAYGo) or the mode of delivery (ownership, rental, or Energy-as-a-Service). These choices are driven by what the target beneficiaries need, what products are available in the market, and what type of products and services the program wants to incentivize. PAYGo products are typically more expensive than products bought in cash, given the additional costs associated with this model (e.g., PAYGo technology, additional customer services, payment collection, cost of capital of providing consumer finance) and the risk that a customer may not fulfill all payments. However, a program may nevertheless choose to favor the PAYGo model as it is more affordable for end-users by spreading payments over time and allows for remote monitoring.

81 ESMAP 2022, Multi-Tier Framework

82 Verasol, Certification process

83 Clean cooking alliance, Regional Testing and Knowledge Centers

Table 2: Difference in subsidies for product purchase versus subsidizing electricity service or fuels (duration of the subsidy)

Product subsidies (linked to retail sales / purchase of clean energy products): Product subsidies are intended to reduce the price for customers to purchase and own a product. For SHS or clean cooking solutions bought in cash, subsidies are often provided as a one-off amount. In the case of lease-to-own sales via PAYGo, subsidies are typically provided periodically (with the subsidy reducing both the downpayment and recurring payments). Such periodic subsidy payments end when the product is fully paid, typically after a period ranging from 6 months to three years. Notable examples of this are Nigeria's NEP and Rwanda REF programs, which provided subsidies for product purchase through both cash and PAYGo payment models.[84]

Subsidies for electricity or fuel (linked to recurring service provision / consumption of energy): In contrast, subsidies for electricity (from SHS under a fee-for-service or energy-as-a-service model) or clean cooking fuels involve ongoing support based on usage and are regularly paid out, determined by the beneficiaries' usage patterns. Subsidies for clean cooking fuels are aimed at lowering the ongoing costs to beneficiaries. The duration of such subsidies may be unlimited, for as long as customers meet eligibility criteria. For example, with Indonesia's LPG subsidy program, beneficiaries receive a subsidy each time they refill.[85]In electricity, examples include South Africa's Free Basic Electricity program[86], providing discounts to eligible fee-for-service SHS customers.

This report does not provide specific recommendations regarding the suitability of retail sales vs service models. The general recommendation is to adapt the design to the context and available models in the market where the subsidy will be introduced. In markets where both models co-exist and/or are desirable, both can be made eligible for subsidies. Retail sales of SHS and clean cooking solutions through cash or lease-to-own PAYGo are more widespread, and thus more referenced in this toolkit. Electricity supply via fee-for-service / energy-as-a-service (EaaS) is however more prevalent under rural electrification public-private partnerships found in francophone West Africa, for example. The EaaS model is also gaining prominence as a model well-suited to reach the poorest[87], promoted by companies like Solar Aid in Malawi and Zambia, and Moon in Senegal and Togo[88].

Many of the methodologies in this toolkit may apply to both retail sales and service models. The principles of targeting, subsidy levels, delivery and verification can be used for both with some adjustments. The crucial difference is in the duration of the subsidy and the exit strategy. Given service contracts are long term, subsidies should also be designed in a way that enables a long-term affordable energy supply, factoring the cost of replacing devices at the end of their lifespan. The exit strategy section (section 2.7) discusses recurring subsidies in more detail.

For product selection, program designers have a few choices, summarized in Figure 15 and described in more detail below**.**

Restricting eligibility to certain products or product tiers. Under this approach, subsidies are only provided to beneficiaries buying a product with certain specifications (e.g., a solar lantern with a specific wattage) or a product from a particular tier. Often, eligibility is linked to tiers instead of specific products to allow consumer choice and the market to develop. For example, depending on the program goals, designers may subsidize only lower-tier products to reach a larger number of beneficiaries with the available funding. On the other hand, the project could instead focus on subsidizing higher-tier products to enable greater energy-level access. For instance, in Malawi's Ngwee Ngwee Ngwee Fund, only Tier 1 OGS solutions are eligible for the subsidy. This is inscribed in the logic of self-selection targeting presented in the previous section. Limiting subsidies to Tier-1 SHS makes the subsidy pro-poor. See Case study 6 below.

Allowing all products and product tiers to be eligible. Under this approach, subsidies are provided on all products offered by companies participating in the program (for further detail, see the section on Subsidy Delivery and Company Selection therein). Allowing all products to be eligible has the benefit of giving customers the freedom to choose their preferred product. It also encourages competition. This was the approach preferred under Nigeria's NEP for SHS, which is described in detail in section 3.5. Program designers may still differentiate the subsidy amount by product tier or target group. More on this is discussed in the subsidy level section below.

84 Details of these projects are provided in sections 3.4 and 3.5.

85 International Institute for Sustainable Development, Global Subsidies Initiative 2021, LPG Subsidy Reform in Indonesia: Lessons learned from international experience

86 A case study of South Africa's FBE program is available in section 2.7 Exit Strategy.

87 The rationale for this is: (i) Retail models, even when subsidized, ask the poorest people to make an investment decision. Investment decisions inherently involve risk which act as a barrier to access. (ii) All products have a lifespan, whereas energy service contracts can be long-term, with the replacement of equipment when needed.

88 Solar Aid: Light A Village. Moon – public private partnership to provide electricity as a service for last-mile rural households. See p. 120 of IEA's Financing Clean Energy in Africa report (2023).

In addition to the customer choice and subsidy cost-effectiveness considerations above, it is also important to acknowledge that subsidies can entice companies to offer different products or services. For example, under Nigeria's NEP, making subsidies available for entry-level products, attracted several solar energy companies to this market segment. In this sense, subsidies have 'market shaping' power.

In all cases, it is important for subsidy programs to set minimum standards for product quality and after-sales service.

- **Product quality standards:** Setting quality standards can help to minimize repairs or replacement of the subsidized product. Examples of leveraging standards include requiring OGS products to meet the International Electrotechnical Commission (IEC) standards and requiring product verification by VeraSol or requiring clean cooking products to meet ISO 19867 standard and requiring product verification by Burn Design Lab.[89,90,91] Beyond using these standards, or if they cannot be used, programs may put their own requirements on products or perform more stringent due diligence on companies and their products, as part of the selection process.

- **Service standards:** Service level standards can define a certain warranty period, consumer protection plans, or require accessibility of after-sales services in the program's geographic location. Minimum standards can be based on local government standards, industry standards, or both. Program designers should implement a Grievance Redress Mechanism (GRM) where customers can report instances where companies have failed to offer required services within a stipulated period.

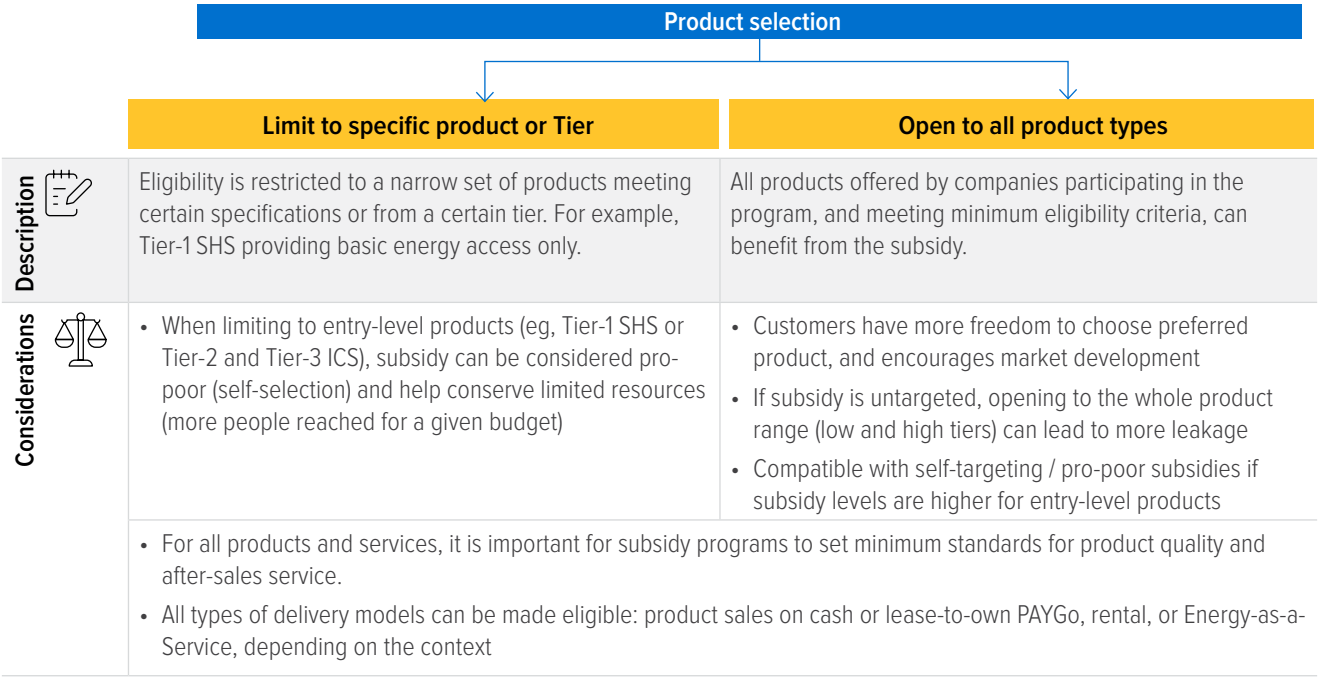
©GIZ EnDev

89 End-User Subsidy Lab, Case study: EnDev's Pro-poor Results Based Financing in Rwanda

90 End-User Subsidy Lab, Case study: Togo CIZO Check Program

91 International Standards Organization, ISO 19867-1:2018 Clean cookstoves and clean cooking solutions

Figure 14: Summary of product selection considerations



CASE STUDY 6

SHS subsidies provided by the Ngwee Ngwee Ngwee Fund under the Malawi Electricity Access Project (MEAP)

Program objectives: To increase electricity access among the off-grid population in Malawi through SHS.

Overview: Malawi's electricity access rate in 2023 was estimated at 19% (13% through connections to the grid, and 6% through SHS) with severe disparities between urban (42%) and rural areas (5%). The government set the goal to achieve universal energy access by 2030, with SHS playing a major role[92].

Under the World-Bank funded Malawi Electricity Access Project (MEAP), the Ngwee Ngwee Ngwee Fund (NNNF) was set up to support the scaling of the OGS market in Malawi's rural areas. It has a $20 million financing window that includes working capital financing to companies and RBF grants as end-user subsidies, with a goal of providing access to 200,000 households.[93]

The OGS market in Malawi is emerging, with a few international and local companies with well-developed distribution networks and expanding their operations. However, with widespread poverty in Malawi (71% of the population living under the poverty line[94]), the market for SHS at unsubsidized prices is likely to saturate quickly, justifying the end-user subsidies provided by the NNNF. Unsubsidized prices of Tier-1 SHS are unaffordable for about 80% of the off-grid population, based on assessment of their ability to pay (see Figure 15). For this reason, **subsidies under the NNNF are mainly untargeted, but with some geographic and self-targeting elements** (only rural households are eligible, only Tier-1 SHS are eligible for subsidies).

Product selection: Limited to specific Tiers. As mentioned above, the program is intended to remain pro-poor and is therefore limited to basic Tier-1 SHS (as defined under the multi-tier framework). This is inscribed in the logic of self-targeting of subsidies described in section 2.3. It also ensures cost-effectiveness for the limited funding available.

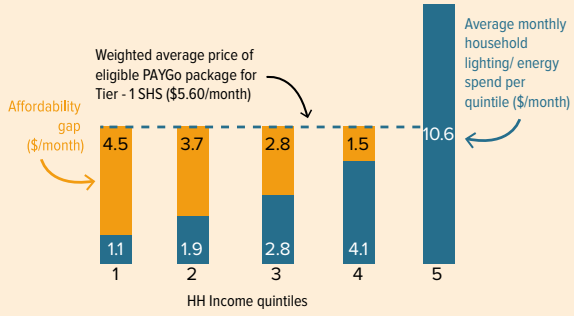
92 World Bank, 2023. Malawi Economic Monitor - Powering Malawi's Growth: Rapidly and Sustainably Increasing Energy Access.

93 IDCOL, Off-Grid fund launched in Malawi with support from IDCOL

94 The proportion of people living on less than US$2.15 Purchasing Power Parity (PPP) per capita a day was 71.3% in 2022. World Bank, 2023. Malawi Economic Monitor - Powering Malawi's Growth: Rapidly and Sustainably Increasing Energy Access.

Affordability gap and subsidy level: an analysis of ability to pay of the off-grid population suggests that only the wealthiest 20% (quintile 5 in Figure 15) can afford unsubsidized prices. This is a market segment quickly saturating. In order for the market to continue to expand, a subsidy of $20 per unit was estimated to suffice for PAYGo pricing to be reduced to what the next quintile of the population can afford. This **subsidy level is relatively low**, representing about 15% of the PAYGo price (sum of all payments) of a Tier-1 SHS in Malawi.

Figure 15: Affordability of SHS for the off-grid population in Malawi, by quintile[95]



Results: as of April 2024, more than 50,000 households have benefitted from subsidized SHS, allowing the market to grow despite deteriorating economic conditions in the country.

Piloting targeted subsidies: for products to be affordable for the poorest among the off-grid population (quintile 1), the amount of the subsidy per unit would have to increase by a factor of 3 to 4. As SHS sales increase over the coming years and the market expands into poorer segments of the population, it is expected that subsidies will need to be increased to overcome the affordability gap and realize universal electrification targets. Such increases may be accompanied by more narrow targeting. In anticipation of this need, Endev is piloting targeted subsidies in Malawi, making use of Malawi's social registry, the Unified Beneficiary Registry (UBR). This pilot project is described in detail in section 3.2.

Key insights on product selection:[96] Choose high-quality products that are delivered with good after-sale service and certified by an independent party, such as VeraSol for OGS or Burn Design lab for clean cooking stoves.[97]

2.4.2 Ability to pay and affordability gap

The next element in determining the subsidy level is to estimate the affordability gap, based on the price of eligible products and how much beneficiaries can pay for them.

The product price used in this calculation is typically the sales-volume-weighted average price of eligible products in the market. This can apply to products sold on cash, on PAYGo, or fee-for-service packages. Ideally, designers will not only look at the cheapest product available but also include higher-priced products and those most popular in the market. For nascent and emerging markets, it is also important to compare prices in the local market with international benchmarks and understand the pricing structure (including manufacturing, shipping, importation, distribution, consumer finance, profit, after-sales service, etc.). Local prices significantly higher than the benchmark may signal the need for supply-side incentives (such as supply-side RBF or credit lines) and enabling-environment interventions. See Box 1 in the next subsection for more details on rolling out supply-side and demand-side subsidies simultaneously.

The ability to pay is driven by the amount of household income that is available for energy expenditures. Another point of reference is 'willingness to pay', which is the maximum price a household is willing to pay for a product or service.[98] Willingness to pay is more subjective and varies more among target beneficiaries, typically influenced by the value perception of the products involved.

To estimate the ability or willingness to pay for energy access solutions, designers can use data from existing surveys on household income and expenditure or conduct their own. Existing household surveys may come from

95 ECA, MARGE, 2019. Off-grid solar market assessment in Malawi.

96 End-User Subsidy Lab learnings from partner organizations

97 Clean cooking alliance, Regional Testing and Knowledge Centers

98 Harvard Business School 2020, Willingness to Pay: What it is & How to calculate

government entities, NGOs, or other organizations aiming to determine disposable income levels in the target region, often to inform social protection programs. Such surveys may be explicit about energy expenditure. If this is not the case, assumptions can be made about the proportion of their global expenditure they can afford to spend on energy.[99] If data is missing, incomplete, or outdated, designers may conduct their own surveys on ability or willingness to pay. For example, for the Malawi case study presented above, ability to pay was estimated based on household energy expenditure reported in integrated household surveys conducted by the government, combined with surveys specifically conducted for the design of the project. In designing a pilot EUS project for Uganda's refugee settings (see details in section 3.3), EnDev conducted a "willingness to pay" field survey in three settlements to complement other available data points.[100] EnDev typically uses 'revealed' willingness to pay, which is based on consumers' past choices in purchasing energy and anticipates a slight increase in spending for a higher-tier service. Revealed willingness to pay can be more effective than stated willingness to pay since actual consumer behavior does not always align with what people say they will do.

The affordability gap is calculated based on the product price and ability to pay. This calculation will always be an estimate due to data constraints and may change depending on macroeconomic factors affecting households' disposable income (e.g., depreciation of local currency, food price increases). Other factors may also affect the affordability gap, such as price changes due to technological changes and sector maturity. As such, the affordability gap requires regular monitoring throughout implementation. If this leads to revisions of subsidy levels, these need to be carefully planned and communicated in alignment with the companies involved.

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99 For OGS products, the OGS market trends report proposes an affordability estimation which assumes that households can allocate 5% of their monthly expenditure to OGS products (between 5% and 10% is considered affordability at a stretch). This 5% of monthly household expenditure is also in line with the Multi-Tier Framework definition of affordability for electricity access and clean cooking.

100 EnDev, 2023, Demand-side subsidy pilot – Malawi

2.4.3 Subsidy level

Subsidy levels are set to match the affordability gap of the target population, they therefore depend on the targeting approach. In general, the more targeted the subsidy is towards poor populations, the higher the subsidy level. In the case of untargeted subsidies, like the Malawi subsidy presented above (see case study 6) or the subsidy under Nigeria's NEP (see section 3.5), end-user subsidies were set relatively low (to about 15-20 percent of price) with a logic of allowing markets to continue to expand despite widespread affordability challenges. Keeping untargeted subsidies low helps reduce leakage, the risk of market distortion, and the risk of political challenges when removing such subsidies. On the other hand, targeted pro-poor subsidies like Rwanda's REF or EnDev's pilot in Malawi (see sections 3.4 and 3.2 respectively) subsidy levels were set high (ranging from about 45 percent to 90 percent of price) to meet the affordability challenges of much more narrowly defined target populations.

Designers can further vary the subsidy level by target group, product range, or payment model – or they can choose to keep the subsidy level consistent. The different options for varying subsidy levels are:

- **By target group:** This may be used with a more targeted approach in which different target groups can be easily identified, such as mentioned above for Rwanda REF using Ubudehe categories or EnDev's pilot using the wealth categories of the Unified Beneficiary Registry. Other options include higher subsidies for marginalized groups, such as women-led households or refugees.
- **By product range (Tier):** This option may be used with less targeted approaches. Following the logic of self-targeting, higher subsidies can be given to lower-tier products, thus encouraging higher uptake by the beneficiaries with the lowest ability to pay. This subsidy level differentiation is relatively simple to communicate and manage, as product categories are clearly defined. This option was chosen by Uganda EASP, varying subsidy levels by tier and technology for both OGS and clean cooking products[101].
- **By payment model or mode of delivery:** This option may be used to incentivize certain payment models or compensate for price differences. Designers may vary the subsidy by payment model (such as cash versus PAYGo) or by mode of delivery of the subsidized product (such as ownership, rental, or Energy-as-a-Service). For example, designers may set a higher subsidy level for products sold through PAYGo to incentivize this model because it increases affordability and allows for remote monitoring.

Box 1: Rolling out end-user subsidies simultaneously with supply-side incentives or enabling-environment initiatives[102,103]

Another factor to consider when setting subsidy levels is whether the end-user subsidy is being rolled out in parallel to supply-side incentives and enabling environment initiatives. This is especially relevant for nascent and emerging markets, where prices are high (in comparison with those of mature markets), distribution networks are not as well developed (poorer and remote areas not yet covered), and the policy and regulatory framework is not yet favorable for clean energy products and services. Projects like Nigeria NEP and Uganda EASP rolled out supply-side RBF simultaneously with end-user subsides, so that companies would have an incentive to expand their distribution networks. Projects like Malawi MEAP provided a line of credit to companies, potentially reducing the cost of capital for them. Enabling-environment measures like removing taxes or import duties for clean energy products may also translate into price reductions which need to be considered when setting the subsidy level.

As a general rule, supply-side incentives and enabling environment initiatives (which unlike end-user subsidies do not mandate price reductions) should be used to (i) help reduce general prices to levels reasonably similar to those of mature markets, and (ii) help products be accessible throughout the country or region, thus removing the access gap (refer to discussion in Chapter 1). **End-user subsidies should be used to address the affordability gap in relation to the reasonable price level.** For example: Uganda is considered a mature clean energy market, but with a significant access gap in hard-to-reach areas, such as refugee-hosting and surrounding rural districts. In addition to an end-user subsidy, Uganda EASP provides a supply-side RBF

101 UECCC, 2023. EASP Project Operations Manual.

102 Refer back to discussion in Chapter 1

103 World Bank, 2022. Designing Public Funding Mechanisms in the Off-Grid Solar Sector.

to incentivize companies to distribute and service eligible OGS and clean cooking products in such areas[104]. The amount of the supply-side RBF is calibrated to offset the additional cost companies incur to serve hard-to-reach areas, so that products can be sold at the same price as in the rest of the country. The end-user subsidy amount is calibrated to address the affordability gap in relation to that reference price.

For additional guidance on the complementary use of end-user subsidies and other forms of incentives, the World Bank has produced a toolkit on *"Designing Public Funding Mechanisms in the Off-Grid Solar Sector"*.[105]

Once the principles of setting subsidy levels are defined, the actual subsidy level can be defined as a percentage of the product price, a fixed amount, or a combination of both.[106] These options are summarized in the diagram of Figure 16 and explained in more detail below.

Figure 16: Subsidy level options

Subsidy level determination

Subsidy level principles → **Actual subsidy levels**

	Invariable	Vary by target group	Vary by product Tier	Fixed / absolute amount	Proportional to price or size	Combination
Description	The subsidy is defined as a unique an invariable amount for all eligible products and customers	Subsidy level can adapt to affordability of each group, whether socio-economic, geographic or demographic.	Subsidy level can vary for different product categories / Tiers	Subsidy level is set as a fixed $ amount per product and customer	Subsidy set as a percentage of price or fixed $ per unit of capacity ($/Wh or $/Wp) for the selected product or service	Subsidy level is determined as a combination of percentage of price with a maximum fixed amount price
Considerations	• Well-suited to untargeted / self-targeted subsidies • Well-suited to relatively low subsidy levels • Simple to implement	• Applicable to targeted subsidies only. • Subsidy levels can be set high for the poorest • Much more complex to implement	• Well-suited to self-targeted subsidies, if subsidies are higher for lower-tier products • Defining tier/ category is complex for clean cooking	• Well-suited to untargeted / self-targeted subsidies • Well-suited to relatively low subsidy levels • Simple to implement • Less prone to subsidy manipulation	• More subsidy is captured by more expensive products • Perverse incentive for companies to inflate price • Not commonly used without subsidy cap	• Helps level subsidized pricing across products • Avoids over-subsidizing cheaper products • More complex to implement • Better suited to high, targeted subsidies
		• Options not mutually exclusive • Subsidy can also vary **by payment model or mode of delivery** (e.g., cash, lease-to-own PAYGo, EaaS)				
	• **Price references** can be the sales-volume-weighted average price of eligible products or services in the market. Understanding price structure and international price benchmarks are also an important reference. • **Affordability**, based on ATP or WTP, can be estimated through economic data, average spend on supplementary products, income data, and surveys					

104 UECCC, 2023. Electricity Access Scale Up Project (EASP) documents.

105 World Bank, 2022. Designing Public Funding Mechanisms in the Off-Grid Solar Sector.

106 Africa Clean Energy (ACE) Technical Assistance Facility (TAF) and Open Capita 2020, Demand-Side Subsidies in Off-Grid Solar: A tool for achieving universal energy access and sustainable markets.

Percentage of price: The subsidy is set as a percentage of the product price during the program's implementation (for example, 70 percent of the product price on all eligible products). This would mean a product that costs $100 receives a $70 subsidy, and a higher-tier system that costs $500 receives a $350 subsidy. Such an approach can result in a large quantity of funding going to higher-priced systems. Therefore, a percentage subsidy level is almost always accompanied by a cap amount, which is the 'combined' subsidy level option described below, or limited to specific tiers (e.g., only Tier 1 products). A significant risk associated with this approach is the potential for companies to inflate product prices to maximize the subsidies they are eligible for. To mitigate this, program designers would need to monitor country and regional price trends before and during the program.

Fixed amount (absolute value): The subsidy is a fixed dollar or local currency (LCY) amount (for example, $50) to cover a portion of the product price. Keeping the amount fixed across all products results in the lowest-priced products attracting the highest relative subsidy levels. This approach can be considered a self-selection targeting approach, as the subsidy is relatively more valuable for lower-priced products. This approach has been used in Malawi's NNNF (one single subsidy level) and Nigeria's NEP (amount is fixed for each product category), both of which offer relatively low end-user subsidy levels. If subsidy levels were high, setting fixed amounts may result in over-subsidizing the cheaper products.

Combination of percentage and absolute value: The subsidy level is set to both an absolute amount and a percentage of the product price (for example, 70 percent of the product price, with an absolute cap of $50). This way, there is a ceiling to the actual subsidy. Furthermore, the lower of the two amounts is always used, which avoids over-subsidizing larger products and certain companies. The complexity associated with this method is justifiable when subsidy levels are high, like Rwanda REF or Uganda EASP.

CASE STUDY 7

Combined percentage and fixed subsidy level in Rwanda's REF Window 5[107]

Rwanda's REF Window 5 end-user subsidy provided targeted subsidies to the poorest families living within identified off-grid electrification areas, as described in section 3.4. Subsidy levels were high to match the affordability gap of the target population, justifying a more complex calculation of subsidy amounts.

The subsidy amount for each SHS product is set as a percentage of the retail price, but the subsidy is capped at a maximum absolute level. With the Ubudehe categorization, the relative subsidies were 90% , 70%, and 45% for Tier 1, 2, and 3 OGS solutions, respectively. A maximum absolute subsidy was set at Rwandan Francs (FRW)100,000, FRW 80,000, and FRW 50,000 for the three respective categories. The subsidy was then disbursed in three installments for PAYGo customers and two installments for cash customers. The subsidy categorizations are however currently under review to reflect market dynamics.

Category[108]	Percentage coverage (of final price)	Maximum subsidy (in FRW)
Ubudehe 1	95%	120,000
Ubudehe 2	80%	95,000
Ubudehe 3	70%	80,000

By combining an absolute and a relative maximum subsidy amount, the program design safeguards against the risk of over-subsidization and price inflation by participating companies. The subsidy levels will be reviewed regularly to reflect changes in market conditions; hence, the subsidy amount may vary over the program's lifetime.

Key insight on subsidy level calculations: Subsidy structures need to be kept simple where possible. Complexity may be justifiable for higher subsidy levels, where risks of market distortion increase.

107 Development Bank of Rwanda, 2021. Window 5 Operations Manual, Version 04/23.06.2021.

108 Note: The use of the Ubudehe classification has been suspended in the program, and a new approach is currently in development

The more complex the subsidy structure, the more difficult it is to communicate and administer. Beneficiaries may find it difficult to understand why certain groups or products attract a higher subsidy level. Subsidy administrative processes such as verification and disbursement are also more complex with differentiated subsidy levels. Designers need to balance the trade-off between being specific and keeping subsidy delivery simple.

Box 2: Setting subsidy levels via reverse auction?

As an alternative to program designers setting the subsidy level as described in this section, they can ask companies to set the subsidy through a reverse-auction process. In this approach, program designers issue a tender to companies operating in the region with broad guidelines for the target beneficiaries, types of products to be subsidized, and total subsidy funding available. Companies place bids on the subsidy they require for selling a certain volume of OGS or clean cooking products, at a defined price, in a particular area. The winning bidder(s) are the ones needing the lowest subsidies.

The main benefit of this approach is the potentially reduced subsidies[109] However, reverse action has potential drawbacks, including giving an unfair advantage to larger companies.[110] This approach calls for active monitoring during implementation, as companies may set subsidy levels that are not fully aligned with market realities.

There is ample experience of reverse auctions to set supply-side RBFs, but not as much for end-user subsidies. The KOSAP project used a reverse auction for their solar RBF component[111]. The BRILHO programme in Mozambique uses a reverse auction for their clean cooking RBF.[112] RBFs provided by the Beyond the Grid Fund for Africa (BGFA) are also set based on reverse auction[113]. None of these projects are end-user subsidies in the sense that no price reductions are mandated. More research is needed in this area to draw recommendations for auctions specifically for end-user subsidies.

2.5 Delivery of Subsidy

In this section, the toolkit covers how the subsidy is delivered to the beneficiary, including **the delivery channel, company selection, subsidy disbursement, fund management, and claim management.** A well-designed delivery mechanism aims to promote transparency and accountability, encourage stakeholder participation, and maximize customer outcomes.[114] The five delivery elements are defined as follows:

- **Delivery channel** – how a subsidy is given to a beneficiary, for example, directly through cash or vouchers, or indirectly through a company
- **Company selection** – the process of selecting eligible companies to participate in the subsidy program
- **Subsidy disbursement** – the process by which payments are made, for example to companies selected to deliver a subsidized product or service (when working through companies)

109 MECS and ENERGY 4 IMPACT, 2021. Clean cooking: results-based financing for modern energy cooking solutions: Analysis of a potential scale-up tool for the sector

110 MECS and ENERGY 4 IMPACT, 2021. Clean cooking: results-based financing for modern energy cooking solutions: Analysis of a potential scale-up tool for the sector

111 Kenya Off-grid Solar Access Project. Project website here.

112 MECS and ENERGY 4 IMPACT, 2021. Clean cooking: results-based financing for modern energy cooking solutions: Analysis of a potential scale-up tool for the sector

113 Beyond the Grid Fund for Africa (BGFA). Project website.

114 GOGLA (2021), How End-User Subsidies Can Help Achieve Universal Energy Access: Views From the Off-Grid Solar Industry

- **Fund management** – the form of administration of the program
- **Claim management** – the process by which companies submit documentation notifying the EUS program of a sale of the subsidized product and requesting reimbursement where relevant

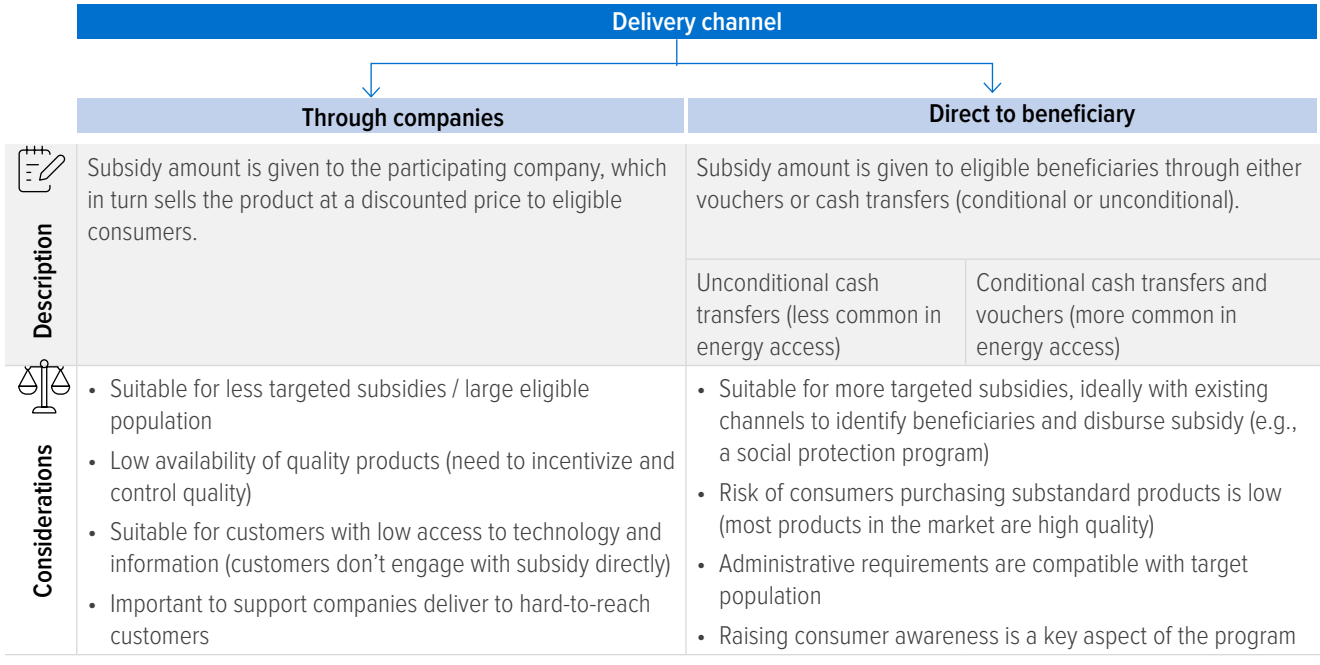
Table 3: Questions to help determine the delivery approach across the five elements[115]

- **Ease of access:** Can the target population easily access the subsidy through the selected delivery approach?
- **Robustness of approach:** Is the approach reliable (provided effectively and without delays), and can it guarantee delivery of quality products or services? Is the governance sound, and is there sufficient security to guarantee the subsidies will not be misused?
- **Cost-effectiveness:** Do the benefits of the selected delivery approach justify its complexity and administrative cost?
- **Time of deployment and scalability:** How does the selected delivery approach impact the time of deployment of the subsidy? Can the approach be scaled in line with subsidy program objectives?

2.5.1 Delivery channels

Subsidies can be delivered directly to beneficiaries or indirectly through a company. Direct delivery of subsidies takes the form of cash or vouchers to offset the cost of the product. Beneficiaries may receive cash up front with the intent that they use it to purchase the product, or they may receive periodic payments in a bank or mobile money account as they make recurring payments for an eligible product or service. Alternatively, consumers may receive a voucher (electronic or physical) that they can provide to a company to purchase the product at a reduced price. In this approach, the company needs to apply for reimbursement of the voucher amount to the subsidy program. Finally, the subsidy may be given directly to the company. In this scenario, the company provides a reduced price to eligible consumers and typically receives the subsidy after a sale is made (see the subsidy disbursement section below).[116]

Figure 17: Delivery channel choices



115 World Bank, 2018, Social Protection Payments in the Directorate of Social Protection and Solidarity – Sao Tome and Principe

116 Africa Clean Energy (ACE) Technical Assistance Facility (TAF) and Open Capita 2020, Demand-Side Subsidies in Off-Grid Solar: A tool for achieving universal energy access and sustainable markets.

Pros	• Has lower administrative costs for program • Leverages existing distribution and marketing channels • Supports the delivery of quality products • Can be effectively implemented even in untargeted approaches • Most widely used delivery approach, and thus more substantial experience	• Makes users aware of existence of subsidy and true cost of product • Provides additional channel for feedback from intended beneficiaries • Allows EUS designers to reach target population directly (minimizes inclusion error)
Cons	• Requires awareness of products for beneficiaries to seek subsidies • May lead to market distortion as the consumer may not fully understand subsidization • Companies may increase prices to compensate for subsidy program management costs • Risk of selling subsidized products to ineligible customers and claiming for subsidizes	• Risk of diverting subsidies (if unconditional subsidies) • Increased administration costs (for example logistics), especially with vouchers • Requires beneficiaries to be aware of eligible products and companies • Risk of exclusion error due to administrative requirements the target population may not be able to meet

Table 4: Factors to help determine delivery channel approach

- **Targeting approach and size of target population:** This relates to the ease and cost of subsidy delivery. The larger the target population (and the less targeted the subsidy), the more difficult and costly it is to deliver subsidies directly to beneficiaries.
- **Availability and consumer awareness of quality products:** some delivery approaches allow designers to restrict product quality standards (e.g. delivery through eligible companies or conditional cash transfers and vouchers), while others (e.g., unconditional cash transfers) do not. Therefore, the availability and consumers' awareness of quality products in the market influences which delivery approach to prioritize to minimize risk for end-users purchasing substandard products.
- **Awareness of subsidy:** when delivering subsidies through companies (notably untargeted subsidies), consumers may not be aware products are subsidized, affecting value perception, and contributing to market distortions.
- **Administrative requirements placed on consumers:** Levels of literacy (reading, writing, digital literacy, ownership of phone, ownership of bank account, etc.) may influence the delivery approach.
- **Administrative requirements for governments:** handling cash transfers and vouchers requires higher investment from the subsidy administrator.

Scenarios where delivery through a company is appropriate:

Designers may consider **delivery through a company** based on the following factors:

» Targeting approach and size of target population:

- Less targeted subsidies (untargeted, self-targeted, and, to some extent, geographic) will make a large part of the population eligible for the subsidy. The government may lack mechanisms to provide subsidies directly to such a large population (comprehensive population databases or capacity to deal with individual subsidy applications). On the other hand, companies may integrate the subsidy transaction to their existing sales' processes and claim subsidies to the government in bulk.
- On the other hand, if subsidies are more targeted and the government already has direct access to the target population - for example, via a social safety net program - direct subsidies may be considered a suitable option.

» Limited availability of quality products:

- When penetration of low-quality energy access products in a given market is high, designers may opt to deliver the subsidy indirectly through companies pre-vetted for quality. This will incentivize companies

(existing and new entrants) to provide quality products. This eliminates the risk that beneficiaries will use their cash or voucher to purchase low-quality products. It is however important to highlight that such a risk can also be addressed by making cash transfers and vouchers conditional to the purchase of quality products.

Beneficiary characteristics:

- Delivery through private companies may be more appropriate for consumers with poor access to information and technology, because it does not require customers to handle the subsidy themselves.

Delivery through companies leverages existing sales' networks and processes, lowering administrative costs for the program. It may also support the delivery of quality products and the transparency of implementation. With delivery through companies, subsidies can be delivered in bulk to a few partner companies – as opposed to thousands of individual beneficiaries – requiring lower administrative costs for logistics and facilitation. RBF is the most common delivery tool when using this approach because it allows program implementors to verify that the intended beneficiaries have received the subsidy. Additionally, RBF schemes allow implementers to steer market development in the right direction by offering incentives for specific achievements, such as program transparency and product quality.

Because of these advantages, delivery through companies is one of the most widely used delivery approaches. This approach was taken in Rwanda during Endev's Pro Poor subsidy and REF Window 5, in Uganda during the World Bank's EASP, in Nigeria during the NEP SHS output-based fund, and during various other World Bank and EnDev programs, among many other examples worldwide.

Delivery through companies may affect how effective a subsidy is in reaching poorer and excluded users, so supporting companies to adopt inclusive modes may be necessary. Box 1 described how supply-side incentives can be deployed simultaneously with subsidies to reach poor and remote populations. Some designers have opted for subsidy delivery though companies even in challenging contexts such as remote refugee settlements, by providing companies with significant support. For example, Mercy Corps recently partnered with two private companies to deliver quality SHS to refugees in Uganda (see case study below).

CASE STUDY 8

Subsidy delivery through private companies in refugee settings – Mercy Corps' AMPERE project in Uganda[117,118,119,120,121]

Project objective: To increase access to energy for refugees and their host communities by facilitating the introduction of private sector energy providers.

Overview: Affordability of OGS solutions remains a major challenge for refugee populations in Uganda, whose ability to pay for these products is three to four times lower than the national average. The Accessing Markets through Private Sector Enterprises for Refugees Energy (AMPERE) project was designed to incentivize the entry of energy companies into refugee settlements and to better understand both the market and the ability of potential consumers to pay for the relevant products. The project was implemented at pilot scale over one year (from July 2019 to June 2020), in the Bidi Bidi refugee settlement in West Nile, Uganda. Initial market research highlighted key constraints, including affordability and consumer finance, appropriateness of products, consumer awareness, and last-mile distribution infrastructure. The project sought to address these constraints through producing market intelligence, engaging private sector players through an RBF scheme, leading product awareness campaigns, and training sales agents.

Subsidy design: the subsidy was targeted to refugees and their host community, made eligible to all residents of the Bidi Bidi Refugee Settlement and its host community. The subsidy level was high, at about 50-60% of the price of eligible products (quality-verified solar lanterns and SHS), to adapt to the limited ability to pay of the target population.

Delivery channel: Through private companies. Given the (i) target population was large (all residents of target area were eligible) and (ii) that the objective was a scalable approach to developing markets for high-quality OGS

117 End-User Subsidies Lab, Case Study: The role of end-user subsidies in strengthening solar markets for refugees in Uganda

118 Response Innovation Lab, D.LIGHT AND VILLAGE POWER: Supporting private sector energy actors to enter refugee markets

119 UOMA, 2020. Reaching unserved refugee markets in Uganda

120 Mercy Corps, 2022, Ensuring Access to Affordable, Reliable, Sustainable and Modern Energy for All

121 USAID Power Africa, , Assessment of Market-Driven Solutions for Energy Access in Refugee Settlements in Sub-Saharan Africa, Master Card Foundation

products and PAYGo consumer finance in refugee settings, private solar companies were selected to partner with Mercy Corps to implement the project. The selection was competitive, and two companies (d.light and Village Power) were tasked with selling the lanterns SHS at subsidized prices, targeting potential customers through marketing events. A key goal of selecting these companies was to facilitate increased proximity to the beneficiaries.

Results and lessons learned: By the end of the pilot in June 2020, a total of 4,000 products were sold which equates to roughly 9% of refugee households in the Bidi Bidi settlement. The pilot demonstrated that supporting a market systems approach could be successful, even in remote and underserved refugee markets. However, such support needs to be scaled and regularly adapted to the context to be sustainable. A two-year follow-up survey continued to monitor the state of the market. It was determined that as a result of COVID, sales stopped, the companies reduced their personnel capacity and system repairs had a tendency to go unmet. Being that AMPERE was a limited pilot without continued scaling momentum, the cost of serving and servicing these markets increased. Two years on, there was a considerably reduced company footprint in the settlement especially for PAYGo systems.

The AMPERE pilot made it apparent that though pilot projects can provide valuable data (such as evidence that refugees can pay for energy services), they will not result in systemic change. A long-term outlook with strong partnerships and consistent momentum is essential to long-term gains and a sustainable market approach. Though the subsidy was meant, in part, to reduce the risk to the private sector, solar distributors still see significant risks in these markets, and this requires appropriate support to enable them to operate profitably in this market.

A challenge with delivering through companies is that beneficiaries may not be aware that the prices they are paying are subsidized.[122] This creates a misconception that the product is much cheaper than it is and thus affects future willingness to pay for the product at commercial rates. To mitigate this challenge, it is crucial that designers and implementors adopt a communication plan to ensure the target communities are aware of the temporary nature of the price reduction and reasons for the subsidization (e.g., due to health benefits or government goals related to energy access and climate change). Companies could also be held accountable by being obliged to provide this information to beneficiaries through, for example, program-branded subsidy certificates delivered together with the product.

Another challenge of working through companies is that they may not always entirely pass the subsidy on to their customers. Experience of delivering subsidies through companies has shown companies increase retail prices to compensate for the complex or hard to-administer subsidy delivery systems, subsidy program transaction costs, long procedures and verification delays incurred by them in the subsidy release process. Therefore, end-users do not access clean energy products at the least-cost.[123] This challenge can be mitigated through balancing more efficient procedures on the one hand, and monitoring of end-user prices on the other.

Scenarios where direct delivery to beneficiaries is appropriate:

Designers may consider **direct delivery to beneficiaries** based on the following factors:

- **Size of target population:**
  - When there is a smaller target population or a clear targeting mechanism that enables easy identification of beneficiaries, the subsidy can be efficiently distributed directly to end-users. Direct delivery requires precise targeting approaches because the program implementor needs to know the exact households to serve.
- **Availability of products:**
  - When there is a low risk of consumers purchasing substandard products.
  - When there is a wide range of possible products available on the markets, subsidies directly to beneficiaries provide additional flexibility to potential beneficiaries to select the product most relevant to them.
- **Administrative requirements**:

122 Africa Clean Energy (ACE) Technical Assistance Facility (TAF) and Open Capita 2020, Demand-Side Subsidies in Off-Grid Solar: A tool for achieving universal energy access and sustainable markets.

123 IIED, 2020. Energy for all: Better use of subsidies to achieve impact.

- When the administrative requirements are suitable for the target population (e.g., in terms of technology and literacy), given they will need to understand and complete the required verification processes, which frequently include filling out subsidy request forms or sharing feedback.

Consumer awareness:

- When a key goal of the program is to ensure awareness among beneficiaries of the existence of subsidies, delivery directly to beneficiaries helps awareness development.

- Can empower the customer by teaching them about new energy products and their benefits. Some subsidy programs explicitly include this kind of consumer education as a goal.[124]

Data collection

- Program designers can opt to deliver subsidies directly to beneficiaries to collect additional data on the target beneficiaries that can be leveraged for other goals. i.e., provision of capacity building services in these communities in areas like agriculture or access to concessional third-party financing for productive use of energy (PUE) equipment to bring further benefits.

Direct delivery to beneficiaries requires a clear targeting approach to identify the beneficiaries to receive the subsidy. It is important for program designers to accurately identify the beneficiaries and provide them with a cash transfer or a voucher. This is contingent upon the targeting approach and the quality of data available to allow for accurate targeting.

Direct delivery to beneficiaries can be done through cash transfers or vouchers. Cash transfers may take various forms, including physical cash, mobile money, or bank transfers. They can be comprised of either a single upfront payment during the initial purchase or smaller installments paid out alongside verified customer payments, for example, through a PAYGo model. Vouchers offer an alternative method for delivering subsidies to beneficiaries

Direct delivery to beneficiaries requires a **clear targeting approach to identify the beneficiaries to receive the subsidy.**

and are available in both electronic and physical formats. An advantage of vouchers is that they can incorporate advanced security measures, such as watermarks or multifactor authentication, to prevent duplication or unauthorized resale.

Cash transfers may be conditional or unconditional. Most direct subsidy programs linked to OGS and clean cooking solutions are delivered as either conditional cash transfers or vouchers. Conditional cash transfers imply subsidy recipients are subject to meeting certain desirable behaviors. In the case of energy access, such a condition may be to use the subsidy to pay for clean and high-quality energy products or services (the program's eligible products and services). Unconditional cash transfers would remove such a condition, giving the beneficiary the freedom to choose how to spend it. Unconditional cash transfers are not common in energy access programs, where there are often specific objectives linked to beneficiaries acquiring a certain tier and quality of access to electricity or clean cooking solutions. A conditional cash transfer program needs to be vigilant in announcing it (so that all parties involved understand the rules), monitoring it, and enforcing it. Vouchers are an alternate format for delivering conditional cash transfers. They are useful to maintain control of the quality of products acquired by linking voucher redemption to only qualified suppliers.

Delivery of subsidies directly to beneficiaries provides a straight communication channel with beneficiaries and ensures reach. This is because direct delivery provides an additional channel for feedback from intended beneficiaries during the subsidy delivery process. Beneficiaries are also kept aware of the true price of systems and the existence of subsidies because they engage directly with product costs. Additionally, direct delivery to beneficiaries allows EUS designers to reach the target population directly, thus minimizing risk of leakage or inclusion error.

124 Stephen Nash and Jo Khinmaung-Moore 2020, Designing Sustainable Subsidies To Accelerate Universal Energy Access A briefing paper on key principles for the design of pro-poor subsidies to meet the goal of sustainable energy for all.

The effectiveness of direct delivery to consumers may be limited by administrative processes that require literacy and technology access, among other requirements. This is because both cash and vouchers require customers to engage administratively with the subsidy through digital or written channels. This may carry risks of exclusion error if customers are unable to do so. For example, beneficiaries might have to submit applications for subsidies or meet routine monitoring requirements, among other administrative requirements. Transfers via mobile money or digital e-voucher systems may risk leaving out people that do not have a phone/mobile money account.

Cash transfers may limit the risk of price distortion as customers directly interact with the full price of a system, sometimes even paying the full price upfront and receiving cash payments after the fact. Customers are keenly aware of the possible alternative uses of cash, which may lead to them placing greater value on subsidized energy products. Without proper control mechanisms, however, there is a greater risk that households will use the funds for other products or services, or low-quality products not intended to be eligible for the program. To limit this risk, designers often prefer to deliver cash in smaller amounts alongside recurring verified customer payments for the product.[125]

Before opting for cash transfers, designers may want to assess the possibility of leveraging existing disbursement channels. These include mobile money services or microfinance institutions.[126] Using existing channels is often preferable because setting up a new delivery channel that is efficient and robust is administratively costly and, in most cases, impractical. For example, Kenya's Mwangaza Mashinani Program leveraged the subsidy disbursement channels of the National Safety Net Programme (NSNP)[127]. When existing channels are available, extensive due diligence is recommended to ensure all intended beneficiaries can access the subsidy. Other factors to consider include the availability of security measures to avoid misuse of the funds and the efficiency of systems to ensure timely disbursements. See Case study 9 below for details on the procedure followed in Bangladesh to select the partner for delivering the subsidy.

CASE STUDY 9

Direct delivery of subsidies to beneficiaries in Bangladesh's BEAM Fund

Program Objectives: To test the effectiveness of conditional end-user subsidies and enhance the effectiveness of financing to vulnerable market segments.

Overview: The clean cooking market in Bangladesh has witnessed significant developments driven by various initiatives and partnerships. The Bangladesh Energy Access to Modernisation Fund (BEAM Fund) aimed to reach 10,000 people in 2,000 households with clean cooking access and provide a total of €50,000 in end-user subsidies to consumers. This intervention was aligned with the Government of Bangladesh's priority to promote the practice of stove stacking to achieve universal access to clean cooking by 2030.[128,129,130]

Delivery channel: Direct to beneficiary through conditional cash transfer

The subsidy was delivered through a post-purchase cash transfer to beneficiaries through a mobile banking payment system. The cash transfers were conditional on customers acquiring clean cooking equipment. The program encouraged suppliers to provide PAYGo options for disbursements such that the upfront cost was significantly reduced for potential beneficiaries.

SNV, the implementation partner, conducted a rigorous procurement process and registered with Bkash, a mobile financial services provider, to ensure the transparent distribution of subsidies to the intended beneficiaries. Since some beneficiaries did not have Bkash accounts, SNV also supported their registration of accounts to facilitate the transfer of the subsidies.[131]

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125 End-User Subsidy Lab, Case study: Mwangaza Mashinani Program

126 Africa Clean Energy (ACE) Technical Assistance Facility (TAF) and Open Capital 2020, Demand-Side Subsidies in Off-Grid Solar: A tool for achieving universal energy access and sustainable markets.

127 More information on this project is available the End-User Subsidy Lab website.

128 Note: Stove stacking involves using multiple stoves concurrently. The choices in stove and fuel use are influenced by factors such as accessibility and availability of clean cookstoves and fuels, cultural considerations, and environmental influences. These choices are primarily shaped by household income and the costs associated with acquiring and using stoves and fuels, including both initial and recurring expenses. Shankar, A. V., et. al, 2020. Everybody Stacks: Lessons from household energy case studies to inform design principles for clean energy transitions.

129 EnDev, 2023, Bangladesh Energy Access to Modernization, BEAM Fund: Final Project Report

130 SNV, Bangladesh Energy Access to Modernization Fund (BEAM Fund)

131 EnDev, 2022, Bangladesh Energy Access to Modernization, BEAM Fund Final project report

The voucher approach minimizes the risk of funds being used incorrectly since they are designated for the specific purpose outlined by the subsidy program. In addition, when delivering the voucher, the program may utilize the opportunity to gather feedback about the program from the beneficiary. The level of mobile penetration or other relevant technological or financial inclusion indicators among the target beneficiaries plays a role in deciding between electronic and physical voucher delivery methods.[132]

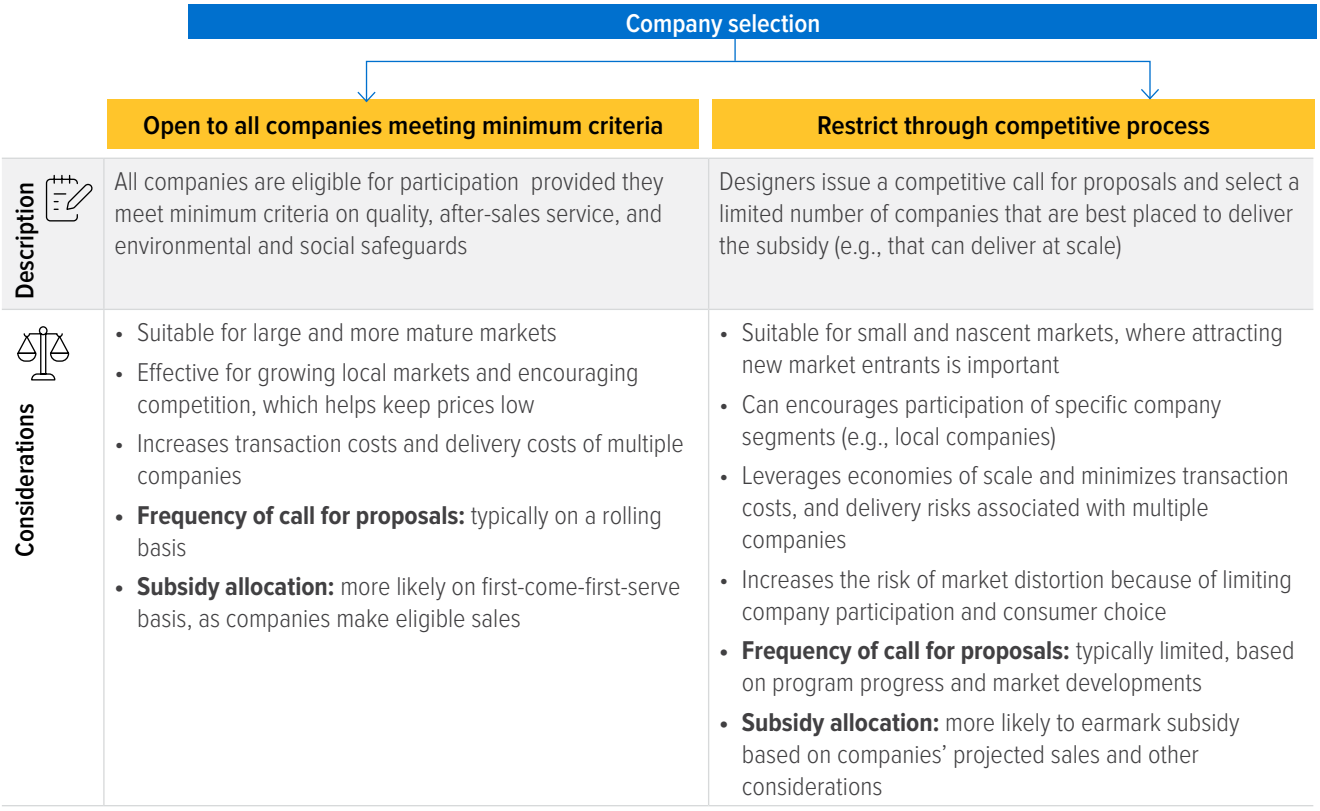
However, creating and managing the vouchers requires additional administrative capacity. This administrative process may result in voucher shortages, under or over-budgeting, and other operational complexities. The voucher approach requires that customers are made aware of the companies participating in the subsidy program in order to redeem their vouchers. As such, communication and raising awareness about the participating companies to the end-users is critical for the success of an EUS program using this approach. Additionally, the voucher system means that companies must make claims to receive reimbursement for the subsidy.

The voucher approach **minimizes the risk of funds being used incorrectly** since they are designated for the specific purpose outlined by the subsidy program.

2.5.2 Company selection

When delivering subsidies through companies, the company selection process is an important step for designers. The subsidy program can allow all companies to participate, after screening for certain minimum eligibility requirements, or restrict participation to a limited number of competitively selected companies. While both options set minimum eligibility criteria, a key difference is that the second option is more restrictive in nature and assigns 'lots' of the subsidy to a few players at the start of the EUS program. The most appropriate approach depends on the program goals, targeting approach, market maturity, and administrative cost as key factors.

Figure 18: Company selection choices



132 Africa Clean Energy (ACE) Technical Assistance Facility (TAF) and Open Capital 2020, Demand-Side Subsidies in Off-Grid Solar: A tool for achieving universal energy access and sustainable markets.

Table 5: Questions to help determine company selection approach

- How many and what eligible companies are active in the market?
- Is the goal to incentivize market entry and attract companies to serve hard-to-reach communities?
- Is the development of local companies a priority?
- Does the program designer want to foster partnerships between international and local companies?
- What are the avenues for keeping the management costs low?

Open to all companies meeting minimum eligibility requirements

In more mature markets, designers typically opt to open participation to all companies. That is because in these markets, there will likely be enough companies that meet the qualification criteria to deliver the subsidy to the intended beneficiaries, and open participation allows designers to maintain the competitive dynamics between them. In these cases, designers define eligibility criteria for companies to participate in the program. Eligibility may be determined by requirements around company registration and compliance, company structure and ownership, company business model and operations, company capacity to adhere to minimum consumer protection practices, company capacity to meet consumer data collection and reporting requirements, the type of products and consumer finance offered, and meeting social and environmental safeguards.[133] Program designers may also include a gender focus as part of the eligibility criteria for participating companies. For example, Malawi's Ngwee Ngwee Ngwee Fund (NNNF) explicitly stated, *"Among equally capable applicants, preference will be given to women-owned or women-led businesses and companies that can demonstrate employing a gender diverse workforce."* [134]

Opening participation to all companies is effective for growing local markets and encouraging competition, which helps keep prices low. A key benefit is that it gives the end-user the widest product options, thus encouraging open market dynamics. It is also effective when program designers are using less targeted approaches. The case study below explains why Uganda's Energy Access Scale Up Project (EASP) opened participation to all companies alongside an untargeted approach to beneficiary selection within a mature OGS market.

Opening participation to all companies may carry higher administrative costs. For each company participating, the subsidy program will need conduct due diligence, issue contracts, run monitoring and verification procedures, and manage disbursements.

CASE STUDY 10

Open company participation to all in Uganda's Energy Access Scale-up project

Program objectives: To increase access to energy for households, commercial enterprises, and public institutions.

Overview: With funding from the World Bank, the Government of Uganda set up the Energy Access Scale Up Project (EASP) to increase energy access. The financial component of the program is implemented by Uganda Energy Credit Capitalization Company (UECCC), and its goals include the provision of results-based grants to facilitate access to SHS, clean cooking, and Productive Use of Energy (PUE) technologies.[135] The RBF includes both an untargeted end-user subsidy and a supply-side incentive for companies to expand operations into more remote and underserved areas.

Company selection approach: Open to all eligible companies

Uganda is classified as a mature OGS market.[136] Participation is open to all energy service companies that initially and continually meet the eligibility criteria to ensure the market remains competitive. These criteria are as follows: adequate ownership structure; possession of adequate funding; possession of a bank account; a satisfactory end-user pricing scheme; proof of the quality of operations; ability to provide a warranty and after-sales service; commitment to gender quotas (at least 10% of the workforce should be women); ability to maintain relevant data systems; and ability to pass a due-diligence inspection. These criteria were set by UECCC.

Launched in 2023, the program outcomes are yet to be established.

133 End-User Subsidy Lab learnings

134 Malawi Energy Access Project 2023, Request for Proposals, Market Catalyst Fund under Ngwee Ngwee Ngwee Fund (Off-Grid Market Development Fund).

135 Uganda Energy Credit Capitalization Company, 2023, Results Based Finance Manual (Part C of EASP Project Operations Manual)

136 Based on the Off-Grid Solar Market Trends Report 2022: State of the Sector, page 80.

Restrict participation to a limited number of companies through competitive selection

Designers **restrict participation** in scenarios where the market has a limited number of companies or where they want to prioritize a specific type of company (e.g., local vs international). Restricting the participation of companies can also be applied to minimize the transaction costs, minimize delivery risks associated with multiple companies, and leverage economies of scale by larger established companies to ensure public funds are utilized efficiently. Restricting participation may also be used to incentivize companies to enter 'less commercially viable' or 'hard-to-reach' regions by guaranteeing companies a more substantial portion of the subsidy. An example of restricted participation is the Togo CIZO program. Given OGS solutions played a significant role in their national electrification strategy, but that the OGS market was only nascent, the government used a competitive selection process to incentivize market entry for international companies, selecting five participating companies.[137]

Programs may also consider encouraging collaboration between international and domestic enterprises, especially when promoting local businesses is a key objective. Governments may require that subsidies be restricted to local companies, which are frequently smaller in scale and typically operate in rural, harder-to-reach areas. Generally, it is advisable to work with more than one company to avoid creating a monopoly.[138] Program designers and funders are also advised to set up an impartial committee that evaluates the selection process results to ensure it is fair, transparent, and in line with program goals.

When restricting participation, minimizing the risk of distorting market competition is important. Program designers should be cautious not to limit consumer choice and put in measures to ensure companies operate in a competitive environment where they price their products fairly and provide adequate after-sales services.

When restricting participation, minimizing the risk of distorting market competition is important. Program designers should be cautious not to limit consumer choice and put in measures to ensure companies operate in a competitive environment where they price their products fairly and provide adequate after-sales services.

Other considerations: subsidy allocation to participating companies and frequency of onboarding new companies

For companies participating in a subsidy program, subsidies can either be earmarked or allocated to them in advance on the basis of their projected eligible sales, or they can be allocated based on actual sales, on a first come first serve basis.

- **First come, first serve:** eligible companies prequalify for a program and then claim the grant as they make sales on a first come, first serve basis subject to any company caps. Transparency should be provided to all firms, showing how much of the total grant has been paid out and how much is available.[139]

- **Earmarking subsidy amounts per company:** In some circumstances, it is also helpful to incorporate a maximum subsidy amount per company. This is to avoid situations where a fast mover monopolizes the market and prevents other actors from participating. Conversely, program implementors may also start with small subsidy amounts for specific companies to test their ability to implement and avoid overcommitting on non-performing contracts. Setting a maximum amount, which can be periodically reviewed, also helps to manage the risk that the program funds become 'over-subscribed' or depleted too quickly.

Similarly, a program can choose to issue one or several calls for proposals to onboard companies into the subsidy program, or to keep applications open on a rolling basis.

2.5.3 Subsidy disbursement

When working through participating companies to deliver subsidies, there are four subsidy disbursement approaches. Companies participating in the subsidy program sell products and services at a subsidized price and then claim reimbursement. The following options guide the payment schedule (or cadence) of subsidy reimbursement to participating companies:

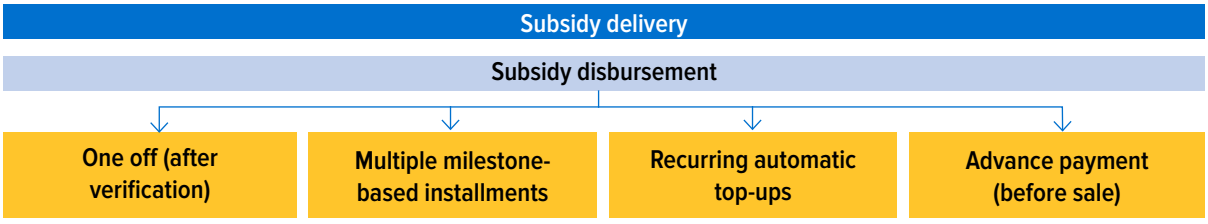
137 End-User Subsidy Lab, Case study: Togo CIZO Check Program

138 Africa Clean Energy (ACE) Technical Assistance Facility (TAF) and Open Capital 2020, Demand-Side Subsidies in Off-Grid Solar: A tool for achieving universal energy access and sustainable markets.

139 Open Capital consultations

- **One-off payment (after verification):** Subsidy payments are reimbursed in full, one off, for all products sold within a certain period, after such sales have been verified by the program.
- **Multiple milestone-based installments:** Subsidy payments are made at regular intervals determined by completion and verification of pre-defined service conditions.
- **Recurring automatic top-ups:** Subsidy payments are made to match the repayment pattern of the beneficiaries, for instance in PAYGo sales or EaaS contracts.
- **Upfront payment before a sale:** A portion of the subsidy payment is made before a sale has been made and verified, often to support companies with upfront capital expenditure. The remaining subsidy can be disbursed following one of the above approaches.

Figure 19: Payment schedule choices



	One off (after verification)	Multiple milestone-based installments	Recurring automatic top-ups	Advance payment (before sale)
Description	Companies are reimbursed in full, one off, for all subsidized products sold within a certain period, after such sales have been verified by the program	Subsidy payments are made in regular intervals determined by completion and verification of pre-defined service conditions	Subsidy payments are made to match the repayment pattern of the beneficiaries	Portion of subsidy is paid before sale and verification. The remaining subsidy is disbursed following one of the prior approaches.
Considerations	• More suitable for relatively low subsidy amounts • Lower transaction and verification costs • Convenient for companies as it reduces working capital requirements • Limits options to enforce after-sales service • May limits accuracy of reporting (given once-off verification)	• More suitable for relatively high subsidy amounts • Higher transaction and verification costs • Less convenient for companies as it increases working capital requirements (which they may pass on to consumers through price) • Tool to enforce after-sales service • Improves accuracy of reporting (given multiple verifications)	• More suitable for PAYGo sales and EaaS contracts (rather than cash sales) • Similar considerations as multiple milestone-based instalments (in terms of cost and quality aspects)	• Useful to reduce companies' working capital requirements • May increase transaction costs • Suitable where access to finance for companies is limited

Table 6: Questions to help determine the selection of a subsidy disbursement approach

- How are eligible products and services sold (for example, cash, PAYGo, or fee-for-service)?
- What mechanisms or incentives exist to guarantee companies provide after sales services?
- Do suppliers have sufficient working capital / financial resources?
- Are there other supply-side incentives in place, such as credit lines?

One-off payment (after verification) is an efficient subsidy disbursement approach because each product sold has a single subsidy transaction and only needs to be verified once. As a result, a one-off payment approach minimizes both transaction costs and administration. Nigeria's NEP subsidy program has over 50 participating companies and uses this approach to reduce costs and expedite disbursements (see section 3.5 for details).

This approach is attractive to energy companies selling products on credit because they can access additional working capital at no cost. This is because the full subsidy payment is given after the customer has only made the first down payment. To illustrate this benefit, consider a SHS on sale at a price of $100 under a PAYGo arrangement, whereby the customer needs to make a 20 percent down payment upon purchase. Suppose this product has a 40 percent subsidy. In that case, the energy company will receive $60 at the moment of purchase (the sum of the customer's down payment and the subsidy) instead of $20 (the down payment under the PAYGo arrangement).

While the one-off payment approach minimizes transaction costs and is attractive to companies, it has a few challenges.

- The program implementor, for instance, has no avenue to **verify that the OGS company is providing after-sales services** to the subsidy beneficiary because verification is carried out only once at purchase. As a result, the beneficiary may face technical challenges with the purchased OGS or clean cooking product and not receive support. It is important to highlight that for PAYGo sales, the company still has an incentive to provide after-sales service, since future customer payments are dependent on the customer having a functional system. There are also ways for a subsidy program to mitigate against this risk, such as (i) working with companies with a proven track record in after-sales service and establishing an appropriate grievance redress mechanism, (ii) use one-off payments only in program's where subsidies are relatively low, leaving a substantial amount for the customer to pay over time.
- The secondary impact of this is that the EUS program may have **inaccurate reporting on households** connected to electricity or provided with clean cooking solutions. Because of the single verification, there is a possibility that a subsidy may be paid out to an OGS company, and the beneficiary household counted as having access, even when the product may stop working or households defaulted on their payments. This risk can also be mitigated by (i) working with companies committed to after-sales service, and (ii) establishing suitable monitoring systems, such as remote-monitoring platforms (more details in section 2.6 on verification).

While the multiple milestone-based installments approach attracts higher transaction costs, it also allows implementors to ensure that companies provide after-sales services to beneficiaries and that beneficiaries complete their payments in the case of PAYGo sales. This is because the program implementers stay in contact with the company over a longer period. Criteria for payments typically include the level of customer satisfaction and quality of service, among others. For instance, Rwanda's REF pays companies in three installments for PAYGo sales and two installments for cash sales. The final installment is made after three years of service (details in section 3.4).

The multiple milestone-based installments approach has two main disadvantages. First, the multiple payments and verification processes lead to higher costs and more cumbersome processes. Second, the program designers may have to spend more time with participating companies to align on milestones for the payment.

Recurring automatic top-ups are used when the beneficiary is required to pay fixed amounts over a regular repayment schedule. The subsidy amount is disbursed to the companies per this repayment schedule. For instance, if a PAYGo beneficiary is obligated to make 24 equal monthly payments on specific dates, then the program will disburse parallel payments to their service provider following the schedule. Like all other approaches discussed where the program implementers stay in touch with the company over a long period, recurring automatic top-ups ensure that the energy company addresses technical challenges through after-sales services.

This method is more appropriate for a fee-for-service subsidy or PAYGo programs with monthly payments. Togo's CIZO program uses this approach to settle subsidy amounts to participating companies (see case study below).

CASE STUDY 11

Multiple recurring disbursements in Togo's CIZO program

Policy Objectives: To achieve universal electricity access for people living in rural Togo through increased access to off-grid solar systems.[140]

Overview: In line with the government of Togo's National Electrification strategy to reach universal electrification by 2030, the CIZO program was initiated to deploy SHS through public-private partnerships. The program was designed to target rural populations and electrify more than 555,000 households with SHS of 20Wp, which is above the minimum Tier 1 access defined by the multi-tier framework. During the program, the government has sought to address affordability using two means: consumer financing (provided by MFIs and SHS companies through their PAYGo platforms) and an end-user subsidy.

Subsidy disbursement: Multiple recurring disbursements Upon identification of eligibility for the program, beneficiaries acquire an eligible SHS and make a payment to activate an associated mobile money account. The telecom company then requests an eligibility confirmation from the government and, if it is successful, channels the subsidy to the SHS company. Given the PAYGo nature of the program, the company collects regular payments from the customer, and in parallel, the telecom company transfers subsidy funding to the company monthly for 36 months.

Like the multiple milestone-based installments approach, the multiple recurring top-ups approach attracts higher transaction costs. In addition, maintaining the automatic payments usually requires an IT system, which increases administrative costs, both for government and for companies.

An additional subsidy disbursement option includes upfront payments, which can be used in combination with one of the approaches above.

Advance payments are when the subsidy program pays out part of the subsidy at a verifiable milestone before the sale of a product. Typically, after the upfront payment is made, companies must continue submitting claims to the EUS program until their total sales make up the amount of the upfront payment. This approach is often combined with one of the other approaches to ensure that follow-on payments are made. This could be in line with agreed-upon milestones and thus follow a multiple recurring milestone-based payments approach. The method of upfront payments is used in various RBF programs, for example, the Global LEAP RBF made payments directly to both manufacturers and distributors after orders had been placed.

This payment option is especially helpful in contexts where it is challenging for companies to access financing because it provides extra cash flow for companies to purchase stock in advance. While this method might be attractive to participating companies, there is a risk of misuse of the funds, in which companies use the upfront payment for other purposes. Program designers should, therefore, be cautious in using this method. They should apply rigorous screening of companies during selection as well as close monitoring during implementation to assess whether the use of funds is in line with contractual agreements.

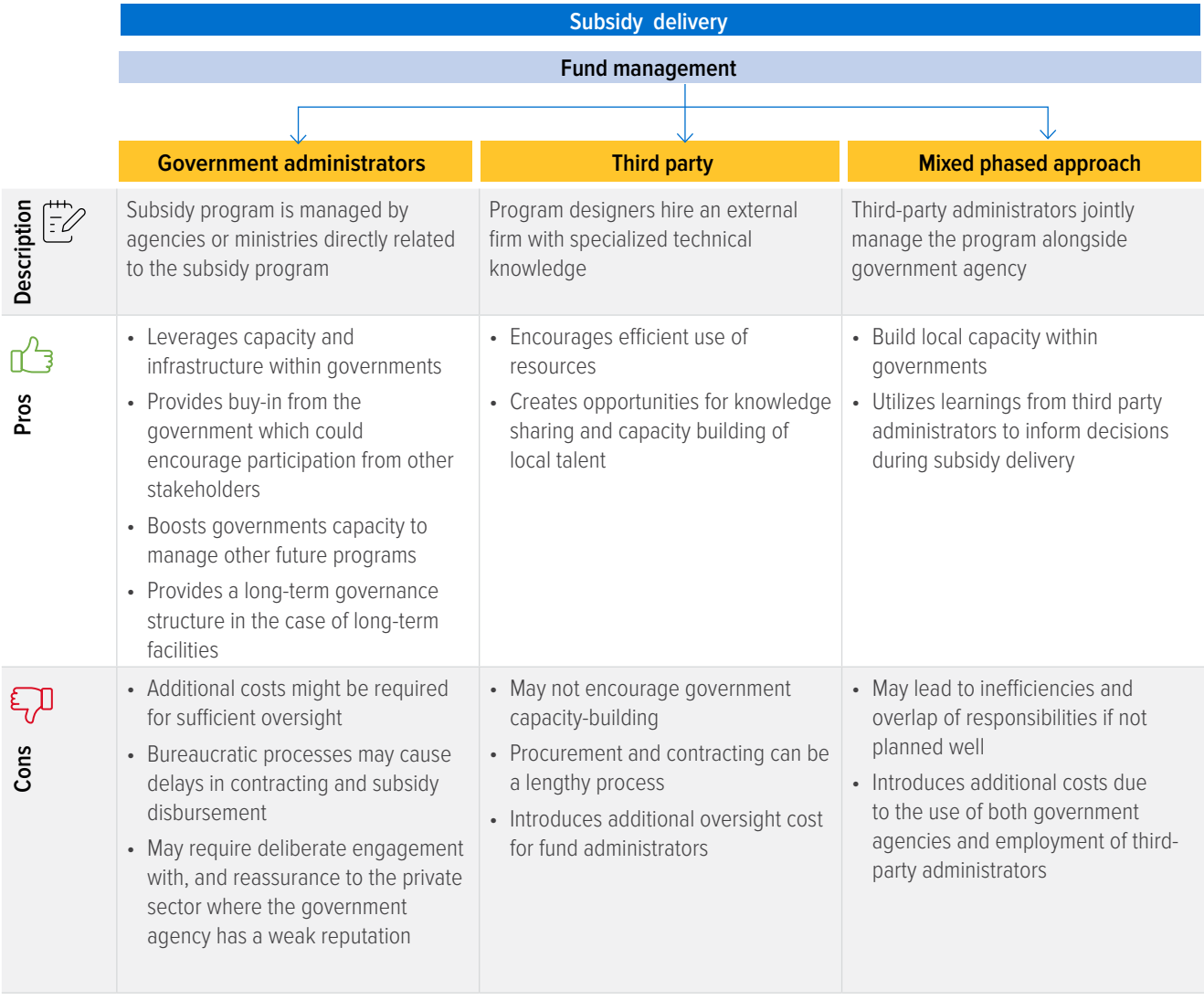
2.5.4 Fund management

Fund managers provide oversight of implementation and program administration. Strong administration structures consist of defined roles and responsibilities for the players involved in implementation, as well as clear processes and procedures for claiming and disbursing funds. This minimizes the risk of abuse of funds. There are three approaches to fund management: government agencies, third-party administrators, or a mixed approach.[141]

140 End-User Subsidies Lab, 2022, Case Study: Togo CIZO Cheque Program

141 Africa Clean Energy (ACE) Technical Assistance Facility (TAF) and Open Capita 2020, Demand-Side Subsidies in Off-Grid Solar: A tool for achieving universal energy access and sustainable markets.

Figure 20: Fund management choices



An important driver for this choice is whether the relevant government agency has adequate institutional capacity and infrastructure to manage the subsidy program. Designers may opt for a third-party administrator in instances where the government agency does not have the capacity, or other considerations may be at play, such as trying to attract a fund manager into the market or aiming to run a pilot requiring short-term, technical expertise. Designers may also opt for a mixed approach that involves a third party working alongside the relevant government agency. Regardless of the approach adopted, it is important to involve public institutions and build their capacity throughout implementation. While this is not a primary objective of EUS programs, it is important for their sustainability. Another general consideration is to engage independent auditors to periodically review the management of funds.[142]

Government administrators are usually situated within agencies or ministries directly related to the subsidy program. The use of government agencies allows programs to take advantage of pre-existing government infrastructure and human resources. For example, the subsidy for SHS under World Bank-funded NEP in Nigeria is managed through the Rural Electrification Authority. Similarly, the Rwanda REF Window 5 is managed by government-owned

142 Africa Clean Energy (ACE) Technical Assistance Facility (TAF) and Open Capita 2020, Demand-Side Subsidies in Off-Grid Solar: A tool for achieving universal energy access and sustainable markets.

EDCL and BRD. Working through governments is also a more natural fit for a long-term subsidy program since it ensures alignment with government priorities and proper governance accountability.

Deciding whether to involve a government agency is often dependent on the following competencies within agency:[143]

- **Knowledge of OGS and cleaning cooking technologies:** Knowledge about OGS or clean cooking markets differs significantly from country to country, and it is important to work with an agency that already understands these technologies well. Where the institutional knowledge of the technologies is low, designers may consider allocating a budget towards training and oversight in the first few years.

- **Past track record in executing similar programs:** It is advisable to engage with agencies that have demonstrated strong financial controls in the past without instances of misappropriation of funds.

- **Level of bureaucracy:** Government agencies have varying levels of bureaucracy due to variances in governance structure and operational policies. Government agencies may have to seek approval from their line ministries, a process that is often time-consuming and can impact contracting and fund disbursement.

Program designers may opt for a third-party administrator with specialized technical knowledge, such as a private sector entity or development partner. This is especially appropriate when the relevant government agencies in the country have limited capacity to execute the project. For example, in Malawi, the Ngwee Ngwee Ngwee Fund (under the Malawi Electricity Access Project) selected a fund manager through a competitive procurement process. Infrastructure Development Company Limited (IDCOL) was selected to manage the fund.[144] Having demonstrated experience managing similar funds, notably Bangladesh's IDCOL Solar Home System program, IDCOL is well placed to support the Malawi government run the program, while in parallel help develop internal capacity of the Ministry of Energy. Although selecting a local fund manager helps boost local capacity, this does not restrict program designers from hiring international firms with the required technical capacity and a good understanding of the local context. This is also appropriate if program designers want to encourage the third party to set up operations in the country or a particular region. Engaging a third-party administrator is typically more costly than fund management by the government. It is also a lengthy process, with competitive procurement and contracting taking a significant amount of time, which may delay program implementation. However, it may be a cost-effective solution for specialized projects, allowing for leveraging of skills and best practices and for building local capacity.

When selecting a suitable third-party fund manager, designers are advised to take the following steps: [145,146]

- Ensure that the role, expectations, and service levels for the fund manager are well documented in the contract. Create explicit terms of reference, ideally accompanied by an operational manual delineating all the necessary steps, procedures, and required documents.

- Assign fund managers activities that fall within their core business and capacities, such as executing transactions, overseeing clients, and conducting compliance-related tasks. Designers and implementors should seek to enhance these strengths and avoid urging fund managers to assume responsibilities like technical verification that are best suited for independent technical experts.

Engaging a third-party administrator is typically more costly than fund management by the government. It is also a lengthy process, with competitive procurement and contracting taking a significant amount of time, which may delay program implementation. However, it may be a cost-effective solution for specialized projects, allowing for leveraging of skills and best practices and for building local capacity.

143 Africa Clean Energy (ACE) Technical Assistance Facility (TAF) and Open Capita 2020, Demand-Side Subsidies in Off-Grid Solar: A tool for achieving universal energy access and sustainable markets.

144 GET.Invest, 2023, Malawi Off-Grid Market Development Fund (OGMDF) - Debt Window.

145 Open Capital Advisors Consultations

146 EnDev 2021, Transforming energy access markets with Results-based Financing: Lessons from 7 years of implementation under EnDev's RBF Facility financed by UK Aid

- Consider the fund manager's understanding of the local market as well as their human capital resources and access to target beneficiaries in the form of their rural presence, agents, or branch networks.
- Select an institution with a proven interest in the energy sector. Such a firm will be more likely to set up internal procedures and structures leading to the further development of energy-focused services beyond the subsidy program.

Designers may opt for a **mixed approach** when the relevant government agency has the technical capacity to design and execute the program but face limitations in relation to contracting, fund management, and/or disbursement. The program may be designed in such a way that a third-party administrator manages the program alongside the relevant government agency's personnel to capitalize on each institution's expertise. As seen in the case study below in Rwanda, it is important to have a clear division of roles and responsibilities.

CASE STUDY 12

Mixed approach to fund administration in EnDev's Pro-Poor RBF in Rwanda

Program objective: To provide affordable off-grid solar products through a subsidy mechanism targeted to the poorest and delivered through companies[147]

Overview: This pilot project aimed to accelerate access to electricity for low-income households in off-grid areas through targeted incentives. While existing programs focused on access to finance for households and working capital support to companies, affordability remained the key challenge to SHS uptake.[148] The different subsidy levels were informed by the ability to pay of various socio-economic categories, a government of Rwanda system called Ubudehe. Those categorized as Ubudehe 1 are the most vulnerable households and received the highest incentive. The concept of this pilot project was scaled under the government's REF Window 5 subsidy.

Fund management: Mixed approach
From November 2019 to March 2021, EnDev, Rwanda Energy Group (REG), and Urwego Bank, a local microfinance institution, joined forces to execute the pilot program. This collaboration utilized the unique strengths of each organization and fostered a sense of ownership among all stakeholders.

EnDev took the lead in project implementation and management, development of IT monitoring tools, and provision of funds. Urwego Bank played a crucial role in the management of the fund, selection of eligible companies, contract management with participating companies, and overseeing the disbursement of funds. REG was co-implementing the program with EnDev Rwanda, focused on communication campaigns, participating in the selection of eligible companies, and participating in periodic program reviews. The verification was carried out jointly by all the three stakeholders prior to the disbursement of the subsidy.

The third-party administrator may also train government agency personnel on the essential responsibilities for successful subsidy programs. Responsibilities can be progressively transitioned towards the government in phases or based on certain milestones.

2.5.5 Claim management

Claim management involves coordinating with the participating companies to submit information about the sale of a product. The claim process starts with companies submitting a form with information on the customer and the product sale. Information about the customer may include their name, identification number, address or GPS coordinates, and phone number. Product information may consist of product type and model, serial number, date of sale, price, and payment terms (for example, cash or PAYGo).[149,150] A claim form is typically submitted electronically by sending an email or uploading the form onto an online IT platform. For example, in Rwanda's Energy Fund Window 5, companies are required to submit a claim form through email.[151] In Nigeria's NEP, companies submit information through an IT platform.[152] The claim management process

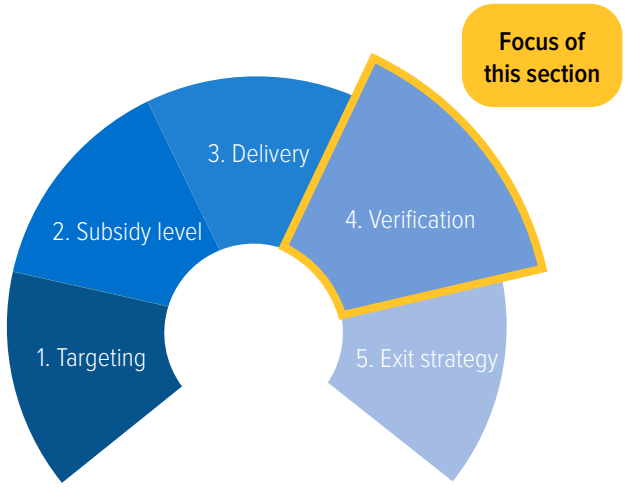
147 End-User Subsidies Lab, 2022, Case Study: EnDev's Pro-Poor Results Based Financing in Rwanda
148 USAID, 2022, Pro Poor Results-Based Financing: Increasing Off-Grid Access To Electricity In Rwanda
149 Development Bank of Rwanda, EDCL, The World Bank 2023, Window 5 Operations Manual.
150 End-User Subsidy Lab learnings
151 Development Bank of Rwanda, EDCL, The World Bank 2023, Window 5 Operations Manual.
152 NEP uses the Odyssey platform. Details provided in section 3.5.

may be further enhanced via a direct integration with a company's Customer Relations Management (CRM) software. In this case, claims can be made automatically through synchronization with the company's latest sales and repossessions.

It is important for program designers to keep the claim management procedure simple and set realistic timelines. Multiple claims by multiple companies may be submitted in parallel, and typically, claims are submitted and handled in batches. For example, a batch may contain 500 sales. The processing of claims mostly involves verification (see next section) and, is ideally quick, accurate, and simple. The process, timelines, and documentation requirements should be well communicated to companies. Transparent communication with companies on the status of claims and any data compliance issues is also important. Digitizing records can significantly enhance efficiency. Using specialized IT platforms for claim management, such as Odyssey, Prospect, or others, can support improvement in automating the claim management process, reducing processing time and potentially reducing overall cost. Further details are provided in the section on verification.

Designers should also consider how to handle specific scenarios related to claims such as repossessions, non-working systems, and fraud. Products sold on credit (PAYGo) may be repossessed by companies when customers do not pay. Other scenarios include those in which products are not working during verification or cases of fraud by the customer or company. Processes for handling claims in these instances should be defined in advance in the operations manual.[153] For example, in the case of repossessions, it is recommended that these must be declared to the fund administrator, if not automatically made aware, e.g., in the case of recurring payments linked to PAYGo payments. There is a risk that companies may hide information about repossessions, as it may impact their subsidies, which means that fund administrators should apply clear processes, monitoring, and potential sanctions. In cases where the subsidy for such products had been fully disbursed, the program may decide to deduct that subsidy amount on the next sale of a similar product. Program designers should further capture processes and policies that handle other issues, such as cases of theft, fraud, and on selling, among others.

2.6 Verification



Verification is used to confirm that the subsidies are implemented as designed, i.e. that eligible products or services have been sold to eligible customers, at a subsidized price, and, to the extent possible, that these products are being used as intended (by the eligible customer, and in good operating condition).

Verification starts at the point of sale, supported by eligibility tools where necessary. That is because vendors need to confirm that a customer meets the subsidy eligibility criteria before selling them the subsidized product. The level of verification at the point of sale is related to the targeting approach. With a less targeted approach, pre-sale verification may be quite simple. At a minimum, the program or company will want to verify that a beneficiary has not already received a subsidy from the program. With more targeted approaches, verification at the point of sale may involve confirming the demographic, geographic, or economic characteristics of a beneficiary as selected in the targeting approach. Companies typically do this verification supported by technology in the form of an online platform or database with data on eligible customers. For example, under Rwanda REF Window 5, an eligibility tool was provided to companies (for more details, refer on eligibility tools, refer to section 2.3 or targeting or section 3.4 for details about the Rwanda REF eligibility tool). The remainder of this section focuses on verification post-sale.

153 Open Capital Advisors Consultations

The core focuses of verification in EUS programs are around product delivery and use, which inform subsidy disbursement. For subsidies delivered through companies, verification confirms whether the product was delivered to the intended recipient as "claimed" or reported by the company. Verification is thus connected to the claim management process (described in sub-section 2.5.5) and helps inform whether a subsidy can be disbursed. Beyond product delivery, the program needs to verify if the product is still operational and has not been resold by the beneficiary.

Verification is typically done by independent verification agents (IVAs). Using a third party for verification helps mitigate the risk of fraud and avoids potential disputes between companies and the fund manager. The IVA can be contracted by the program designer or the fund manager with a mandate to verify product delivery in line with the subsidy design.

There are multiple options and tools to carry out verification, ranging from more traditional or manual forms of verification to more automated verification leveraging data and technology. The more traditional or manual approach typically involves the fund manager and IVA investigating companies' subsidy claims through paper trail checks, and the IVA conducting a combination of phone and field surveys of a sample of customers. The automated verification refers to leveraging data and technology, such as using information on the use of products (if they are equipped with remote-monitoring technology) and customer payment information drawn from companies' customer relation management (CRM) systems or mobile money operators (if such payments are primarily done through mobile money).

There is a trend for subsidy programs to integrate automated verification features where this is possible, to improve the speed and accuracy of the verification process. Where possible, program designers should try to use technology as much as possible but leverage manual methods as a complement. In practice, a hybrid approach is the most often adopted as some level of manual verification is often still needed to complement results from the tech-enabled processes. Manual verification may also be needed in situations where tech-enabled verification will not work. Examples of such situations include projects delivered in remote areas where connectivity is an issue and projects involving lower-tier products that are not equipped with remote monitoring technologies. For example, the more basic improved cook stoves (ICS) are typically not GSM or GPS enabled.

Figure 21: Verification options

Verification (complementary options)

	Traditional / manual verification methods	Automated / technology-enabled verification methods
Description	Involves combined techniques of desk-based verification (paper trail), phone surveys, and field verification	Leverages digital technology to automate verification (e.g., remote monitoring via GSM or GPS, customer payment information through companies' CRM systems or mobile money providers, automatic SMS/Whatsapp surveys, etc)
Pros	• Works for all types of products and regions as it does not require any form of remote connectivity • May involve lower upfront set-up costs compared to automated tech-enabled verification • Flexibility in cases where verification is difficult, as in-person judgement calls can be made, with nuanced insights	• Allows for quicker results and avoids the risks of human errors • Allows for quicker subsidy disbursement to the companies • Lower running costs compared to manual approach, and potential for economies of scale • Allows for data accessibility and transparency
Cons	• Longer execution time than other methods • Phone surveys may not work in areas with low mobile phone ownership or low coverage • Labor-intensive and therefore costly in implementation • More prone to human error or fraud	• May not work for all types of sales (i.e. those not leaving a digital trace, such as cash sales of low-tier products) or in regions with low internet connectivity • Relatively novel approach, and might require manual verification to supplement • Set-up of the system requires high up-front costs

Table 7: Questions to help inform the verification approach

- Does automated / technology-enabled verification increase the price and, therefore, affect the affordability of products?
- What data needs to be tracked during the verification process? Can all of the data be provided through technology, or does it also require manual processes?
- Are there existing databases or platforms that the program may leverage for verification? Or would the program need to develop something new?
- How do program costs (and timelines) compare for both methods?
- Is automated / technology-enabled verification feasible for all products in the program scope? Or is it limited to higher-tier products or products sold with PAYGo as a payment model?
- Does network coverage allow for automated / technology-enabled verification in all the program's target areas?

2.6.1 Manual verification

In manual verification, an IVA combines techniques of desk-based verification, phone surveys, and field verification. These activities are labor-intensive and, therefore, costly to implement. They are more prone to human error or fraud (for example, false narratives from beneficiaries and other stakeholders) and may involve significant logistical challenges, particularly in remote areas. Desk-based verification can include a paper trail and payment verification, including company visits to verify orders and receipts. Field visits and phone calls are typically only done for a representative sample of customers or a given percentage of each company's claim. IVAs may use field officers to confirm in person that beneficiaries have received the subsidized products and that those products are still operational. Each of these steps is labor intensive, and there is a notable risk that customers may not be present or responsive to calls. Therefore, manual verification is a time-consuming process that can potentially delay the disbursement of subsidies to participating companies.

It is important for program designers to create alternative approaches as needed to adapt to beneficiary circumstances. For example, when beneficiaries do not own a phone, program implementors may allow them to provide alternative contact numbers from neighbors or family members for phone verification. Another example is when

It is important for program designers to **create alternative verification approaches as needed to adapt to beneficiary circumstances.**

customers do not know the specific name of their product and are instead allowed to describe what the product looks like for verification purposes. To increase the chances of reaching a beneficiary, phone verification calls can be conducted at different times of the day.

Despite its drawbacks, manual verification has several advantages. First, it is widely applicable because it does not require any form of remote connectivity. It can, therefore, be used across all types of products and regions. In addition, this approach allows for more flexibility in cases where verification is difficult because alternative verification methods exist. Lastly, it allows for more nuanced insights because interactions are in person.

CASE STUDY 13

Manual verification in Bangladesh's IDCOL SHS Program

Program objectives: Provide electrification through solar home systems (SHS)

Overview: The IDCOL SHS Program was one of the world's largest national off-grid electrification programs. The program ran from 2003 to 2018 and provided energy access to about 20 million people through grants and loans. The program was managed by Infrastructure Development Company Limited (IDCOL), a government-owned organization created to support the uptake of SHS. This program was implemented through partnerships with various participating organizations that supplied the SHS.[154]

Verification: Manual
Monitoring and verification were conducted in-house by IDCOL, which built the capacity to manage the process to minimize program costs. For this purpose, IDCOL set up three divisional and 12 regional inspection offices, employing 103 technical inspectors responsible for monthly checks.

The program's cost-effectiveness was attributed to the internal verification operations and the strong sense of accountability among partnering organizations to deliver and maintain high-quality and well-functioning SHS. This approach led to heightened consumer confidence and, consequently, a notable level of program success.

154 End-User Subsidies Lab, How IDCOL Addressed the Affordability Gap: Lessons from Bangladesh's Solar Home System Program

2.6.2 Automated verification

Automated verification leveraging digital technology allows for quicker results and avoids the risk of human errors. In cases where verification is fully automated, the system can do the relevant verification checks and trigger the subsidy disbursement immediately when a new customer is registered. This means companies do not need to wait a long time for the disbursement of funds. Of course, the setup of such a system, whether it leverages an existing solution or builds a new one, involves a significant upfront investment. However, once the system is operational, the running costs are likely to be considerably lower than those related to manual verification. Automated technology-enabled verification also scales up well, as it may be applied in larger programs without the need for many additional staff. Another advantage of working with a centralized online platform is that it allows for data accessibility and transparency. The fund manager, participating companies, and the IVA have real-time access and a single "source of truth." It is important to note that the system should operate in line with the relevant data privacy and security regulations.

Examples of platforms used for automated verification include Prospect and Odyssey. Prospect is an open-access platform based on open-source code. Companies regularly upload their data (ideally via API to enable real-time-monitoring), and the platform can process the data to produce analytics. Personal data is protected through anonymization and there will soon be an option to choose encryption. Companies own the rights to the processed data. The fund manager and IVA get access to a selected subset of the information to verify submitted data and monitor subsidy disbursement. It is also possible to make a direct interface between the remote monitoring system of a company and Prospect. That way, the system also has "live" data on the products in use. Similarly to Prospect, Odyssey offers this service through a license to a platform that can perform automated claim management and verification, among other fund management functions. The Odyssey platform was used in Nigeria's NEP SHS output-based fund. Automation of verification through the platform played a role in its rapid expansion, as explained in the case study of section 3.5.

Automated technology-enabled verification may not work in all situations today because, in some cases, there are challenges in building and integrating the system across participating organizations. Oftentimes, a system needs to be tailored to each program's operations and unique needs, and this comes at a high cost that only makes sense for programs of a large scale. As a result, programs can adopt a mix of both manual and automated verification.

Automated technology-enabled verification may not work in all situations

2.7 Exit or Adjustment Strategy

Focus of this section

An exit strategy aims to ensure a sustainable market for products or services after a subsidy is withdrawn. Traditionally, this occurs when consumers no longer need the subsidy to purchase this product or service. Without a clear exit strategy from program designers, it is more difficult for companies to plan their approach to continuing operations in an unsubsidized market.[155]

Exit strategies are more complicated when it comes to end-user subsidies. Since EUS aim to address the affordability gap in energy access and ensure no one is left behind, the "need" for the subsidy will continue until universal access is affordable on a purely commercial basis (through a combination of economies of market scale, technology advances driving cost reduction, and economic development). It is clear that programs have limited resources and must operate within their realities. Therefore, considering a program-level exit strategy for the moment a program runs out of time and money is crucial to ensuring beneficiaries are not sent back into energy poverty and markets are not distorted. Supply-side subsidies may be simpler to 'exit' given their aim to expand access by reducing the upfront risks or costs to companies with an intrinsic expectation of building a commercial market. For example, incentivizing companies to enter a new market by offering incentives for the first 1,000 systems sold, assuming that companies will choose to continue operating in that market after the subsidies are removed.

155 GOGLA Discussion Paper: How End-User Subsidies Can Help Achieve Universal Energy Access

Exit strategies are more complicated when it comes to end-user subsidies. Since EUS **aim to address the affordability gap in energy access and ensure no one is left behind**, the "need" for the subsidy will continue until universal access is affordable on a purely commercial basis

Therefore, considering a program-level exit strategy for the moment a program runs out of time and money is crucial to **ensuring beneficiaries are not sent back into energy poverty and markets are not distorted.**

A program-level exit strategy, in the context of EUS, means addressing the next step once the specific program ends. In cases where subsidies are expected to continue through another subsidy program, subsidy 'adjustment' may be more appropriate terminology than 'exit'. It is critical to define this next step from the program's start to ensure program objectives, timing, and funding are aligned with what will follow. At the same time, it is helpful to review subsidy schemes regularly to account for changes in market dynamics that may impact the exit or adjustment strategy. There are three potential exit paths shown in Figure 22, including:

i. **Subsidies are no longer needed:** Letting an unsubsidized market take over because the subsidy is no longer needed.

ii. **New subsidy program:** Designing a new program for the next phase of the subsidy (in which case it is important to think through the transition and any gaps between the programs).

iii. **Long-term subsidies:** Envisioning long-term subsidies through a sustainable long-term facility.

Figure 22: Exit strategy options

Exit and adjustment strategies

	Subsidy no longer needed	New subsidy program	Long-term subsidies
Description	When a government has fully achieved its targets and a subsidy is no longer needed, an unsubsidized market can take over	Transitioning to a new subsidy program, with restructuring of subsidies if needed	Continuous end-user subsidy facility that consumers and companies participate in, can be funded from the national treasury or sector level funds
Considerations	• Affordability is no longer a concern, or can be addressed through other mechanisms (e.g., consumer finance, a social protection cash transfers for the most marginalized) • The exit should ensure alignment with program goals • Program should make certain that the market is not distorted • Market monitoring is critical to understand changes in market dynamics to identify when subsidies are no longer needed	• Affordability continues to be a concern to achieve and sustain energy access • Programs are designed to operate within specific timelines and budget constraints, but can transition into new programs where appropriate • A smooth transition from program to program is critical to ensure that the expectations of beneficiaries are appropriately managed	• Affordability likely to remain a long-term concern to achieve and sustain energy access • It is important to consider what recurring subsidies, may be needed to sustain universal energy access • Sustainability in funding and operations is crucial where long-term subsidies are envisioned

Table 8: Questions to help determine exit strategy

- What is driving the current need for subsidies? Are these market dynamics expected to change?
- What are the project's targets? Are there enough funds to fulfill this target?
- What are the government's targets (e.g., universal access, minimum tier), and what are the resources needed to achieve them?
- Can subsidies be phased out after the project's target is achieved? After the government's target is achieved?
- Will recurrent subsidies be needed?

2.7.1 Subsidies no longer needed

When a government has fully achieved its targets, and a subsidy is no longer needed, the market can take over on a purely commercial basis. Depending on the targets set in the context of EUS, that could mean, for example, that all households have access to at least Tier-1 electricity and at least Tier-2 improved cookstoves. In addition, it would mean that customers who received a subsidy to purchase a product can now afford replacement parts or fuel costs, for example, LPG.[156] Alternatively, it may mean that affordability is no longer a major barrier to access, and beneficiaries can afford basic lighting and cooking products on their own. This may be due to a rise in income or product innovations that have driven down costs. Another alternative may be that affordability is still a gap for a smaller group of people. This could also be addressed by a social assistance program rather than a specific energy access EUS program. While all these scenarios are unlikely to happen on a large scale within the timeframe needed to achieve SDG 7, it may be the case in specific regions.

In this scenario, the exit strategy should ensure program goals are met and that there is a successful transition to a market functioning without subsidies. It is critical that there is a proper phase-out of the subsidy program to make certain that the market is not distorted (see the section below on phasing out subsidies). It is recommended that market monitoring is conducted alongside the phase-out so that program implementors can inform participants of risks – and help them manage these – as the program ends. These risks include business collapse, financial losses, and customers having no recourse to repair or replacement services.[157]

CASE STUDY 14

Decreased need for subsidies in Bangladesh

Program objectives: Provide electrification through solar home systems.

Overview: The IDCOL SHS Program was the largest national off-grid electrification program in the world. The program ran from 2003 to 2018, providing electricity to about 20 million people through grants and loans that facilitated access to SHS. The program was run and managed by Infrastructure Development Company Limited (IDCOL), a government-owned organization that supported the uptake of SHS.[158]

Exit: Subsidies no longer needed

When the SHS Program was launched in 2003, there were around 15 million unelectrified rural households in the country, and the rural electrification rate was under 27%. At that time, the pace of grid electrification was slow. The number of unelectrified rural households declined slowly, reaching about 13 million by 2013. IDCOL estimated at that time that the market for SHS was about 6 million households or about 50% of unelectrified rural households. However, in the following years, the pace of grid electrification accelerated. Among the remaining unelectrified households, an expectation of imminent connection to the grid made many reluctant to invest in SHS. Coupled with an increase in commercial SHS sales and the impact of other government initiatives (e.g., social safety net programs), subsidized SHS sales in the IDCOL program began to decline in 2014, following 11 years of growth. By 2018, more than 80 percent of rural households had access to electricity from either the grid or SHS.

At the same time, the technology for SHS changed, bringing down their cost and altering where subsidies were needed. At the same time, rural households' average incomes increased, and they began to seek additional services from their SHS. The average grant amount per SHS dropped from 19% of the retail price in 2003 to under 5% in 2017.

Following a study to ascertain an appropriate exit strategy for IDCOL, the government opted to gradually reduce the grant component by narrowing down the systems that qualified and reducing the amount of the subsidy itself. From 2012, only systems smaller than 30Wp were eligible for a subsidy. The subsidy amount was set between $9 and $13, down from $55 in 2005 (at which point the subsidy could be used on a system of any size).

156 Private sector paper on "Recommendations for Demand-Side Subsidy Design for Accelerating SHS-Driven Energy Access"

157 Cabraal, Anil, William A. Ward, V. Susan Bogach and Amit Jain. 2021. Living in the Light: The Bangladesh Solar Home Systems Story. A World Bank Study. Washington, DC: World Bank.

158 End-User Subsidies Lab, How IDCOL Addressed the Affordability Gap: Lessons from Bangladesh's Solar Home System Program

Key insight on exiting when subsidies are no longer needed: Market monitoring is critical to understand changes in market dynamics that may impact the subsidy scheme and to identify when subsidies are no longer needed.

2.7.2 New subsidy program

Subsidy programs are designed to operate within specific timelines and budget constraints but can transition into new programs where appropriate. For example, EUS programs often start with a pilot to test a given market's need for subsidies. The narrow scope of a pilot helps avoid market distortion as crucial information is gathered. Programs can then be scaled up by raising new funding or become embedded within existing programs. Close involvement of the scale-up players during implementation allows for a smooth pilot transition into the scale-up phase. Beyond pilots, more extensive programs may also transition into a newer phase, for example, when shifting towards a new region or target group.

A smooth transition from program to program is critical to ensure that the expectations of beneficiaries are appropriately managed. For instance, if the subsidy's target group or product category changes from one program to the next, this must be clearly communicated to avoid confusion in the communities being served. It is important to note that during the design phase, it may not be known if there will be a scale-up or follow-on program, but designers and implementers should make an effort to shape this next phase where possible. Government and potential funders of such new programs should be involved as early as possible to help design an effective 'transition' strategy. In the EnDev pilot for Malawi, for example, the designers identified a government-led fund, supported by the World Bank, as a potential avenue for a scale-up and involved both stakeholders in the design and implementation of the pilot to ensure a smooth handover. This case study is further discussed in 3.2 Designing an EUS pilot targeting the poorest in Malawi.

A smooth transition from program to program is critical to **ensure that the expectations of beneficiaries are appropriately managed.**

Key insight on exiting through new subsidy programs: Program designers are advised to plan well in advance for what could happen after the program ends (i.e., when funds run out or the scheduled timeframe is over) and incorporate this into the exit strategy of the program.

2.7.3 Long-term subsidies

When designing a subsidy, it is important to consider what recurring subsidies, if any, may be needed to sustain universal energy access.[159] Programs with fixed end dates often fail to fully eliminate the affordability gap in a market either because they run out of funds or because there is continued need by marginalized communities for subsidies (for example, to buy, repair, and replace a product). In the case of clean cooking, the poorest consumers may need an ongoing subsidy to buy clean cooking fuel for years to come. The idea of a long-term facility is to have an end-user subsidy scheme that both consumers and companies can tap into on a continuous basis. Companies may find participating in these long-term subsidy facilities appealing because they give them long-term access to potential customers who would otherwise be beyond their commercial reach.[160]

Where long-term subsidies are envisioned, programs should consider how these can be sustainably funded and operated. A long-term facility may be funded by the government or supported by donors. Donor funding may not always allow for long-term facilities. Governments may decide to fund subsidies in other ways, for example, by introducing an electricity levy to subsidize off-grid solutions. Energy markets in many developed countries have such sustainable cross-subsidies in place, which are designed to make energy access universally affordable.[161] This is also being explored in less developed markets, for example, by using income from electricity supplied through the grid to help fund mini-grid development in off-grid settings. Ongoing discussions advocate for extending this pricing mechanism to include mini-grids operated by private companies or cooperatives as well.[162,163] Carbon finance associated to the use of clean energy products may also be considered as a source of funding for long-term subsidies. Besides the funding challenge, other potential obstacles for a long-term facility may be the cost and time involved in the set-up and the government's capacity to operate this.

159 Terafund Designing 2020, Designing Sustainable Subsidies To Accelerate Universal Energy Access: A briefing paper on key principles for the design of pro-poor subsidies to meet the goal of sustainable energy for all

160 Hamayun, Mansoor 2020. Op-Ed: This is how Africa can accelerate energy access.

161 Terafund Designing 2020, Designing Sustainable Subsidies To Accelerate Universal Energy Access: A briefing paper on key principles for the design of pro-poor subsidies to meet the goal of sustainable energy for all

162 Energy & Petroleum Regulatory Authority March 2023, Press Release : Retail Electricity Tariff Review For The 2022/23-2025/26 4th Tariff Control Period (TCP) Effective 1st April 2023

163 Climate Compatible Growth 2021, At what price? The Political Economy of mini-grid electricity development and deployment in Kenya

CASE STUDY 15

Long term subsidies in South Africa

Program objectives: South Africa's Free Basic Electricity (FBE) and Free Basic Alternative Energy (FBAE) programs provide a limited amount of electricity (or alternative source of energy for off-grid households, such as OGS solutions) for free to eligible poor households.

Overview: Municipalities in South Africa are responsible for providing electricity to their population. They are also responsible to determine which households are eligible for subsidized electricity through the FBE program. South Africa's municipalities have registered 3.5 million indigent households in 2017, about 20% of the population.[164] About 2.1 million among them are receiving FBE through the electricity network.[165] For households identified as 'indigent' that are not connected to the grid, the FBAE policy instructs municipalities to supply alternative sources of energy. As of 2022, of South Africa's 257 municipalities, 21 municipalities have supplied SHS to 150,000 households. This represents about 4% of the 3.5 million indigent households, as identified by municipalities.[166]

Adjustment / Exit: Setting up a long-term facility

The FBE and FBAE were policies launched in 2003 and 2006 respectively, establishing long-term institutional arrangements to provide electricity to the poor. Funds are disbursed from the National Treasury to municipalities. Municipalities then pay service providers (Eskom, municipal distribution companies and off-grid concessionaires) on behalf of FBE/FBAE recipients.

Households are required to register with municipalities to qualify for free basic services. A municipality's role is to vet every application, selecting only those households that meet various criteria. Successful applicants are granted indigent status. Municipalities often run awareness campaigns to ensure that households are aware of the application process.

Indigent status is not without end. The economic status of a family might improve over time, thus affecting its status. To ensure that only the poorest families are catered for, municipalities require registered households to reapply for indigent status on a regular basis, often once a year.

There are additional constraints. A municipality might not be able to service all indigent households that have successfully registered, due to lack of funds or inadequate infrastructure. There is also criticism about administrative procedures at municipalities making it difficult for eligible households to complete the application process.[167]

Key insight on long-term facilities: A future energy market with sustained universal access may include long-term support to the poorest and most marginalized people through recurring facilities.

2.7.4 Phasing out subsidies

Regardless of the longer-term exit or adjustment strategy chosen, designers need to consider how to 'exit' subsidies within a specific program. Designers can plan to end a subsidy outright at a specified time, or they can choose a gradual phase-out process, which either reduces the subsidy level over time or incrementally narrows the target group. It is best to think through this phase-out during the design phase to avoid ambiguity around funding amounts and timelines.

When designers plan to end a subsidy completely, it is important that the end date is appropriately planned for and communicated to all stakeholders involved. Ideally, a subsidy will not end abruptly because funding has been depleted. Rather, it will run until a target date that is planned for in advance and that beneficiaries are aware of. In the case of Nigeria's NEP program, in part due to an uptake that was higher than expected, the available funds were depleted before the scheduled end date in 2023. This sudden stop had many negative consequences, such as sudden price increases for consumers and companies having to lay off people and stop distribution.[168,169] This kind of sudden end to the subsidy scheme should absolutely be avoided by careful design and ongoing monitoring.

A gradual phase-out process allows for a smoother transition. Where subsidies are no longer needed, companies can operate through phases of lower subsidy amounts until the subsidy is completely removed, and their own revenue streams can sustain them. Where a new program or long-term facility is envisioned, a gradual phase-out creates a longer period for collecting feedback to inform the design of the follow-up program or facility.

- **One option for such a phase-out is to progressively reduce the subsidy level,** so that consumers and companies can adjust to commercial rates and minimize market distortion.
- **Another alternative is to narrow the subsidy target group,** in which case the subsidy level could also be increased. This particularly applies to programs with a pro-poor strategy that aims to leave no one behind.

164 Government of South Africa, Cooperative Governance Traditional Affairs website.

165 ESI, 2021. The status of Free Basic Electricity in South Africa.

166 Department of Statistics of South Africa, 2022. Solar energy for the poor.

167 ESI, 2021. The status of Free Basic Electricity in South Africa.

168 World Bank, Nigeria Electrification Project

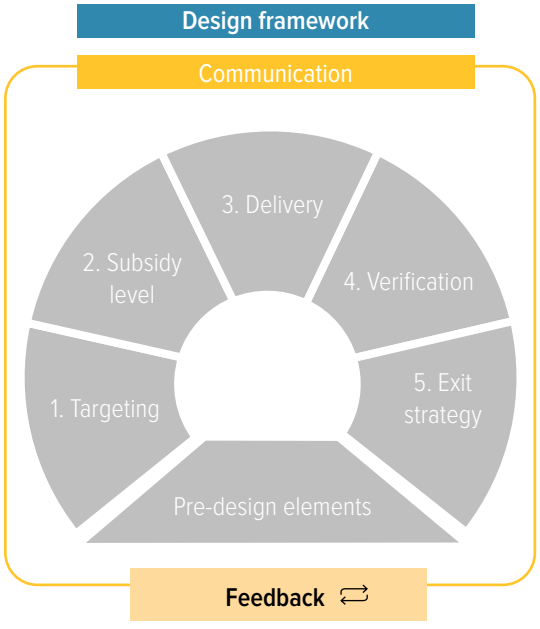
169 Energy for Growth, An update on the Nigerian Electrification Project: electrifying Nigeria's most underserved

For example, Nepal's energy subsidy started with a less targeted approach but progressively narrowed its targeting to reduce spillover risks and ensure efficient use of financial resources. In the last phase, the program targeted only the households experiencing the most marginalization with highly subsidized products.

Active and transparent communication is crucial to any exit strategy. This is critical for households considering using the subsidy and for participating companies who need this information to plan their operations.[170,171] Regardless, programs need to monitor and evaluate progress and market dynamics regularly and adjust the exit strategy if needed.

Key insight on phasing out: Program designers should plan for a phase-out during the design phase and ensure this is planned for, monitored, and communicated well.

2.8 Communication and Feedback



2.8.1 Communication

Designers should prioritize developing a communication plan that will guide interactions with stakeholders before and during program implementation. Communication is an important aspect of a successful subsidy program, because multiple stakeholders in any program need to have a clear understanding of the program's setup and parameters. These stakeholders include both beneficiaries and those excluded by the program, as well as companies and local government entities. The framing of the subsidy – that is, how it is presented – is important to set the right expectations for all involved. It may be presented as a temporary discount, promotion, or waiver, but the language should clearly convey that it applies only for a specified period unless the program has been designed as a long-term facility.[172]

Communication with beneficiaries and non-target populations

Effective communication is critical to beneficiaries since they are the subsidy recipients. A clear understanding on their part not only promotes subsidy adoption but also helps mitigate the risks of market distortion and social tensions. The messaging can elaborate on the importance of subsidy programs for spurring commercial activity, for instance, and explain why specific households are eligible while others are not. Ensuring that beneficiaries are well-informed about the subsidy allows them to appreciate the product's true value, and to understand that the price they pay is subsidized and does not reflect its market value.[173] Some of the effective avenues of communicating to end-users include promotional campaigns and peer-to-peer networking. Public awareness campaigns may include door-to-door campaigns, local events, and digital campaigns.[174]

Effective communication is critical to beneficiaries since they are the subsidy recipients. A clear understanding on their part not only **promotes subsidy adoption but also helps mitigate the risks of market distortion and social tensions.**

170 Open Capital Advisors Consultations

171 Africa Clean Energy (ACE) Technical Assistance Facility (TAF) and Open Capital 2020, Demand-Side Subsidies in Off-Grid Solar: A tool for achieving universal energy access and sustainable markets.

172 End-User Subsidy Lab learnings

173 SeforAll 2022, The Role Of End-User Subsidies In Closing the Affordability Gap.

174 Clean Cooking Alliance, Busara Center for Behavioural Economics 2023, Formative Literature Review: Clean Cookstove End- User Subsidy Research.

When designing communication plans for beneficiaries, designers may consider the following:

- **Tailoring methods and messages to suit the specific context of beneficiaries:** Tailoring the message to the unique characteristics of target beneficiaries is important in driving behavior change in communities. This may be achieved through highlighting how the product can be used.[175] To improve the power of subsidy messaging, program designers may emphasize that the price of the product is subsidized and their additional benefits. For example, communication to beneficiaries using clean cooking technologies could explain how these devices promote better health and benefit the environment.[176] Lastly, the communication method needs to be aligned with the target population. For example, TV commercials may be ineffective in some marginalized communities because they lack televisions, making radio advertisements, flyers, and handbills more effective options.[177]

- **Explore partnering with trusted role models to deliver messages:** Trusted role models may be influential figures within a community, such as teachers, spiritual leaders, or the elderly. For example, SolarAid used schools to help promote the adoption of its products.[178] Messaging that originates from government entities should be treated carefully, as it may interfere with creating a free market. For example, end-users in some contexts may be accustomed to hearing about public free goods from the government, so they may have the impression that the energy products are free.[179]

- **Work with companies to deliver messages:** When delivering through companies, hold companies accountable to provide subsidy information to beneficiaries through, for example, program-branded grant certificates delivered together with the product.

Beyond communication plans for intended beneficiaries, it is important to develop messaging for non-target populations to ensure transparency. This is mostly needed for people not targeted by the program who may encounter it, such as when the program is running in their village or area. A clear understanding of the selection criteria and the overall design of the subsidy helps non-target populations understand why they may be excluded. Additionally, this understanding may provide them with insights on obtaining the same or similar products that are not subsidized. Communication can be done through community engagement activities and print media such as handbills.

Communication with companies

Companies are an important stakeholder and source of information during the design phase. Companies provide an important perspective on the market because they know their customers and potential subsidy beneficiaries, and their preferences around products and prices, among other types of expertise. Companies may be involved in the design process through co-design workshops and in-person consultations, alongside consultations with national and local governments, communities and end-users. It is important to engage companies with experience in supplying OGS and clean cooking solutions, ideally in the regions targeted by the program.

Designers need to clearly communicate the program design and requirements to companies. It must be clear to companies which people are eligible to participate, what products are eligible, and what implementation will involve. It is beneficial to all parties if there is transparency on program elements, like how companies are expected to check customer eligibility, which IT tools will be used, and how and when disbursements will be made. This allows companies to consider participating in the program and to plan their operations once selected. It is also helpful to clarify the role of companies in communication with beneficiaries. For instance, what companies are expected to communicate about the subsidy, and whether there are any communication guidelines to adhere to.

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175 Shields et al. 2020, Improving Smoke Alarm Self-Report Via a Prompted Questionnaire.

176 Clean Cooking Alliance, Busara Center for Behavioural Economics 2023, Formative Literature Review: Clean Cookstove End- User Subsidy Research.

177 Africa Clean Energy (ACE) Technical Assistance Facility (TAF) and Open Capital 2020, Demand-Side Subsidies in Off-Grid Solar: A tool for achieving universal energy access and sustainable markets.

178 SolarAid 2022, Annual Review.

179 End-User Subsidy Lab learnings

Regular engagement of companies during program implementation helps monitor performance. There should be direct lines of communication with each participating company individually, and it is advisable for the program to appoint a focal point for company communication in the team. This ensures that companies always know who to talk to and that there is no miscommunication. Beyond individual communication, it may also be helpful to engage participating companies and other key stakeholders in group settings as well, particularly when more general feedback on the program is required. This helps to identify potential improvements and ensure continued alignment.[180]

Communication with local governments

Alignment with local governments improves the dissemination of program information and may support select implementation components. Local governments have critical roles to play through their offices and officials who are integrated into communities and, as such, are a key resource for engaging end-users and for the design process. There is an opportunity to leverage their networks to disseminate information about the program and, in some cases, facilitate its implementation. For example, EnDev's Pro-Poor RBF in Rwanda used local governments to validate contracts between companies and customers by signing and stamping them. This was an additional step to mitigate the risk of leakage and helped with verification. Furthermore, local governments may support the resolution of challenges in implementing the program, for example, when customers claim that systems were stolen or when there is a conflict between a customer and a company.

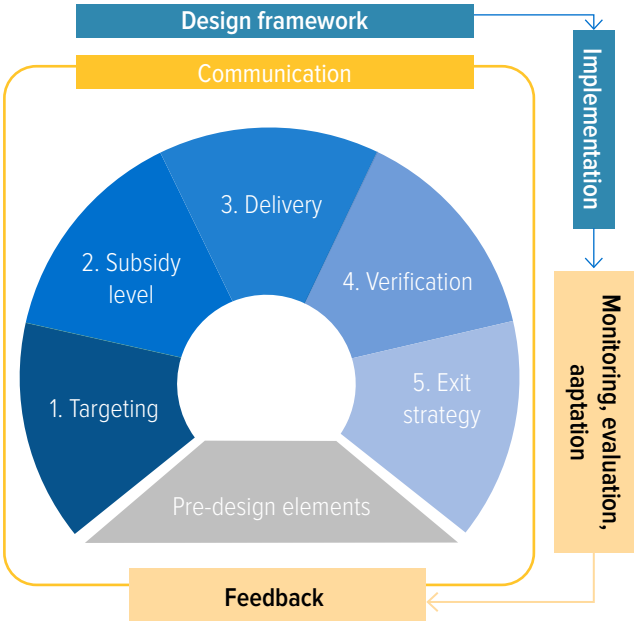
Conversely, without alignment, local government may be a roadblock to implementation. Officials may inadvertently block the work of companies involved in the subsidy scheme if they are unaware of the project and its goals, and thus do not know how the project will affect their constituents. Or they may mistakenly misinform potential beneficiaries due to a lack of knowledge. Overall, local governments are charged with increasing access to basic services for their populations, so the program is advised to engage them to advance joint objectives. Designers may create communication channels with local government through periodic check-ins, appointment of contact individuals, and email communication.

180 https://www.ace-taf.org/wp-content/uploads/2020/09/Demand-Side-Subsidies-in-Off-Grid-Solar-A-Tool-for-Achieving-Universal-Energy-Access-and-Sustainable-Markets.pdf

2.8.2 Feedback: Monitoring, Evaluation, and Adaptation

Designers must continuously monitor the program's performance against its set goals, remain aware of current market contexts and dynamics, and create a framework for program adaptation. Subsidies are complex and their design needs to improve over time, based on learning. Creating feedback loops, periodical program reviews and subsidy redesign when necessary is crucial for subsidy programs to remain successful over time. Subsidies may need revision if uptake is too low, or too high. Macroeconomic factors like currency fluctuations, inflation, and global supply chain costs can significantly influence program implementation. In addition, it is helpful to continuously engage end-users, companies, governments, and development partners through channels such as round tables and one-on-one check-ins to gather feedback on how the program can improve. This may include changes in the targeting approach, increasing or decreasing subsidy levels, engaging additional companies, streamlining procedures, etc. For a subsidy to remain effective and efficient, it needs to be able to adapt.

Figure 23: Continuous Monitoring, Evaluation, and Adaptation of subsidy programs



Subsidy programs should follow best practice around Monitoring and Evaluation (M&E) and adaptive management[181], from external standpoints (e.g. adjusting to market trends) and internal (e.g. from an operational/implementation standpoint). It is very important for subsidy programs to integrate a systematic feedback loop, by closely monitoring it and taking an iterative approach to the design, adapting it during implementation when needed.

Monitoring: Program implementors must actively and continuously monitor the program's performance against its goals as well as continuously monitor the market dynamics. Monitoring is about overseeing the broader performance of the program and may inform any necessary adjustments. A first step in effective monitoring is determining what data are needed, includes the following steps:

- Evolution of subsidized sales or service subscriptions over the duration of the program, and broken down by the different segments of the population (socio-economic, geographic, demographic) and by company, and data on whether customers continue to make payments and use subsidized products and services over time
- Service provision by companies participating in the program and customer satisfaction
- Changes in the competitive environment and technology development, such as entry of new companies into the market, or new technologies allowing for cost reductions
- Macroeconomic factors like currency fluctuations, inflation, and global supply chain costs can significantly influence prices and affordability, thus impacting the subsidy program implementation.
- General feedback on the program, by keeping open lines of communication with participating companies and other stakeholders and make provisions for feedback from end-users

Evaluation: using monitoring data, combined with additional research (e.g., stakeholder interviews, surveys) and analysis, periodic evaluations (independent or self-initiated) can help program

181 A recent publication of IIED (IIIED, 2022. From what works to what will work: Integrating climate risks into sustainable development evaluation — a practical guide) provides insights and best practices for monitoring, evaluation, learning and adaptive management.

implementors assess what is (or is not) working, and the possible reasons behind the results. Implementors and funders may find it helpful to conduct such evaluations regularly (for example, quarterly and annually) to assess any need for adaptation. Adjustments may be necessary to accommodate external influences on prices or other factors influencing the affordability gap.[182]

Adaptation: Adaptive management is often represented as a cycle of planning, implementing, monitoring and learning. This process integrates the design, management, monitoring and evaluation of the program in a framework that can be used to test assumptions and adapt and learn as project implementation unfolds. Each of the design components of the program can be adapted based on this process, for example:

- *Eligible households and targeting approach* can be defined more narrowly if a survey reveals that most of the subsidy is being captured by urban wealthy households, whereas the program's objective was to increase access among the rural poor
- *Eligible products and subsidy level* can be revisited if local currency has depreciated, pushing prices up for imported OGS products and deteriorating ability to pay
- *Delivery of the subsidy:* more companies can be invited to participate into the program if the pace of sales is lower than expected, or new companies have entered the market
- *Verification* procedures may benefit from being streamlined if consultations with companies reveal they are too slow or complex, and carry significant costs and delays in disbursements
- *Exit (or adjustment) strategy:* may be modified if macroeconomic conditions change significantly, increasing or decreasing the size of the population that can afford clean energy

It is important to understand that a subsidy program, often designed on the basis of incomplete information and assumptions, must build in mechanisms to improve the design as data and evidence are gathered, as well as to evolve as the context changes.

2.9 Conclusion

Well-designed end-user subsidies have the potential to generate significant impact and contribute to achieving SDG 7 by tackling a key barrier to electrification and access to clean cooking – affordability. Although implementing end-user subsidies poses challenges, careful consideration of risks allows for the design and implementation of responsible EUS programs, i.e. subsidies that are effective in reaching the poor, efficient in terms of use of limited public resources, and that limit market distortion. This is illustrated in the many case studies throughout this document.

It is important to reinforce the linkages between subsidies and other market-building incentives (including policy and other forms of public financing). End-user subsidies are one of the many public finance mechanisms that can be implemented to improve the affordability of off-grid solar products and clean cooking solutions. Other mechanisms such as supply-side subsidies, concessional consumer finance, grant funding to research and development are needed for markets to grow. Beyond the energy access space, it is important to acknowledge the critical need for complementary market functions and enabling environment support for certain services and products that are often unavailable and contribute socioeconomic development (such as business or smallholder farmer credit, business or farm inputs, advisory support, access to markets, aligning institutions and policies, etc.).

In order to achieve and sustain SDG 7, more EUS programs are needed at an accelerated pace, alongside other initiatives and innovations to address affordability and overall socioeconomic development. We hope this toolkit supports designers and encourages collective learning to ensure no one is left behind.

182 End-User Subsidy Lab learnings

03. The design framework in practice

3.1 Introduction

This chapter aims to illustrate how the design framework for EUS programs can be used in practice. This is done by outlining two example projects that leveraged the framework in their design phase: EnDev EUS pilot projects in Uganda and Malawi. In addition, two projects having rolled out EUS for off-grid solar and clean cooking are analyzed from the perspective of this toolkit: the Rwanda Electrification Fund and Nigeria's Electrification Project. Following from the previous chapter, which explained various design components and considerations, these examples will show how such design choices can be applied in specific market contexts. The goal here is not to prescribe solutions, but rather to highlight how various choices are made based on context factors, and how they are interdependent.

3.2 Designing an EUS pilot targeting the poorest in Malawi

EnDev has designed an EUS pilot project for Malawi, focusing on households designated as "poorer" and "poorest" by the Malawian government.[183] This project was designed between Q3 2022 and Q2 2023, and implementation is planned for 2024 and 2025.

Table 9: Summary of design element selected in an EUS pilot in Malawi

Design element	Selected option
Targeting	Geographic targeting
Eligible products and subsidy level	**Eligible products:** Tier 1 OGS and locally manufactured Tier 1 ICS **Subsidy level:** Percentage of product price with a maximum amount (cap)
Subsidy delivery	**Delivery channel:** Through companies via an RBF **Company selection:** Open to companies meeting minimum requirements through a call for proposals **Subsidy disbursement:** After verification **Fund management:** A consortium of two third-party administrators **Claim management:** Through fund manager
Verification	Led by an IVA that uses manual processes
Exit	Transition to a scale up program or gradual phase out at end
Communication	Channels include mobile phone communications, radio, and community meetings

Key context factors for the design include:

- Malawi has one of the lowest electrification rates in the world. Only 18 percent of Malawians have electricity access, with 11 percent connected to the grid and 7 percent utilizing OGS solutions.
- While several international and local OGS companies are operating in Malawi (including Yellow, Vitalite, SolarAid, Zuwa, among others), affordability of OGS systems poses a significant barrier to access, as 80 percent of the off-grid population is unable to afford Tier 1 access at the prevailing market price.
- Clean cooking market development has been limited due to wider social economic contexts. Accessibility and affordability of modern cooking solutions remains a challenge. 98.8 percent of households rely on firewood and charcoal for cooking, leading to forest depletion and soil erosion.

183 Based on the Unified Beneficiary Registry (UBR) established by the Department of Poverty Reduction and Social protection of the Ministry of Economic Planning and Development. The UBR classifies households into five income categories ranging from poorest to rich.

- The government of Malawi has put in place a strong enabling environment for off-grid electrification, including enhanced regulations and the removal of various taxes and levies, as well as market development initiatives, such as the World Bank-supported Malawi Electricity Access Project (MEAP) which provides EUS for solar home systems. That said, commercialization remains limited due to the low ability to pay and difficult market conditions.

- The Department of Poverty Reduction and Social protection of the Ministry of Economic Planning and Development has established a Unified Beneficiary Registry (UBR). The UBR provides a central, digital repository for data on geographic, demographic, and socioeconomic characteristics of households and was developed to support the implementation of various social protection and other programs in Malawi. The UBR classifies households into five income categories ranging from poorest to rich.

- The above points clearly demonstrate the need for end-user subsidies in Malawi, given the high proportion of the population without energy access and their limited ability to pay for relevant goods and services. Given this context, the pilot aims to reach 20,000 ultra-poor households with Tier 1 OGS and 190,000 ultra-poor households with ICS.

- World Bank-funded Ngwee Ngwee Ngwee Fund (NNNF) provides end-user subsidies to an off-grid population that is close to being able to afford commercial prices. Their subsidies are thus significantly lower and less targeted than the ones proposed under this pilot. For the cooking sector, the project aims to identify a partner who could support the government in scaling up. If a scale-up is not possible, the project will instead focus on a smooth and well-communicated phase-out.

- The project is set up as a 3.5-year pilot with a strong focus on identifying a scalable model and developing a scale-up strategy with support from the government of Malawi and the World Bank to reach ultra poor households not benefitting from other government projects

Targeting – The project leverages an **economic targeting** approach to identify ultra-poor households. Economic targeting was selected due to the presence of available data on the ultra-poor households targeted. Based on proxy means testing, the households registered in UBR are classified into five income categories, with “poorest” and “poorer” being the lowest two. 40 percent of the Malawi population is classified as “poorer” and 10 percent as “poorest.” During implementation, the pilot will utilize KOBO Toolbox digital tool to confirm beneficiary eligibility, specify the requisite subsidy level per technology, and register sales.

Eligible products and subsidy level – Given the high poverty level of the target population, the project will only support Tier 1 OGS products – defined under the multi-tier framework – and locally-manufactured, wood-burning stoves. These stoves are an entry-level solution that saves more than 40 percent on fuel consumption compared to traditional cooking methods. Their inclusion in the project is based on the consideration that a) charcoal that is often illegally produced and at a high environmental cost; and b) there are already a handful of pellet-fueled stoves on the local market with limited fuel distribution chains

Figure 24: Wood-fired cook stove eligible for subsidy (left), and various Tier 1 OGS products (right)

Two fixed subsidy levels have been established for both OGS and ICS, with a higher subsidy level for households classified as "poorest" in the UBR. EnDev calculated subsidies based on available data on prices, as well as recent "ability to pay" surveys. **The project sets a subsidy level as a percentage of the product price for each category and household category up to a maximum (cap) amount, which is calibrated to the affordability gap.** Based on the price point of locally manufactured wood-burning stoves, the indicative subsidy amount for an ICS solution is approximately $3 for the "poorest" households. The indicative subsidy for an OGS solution is approximately $153 for the "poorest" households, which is close to 90 percent of the average price of Tier 1 OGS products (with PAYGo) in Malawi. These preliminary calculations will be adjusted prior to the start of the project and may be readjusted again over the course of the pilot.

Subsidy delivery – The pilot will use qualifying cook stove and OGS companies as **subsidy delivery channels via an RBF approach**. Delivery through companies was chosen over direct subsidies to consumers given that a large proportion of the population is eligible, making direct delivery of consumers costly. The selection process for participating companies is a competitive call for proposals, encouraging local company involvement. Designers opted to select a limited number of companies given the small size of the project. Criteria for selection will include registration with the Malawi government, rural presence, and distribution experience. International companies will be required to partner with local entities to ensure sustainability. **Subsidy disbursement** will follow independent verification of eligible sales. OGS companies may request an advance payment (up to 30 percent of the contract value) to use as working capital for acquiring products. Given the much lower prices and subsidy levels for the selected ICS solution, no advance payment will be offered for ICS suppliers. A consortium of two **third-party fund managers** will be hired by EnDev to oversee the pilot and coordinate with the Malawi government for a seamless transition in case of scaling up.

Verification – The eligibility tool (though KOBO Toolbox) works as a verification mechanism at the point of sale, allowing companies to confirm a customer is eligible for a given subsidy level. In this case, the tool will confirm the recipient's socioeconomic category in the UBR, and they have not already benefitted from the subsidy, among other criteria. In addition, participating companies will be required to submit sales reports for eligible products to the fund manager. An IVA will be recruited to confirm sales using data and document verification, phone interviews, and field visits. This **manual verification** will double-check that the subsidized products are sold only to eligible beneficiaries, that beneficiaries have not already received a subsidy, and can reveal whether beneficiaries have resold products for a profit. The fact that this is a pilot project, the choice of remote regions and lower tier products has led to an emphasis on manual verification processes (notably the cook stove is not "technology enabled").

Exit strategy – If successful, the pilot may be **scaled-up** through a government fund with additional World Bank support. Lessons from this pilot may also enhance the targeting of subsidies in the existing NNNF under the MEAP project, potentially allowing for broader implementation of that project. If a scale up is not possible, the project will instead focus on a smooth and well-communicated phase-out.

Subsidy communication and coordination – Given that the project targets those most marginalized, the project will partner with **government and community leaders** to provide awareness-raising and logistical support. All communication will be developed with consideration for the literacy rates of beneficiaries. Key channels for communication will include mobile messages (the UBR includes phone numbers) provided that this does not violate data privacy rules, printed materials, radio programs, and meetings.

EnDev will collaborate with key stakeholders including the Ministry of Energy, the government's team responsible for the UBR, the World Bank on the MEAP project, and the World Bank's Energy Sector Management Assistance Program (ESMAP) team. EnDev plans to establish a sector-specific working group for key players in OGS to coordinate and share knowledge. In the cooking domain, EnDev will utilize existing national coordination groups for updates and feedback.

Key take-aways for designers

- The program is able to adopt a highly targeted approach focusing on the poorer and poorest households by leveraging data from the existing social protection scheme implemented by the Government of Malawi.
- Given that Malawi is a nascent market, with low access and a high affordability gap, there is a strong need to complement an end-user subsidy scheme with other market-building interventions, which the government has embarked on in the form of several favorable policies (i.e. tax exemptions) and other programs such as the NNNF under MEAP.

- For this pilot, the designers are using a digital tool (hosted by Kobo Toolbox) to serve as a beneficiary eligibility check through identification of ultra-poor households. Verification by the IVA will be manual. In case of a scale-up after this pilot, the designers may opt for more technology-enabled verification, where possible, to lower the costs of verification.

- There is potential pathway for scaling after this pilot, which forms part of a clear exit strategy.

3.3 Designing an EUS pilot targeting refugees and host communities in Uganda

EnDev has designed an EUS pilot project for Uganda, focusing on both refugees and host communities as well as rural poor. Refugee hosting districts have the highest poverty levels in the country per the Multidimensional Poverty Index (MPI) and are thus the most at risk of being left behind for SDG 7.[184] The pilot was designed between Q3 2022 and Q2 2023, and implementation is planned for 2024 and 2025. It supports both off-grid solar and cooking solutions.

Table 10: Summary of design elements selected in an EUS pilot in Uganda

Design element	Selected option
Targeting	Geographic targeting
Eligible products and subsidy level	**Eligible products:** Tier 1 OGS and Tier 1-4 CCS **Subsidy level:** Percentage of product price with a maximum amount (cap)
Subsidy delivery	**Delivery channel:** Through companies via an RBF approach **Company selection:** Open to companies meeting minimum requirements; international companies required to partner with local entities. **Subsidy disbursement:** After verification; option to obtain 30% advance for companies that have demonstrated working capital constraints **Fund management (including claims):** Through third-party administrator
Verification	Led by an IVA who will utilize an online data platform complemented by manual processes such as phone and field verification
Exit	Transition to a scale up program or gradual phase out at end
Communication	Communication channels include mobile phone communications, radio, and community meetings

Key context factors for the design include:

- 94 percent of households in Uganda rely on biomass for cooking and, although electrification has been rising, 43 percent of households do not have any form of energy access. This is often linked to affordability challenges, particularly for rural/refugee hosting households and refugees.

- The off-grid solar market in Uganda is considered mature, marked by healthy competition among companies and a high share of pay-as-you-go (PAYGo) sales. However, refugees and their host communities are not considered commercially viable markets. Literature suggests that the ability to pay for these communities is three to four times lower than the national average.[185]

- Given the large population with limited ability to pay in the target communities, the pilot aims to reach 20,000 households with Tier 1 OGS and 210,000 households with improved cook stoves (ICS), which are Tier 1-2, locally manufactured cook stoves that are more fuel efficient than traditional cooking methods. It also allocates budget to reach 6,000 households with more expensive, higher-tier clean cooking products

- The project is set up as a 3.5-year pilot with a strong focus on learning and adaptation. It has potential for scaling by the Government of Uganda through the World Bank-funded Electricity Access Scale-up Project (EASP). A key goal is to focus on both refugees and host communities as well as rural poor.

Targeting — The project has adopted a **geographic targeting** approach by focusing on selected refugee-hosting districts, as well as additional districts targeting the rural (poor) population. Refugees and host communities/rural poor in these districts are eligible. The choice of these districts

184 Multidimensional Poverty Index Report 2022 – Uganda

185 UOMA, 2020. Reaching unserved refugee markets in Uganda.

is informed by data related to poverty status as measured by the Multidimensional Poverty Index (MPI) of Uganda, and by data available from other programs implemented by government and development partners, such as UNHCR.[186] Given the correlation between these districts and poverty levels, geographic targeting of vulnerable areas was chosen as an appropriate targeting approach. The pilot will employ a phased approach, considering expansion into additional communities after nine months of implementation. The risk of subsidized products being resold in commercial markets adjacent to targeted counties will be mitigated by technology-enabled customer eligibility checks as described below, as well as regular monitoring of market prices.

Eligible products and subsidy levels — Linked to the project goals, support will be provided for Tier 1 OGS products, as well as cooking solutions ranging from Tier 1 to 4 as defined by the respective multi-tier frameworks. Because of widespread poverty in the selected areas, the majority of funding will be allocated to **lower-tier solutions.**

Given that Uganda has a well-developed market of energy companies, the project leveraged price data from reference products already available in the market for both cash and PAYGo sales to estimate the affordability gap for selected products. EnDev used existing data on ability and willingness to pay and complemented this by conducting additional "willingness to pay" surveys to calculate the indicative affordability gap for each product category (tier). The project sets **one subsidy level as a percentage of the product price for each category up to a maximum (cap) amount,** which is calibrated to the affordability gap. The subsidy calculation for a Tier 1 solar lantern system is illustrated in the table below.

Table 11: Example of subsidy setting mechanism

Equipment	Price reference	Estimated willingness to pay	Estimated affordability gap	Subsidy
Tier 3 ICS on PAYGo	$125 with installments for 10 months ($21 deposit and $10.5 monthly payment)	$7.3 monthly for 10 months (totals $73.4)	$52.4 (= price minus Willingness to Pay)	42% of the price with maximum of $52.4 (to be refined how the subsidy will reduce both deposit and installments)
Tier 1 solar lantern + phone charging on cash	$34 (cash)	$13.10	$21 (= price minus WTP)	62% of price with max of $21

©GIZ EnDev

186 Uganda Bureau of Statistics 2022, Multidimensional Poverty Index Report

From previous experience, EnDev chose to equalize the subsidy level between refugee and host communities to avoid social tensions. EnDev may revisit the subsidy levels when expanding to other locations (where affordability metrics may be different) as well as more broadly throughout implementation depending upon product uptake.

Subsidy delivery

Given the market maturity, the project will leverage existing cook stove and OGS **companies via an RBF approach** to deliver the subsidies. The identification and selection of companies for the project will be based on a competitive call for proposals, allowing many companies to participate in the pilot. **Subsidy disbursement** will be done upon verified sales, with an option for companies to receive a 30 percent advance payment. To qualify for this advance, companies will need to demonstrate that they do not have sufficient means to meet the working capital requirements. EnDev will hire a **third-party fund manager** to manage the pilot, who will work closely with the Ugandan government to ensure a smooth transition if later scaled up.

Considering the difficulties and higher costs of serving the selected locations, the pilot project will partner with other programs and stakeholders to **provide complementary supply- and demand-side support,** such as awareness-raising campaigns, logistical support, supply-side RBFs, and credit facilities. Despite Uganda being considered a mature market, its more remote and poor areas remain underserved. Companies need incentives to enter the refugee-hosting districts, which are commercially less attractive. The program builds on the supply-side subsidies implemented by EnDev and other partners, including Mercy Corps, to support companies' expansion into these underserved areas.

Eligibility Tool

An eligibility tool is utilized to confirm customer eligibility under the RBF. The tool (hosted by Kobo Toolbox) will also inform companies about the subsidy level the customer is entitled to. Only if the tool confirms that the eligibility criteria are met, can the company then proceed with the sales and register the client in the tool. The tool will also register sales made under the RBF to update the list of eligible customers and track progress to ensure that households only benefit once from a subsidized system.

Verification

Because the project will partner with many participating companies and in remote areas, an independent verification agent (IVA) will be recruited to **manually verify** sales by periodically checking 100 percent of the data for consistency and conducting spot checks on the accuracy of relevant paperwork. This will be complemented by additional checks on a representative sample of customers, in the form of phone verification (90 percent of the sample) and field verification (10 percent). Additionally, verification will be used to confirm the quality of access obtained by the households.

Exit strategy

If successful, the **pilot may be scaled up** through the existing EASP, which is managed by the Government of Uganda through UECCC and supported by the World Bank. Close involvement of these two players during implementation will allow for a smooth transition of the pilot into the scale-up phase. If a scale up is not possible, the project will aim for a smooth and clearly communicated phase out.

Subsidy communication and coordination

EnDev will collaborate closely with key stakeholders in the design, implementation, and exit strategy of the EUS pilot. A **collaborative working group** is envisioned for knowledge sharing, harmonization of subsidy designs, and communication strategies. The pilot will develop detailed communication activities to increase awareness about the program using a variety of channels.

Key take-aways for designers

- As multiple companies are operating in Uganda, the designers could leverage existing data and work with existing companies, as opposed to having to collect significant data as part of the design process.
- The program builds on blended demand and supply-side subsidies implemented by EnDev and other partners, including Mercy Corps, to support companies' expansion into underserved areas. This is important because while Uganda may be a mature market, its more remote and poor areas remain underserved.
- Given multiple demand- and supply-side interventions being implemented in Uganda, there is need for strong coordination of subsidy structures across programs, which the designers have catered for by involving a variety of stakeholders in the design and by planning for a sector specific working group during implementation made up of industry stakeholders, local associations, and private sector companies.
- The potential pathway for scaling up after this pilot has been made clear during the design phase, which has informed communication plans for the project.

3.4 Analyzing EUS of Rwanda REF Window 5

In 2020, Rwanda's Renewable Energy Fund (REF), funded by the World Bank and managed by the Development Bank of Rwanda (BRD), launched a $30 million RBF subsidy called REF Window 5 with a goal to connect 370,000 households through SHS. Window 5 complements another four REF windows providing end-user financing and financing to OGS companies in the form of debt. REF Window 5 builds on the learnings from EnDev's Pro-Poor RBF pilot, which looked to accelerate access to OGS products for the poorest households.[187,188]

In addition to the OGS RBF, funded via the same World-Bank project[189], **a clean cooking RBF window** subsidizes purchases of clean and efficient cooking solutions, following the same design and implementation structure of REF Window 5. The specifics of the clean cooking window are not covered in this case study.

In August 2023, the project design described in this case study had to change due to modifications in the Ubudehe social protection system used to target subsidies. The new subsidy structure adopted by REF Window 5[190] is not explored in this case study. This case study focuses on the targeted subsidy provided until August 2023, which has been used to connect 330,000 households over a period of three years.

Table 12: Summary of design elements of the subsidy under Rwanda REF[191]

Design element	Selected option
Targeting	Geographic and economic targeting, focused on off-grid areas and lower-income households
Eligible products and subsidy level	Quality-verified SHS providing Tier-1 access and above. Subsidy level varies with socio-economic category of customer (Ubudehe 1, 2 and 3). Levels are defined as a % of price of the SHS with an absolute cap in Rwandan Francs.
Subsidy delivery	Through companies via RBF Open to all companies meeting eligibility criteria (until all funds are allocated to companies) Subsidy claims disbursed to companies in 2-3 instalments within a period of three years Subsidy is managed by government institutions
Verification	Verification of customer eligibility by companies at point of sale via eligibility tool Verification of claims via IVA desk check, and phone calls and field visits for a sample of customers within claim
Adjustment and exit	Periodic adjustments of subsidy level and delivery based on progress and market conditions Subsidy eligibility may need to evolve to cover the replacement of SHS at end of life

Key context factors for the design include:

- Rwanda's National Electrification Plan (NEP) foresees a major role for off-grid electrification—reaching 30 percent of the population by 2024—as transitory solution before the grid arrives. The government has identified the villages that by 2024 are meant to be served with off-grid electrification solutions[192].
- Rwanda's OGS market is classed as a mature market[193], with a high penetration of OGS products (~22 percent of households connected by off-grid solutions by January 2024), many companies participating, a high share of PAYGo sales, relatively strong quality assurance, and policy stability.
- At the time of the design of Window 5, off-grid access expansion through SHS had been slowing down despite the provision of debt financing under REF and favorable policies, such as tax exemptions. Affordability of OGS products of Tier 1 and above had emerged as the key challenge. As the OGS market became saturated

187 End-User Subsidies Lab, 2022, End-User Subsidies Lab Official Launch Session: Rwanda End-User Subsidy

188 Gogla, Africa Clean Energy, World Bank, 2022, End-User Subsidies lab Official Launch: Session 1

189 Rwanda Energy Access and Quality Improvement Project

190 The project removes the economic targeting based on the Ubudehe classification, but continues to applicable to residents of SHS electrification areas only, which are primarily inhabited by households in Ubudehe 1-3 categories.

191 Information sourced from the Project Operation Manual for REF Window 5. This design does not reflect changes introduced since August 2023 due to the modification of the Ubudehe system.

192 Rwanda Energy Group, 2022. Rwanda Electricity Access Development Plan 2018-2024.

193 Lighting Global/ESMAP, GOGLA, Efficiency For Access, Open Capital Advisors 2022, Off- Grid Solar Market Trends Reports 2022: State of the Sector. Washington, DC: World Bank.

for higher-income households, companies started to expand to customers with lower or irregular income, which led to slower sales and an increase in their default rate.

- Rwanda has developed a system to classify the population into socio-economic categories. The Ubudehe program, under the Ministry of Local Government (MINALOC) and managed by the Local Administrative Entities Development Agency (LODA), classifies the population into 4 levels (Ubudehe 1 to 4, with Ubudehe 1 being the lowest), based on factors such as income, employment, profession, and land ownership. These levels are assigned by local government.

- A pilot project led by EnDev (Pro Poor RBF, 2019-2021) had developed mechanisms to provide targeted subsidies to lower income households within off-grid zones (leveraging information systems of LODA and Rwanda's utility company REG).

Targeting

Given the government had identified specific areas for off-grid electrification via the National Electrification Plan, and affordability of SHS had been identified as the main barrier for lower-income households, a targeted subsidy was warranted. Eligibility criteria for the subsidy include being a resident of SHS zones as identified by National Electrification Plan, and pertaining to Ubudehe categories 1, 2 or 3. **Economic and geographic targeting** was possible given the availability of information systems to support both. The project relies on two government databases to determine the eligibility: (i) LODA's Monitoring and Evaluation Information System (MEIS) to check whether the customer meets the Ubudehe eligibility criteria, and (ii) OMIS, an online information system, which allows REG to track developments in grid and off-grid electrification.

An **eligibility tool** (a web-based tool) was developed by the government to support the implementation of RBF. The tool is used by companies to do a subsidy eligibility check on potential customers at the point of sale, as well as determine the amount of subsidy the customer is eligible for. For this purpose, the tool connects with the databases mentioned above.

Eligible products and subsidy level

The subsidy is applicable to products providing **Tier-1 access and above**, that comply with the Ministerial Guidelines for Minimum Standards of SHS[194], which details all quality standards, warranty requirements, and after-sales care and system service level requirements for the Rwandan market.

The subsidies are expected to be fully passed on to end users to match the affordability gap. The subsidy level was estimated based on (i) the average PAYGo price of quality-verified market-leading Tier-1 products and (ii) end-users' ability to pay in each of the three eligible Ubudehe categories[195]. The subsidy level was determined as a **percentage of the retail price,** however, it was also **capped at a maximum absolute subsidy level**. Subsidy levels range from 45 percent of price for Ubudehe 3 customers (capped at FRW 50,000, or ~$55 at the exchange rate when the project started in 2020) to 90 percent of price for Ubudehe 1 customers (capped at FRW 100,000, or ~$110). By combining an absolute and a relative maximum subsidy amount, the program design safeguarded against the possibility of over-subsidization or of participating companies inflating the retail price. While this combined percentage and absolute cap method introduces significant complexity, this is reasonable given the high level of the subsidy.

Subsidy delivery

The subsidy was delivered **through companies via RBF**. To participate in the project, companies need to apply providing evidence they meet eligibility criteria[196] and a business plan including their proposed pricing scheme, expected volume of sales eligible for RBF, and the total amount of grant they are requesting.

By combining an absolute and a relative maximum subsidy amount, the program design safeguarded against the possibility of over-subsidization or of participating companies inflating the retail price.

194 The ministerial guidelines provide standards for plug-and-play SHS under 350 Wp (matching quality standards used by Verasol, contained in IEC TS 62257-9-8) and for component-based SHS.

195 The estimated end-users' ability to pay was based on various survey data on disposable income and energy expenditure by Ubudehe categories.

196 Eligibility criteria include being licensed to operate, have adequate funding, satisfactory quality of products and operations, satisfactory pricing scheme, warranty and after-sales service, adequate accounting and information management systems, and gender quotas, among others.

Once accepted into the project, a grant agreement is signed, and a certain amount of **grant funding is earmarked to them**. This amount is based on their application and the appraisal of their capacity by the project's implementation unit. This grant allocation can be modified over time based on the performance of companies (reduced or increased). This review takes place every 6 months.

The **management of REF Window 5 is done by different institutions within the government**. Energy Development Corporation Limited (EDCL), a subsidiary of REG, focuses on the implementation of RBF[197], and the Development Bank of Rwanda (BRD), focuses on the grant management and disbursements.

With regards to disbursements, companies make quarterly subsidy claims to EDCL for eligible sales during the period. Considering the high proportion of the subsidy on the total price of product, the **subsidy is disbursed in 2-3 instalments (milestones) spread over a period of three years** to incentivize after-sales service from companies. The disbursement schedule depends on the price of the product, the Ubudehe category, and whether the sales are made on cash or PAYGo. All disbursements are contingent on the results of a verification process. The initial disbursement takes place after the verification of the installation and the final disbursement after adequate customer service for three years.

Verification

The verification of reaching the milestones for each disbursement is conducted by EDCL through an IVA. The verification process includes a **desk check** of all customers submitted in a claim, and **phone and field verification** for a sample of customers.

Adjustment and exit strategy

The project was designed to substantially contribute to Rwanda's objective of achieving universal access to electricity by 2024, reaching the off-grid electrification rate of 30 percent as a temporary measure, and connecting households to the grid over the longer term. Depending on how long it takes to achieve universal grid access, the project may need to be adjusted to be able to sustain off-grid connections, by replacing SHS at the end of their usage capacity.

During the project, **subsidy levels can be adjusted to reflect market changes** (such as rate of inflation, foreign currency fluctuation, overall cost of living, etc.) and to ensure sustainability of the program. The review of market conditions takes place at least every six months or on an as-needed basis.

Results

The project has been successful in increasing off-grid connections among the poorer populations and in attracting OGS companies to the market. By August 2023, 24 OGS companies had signed agreements with BRD, with the full $30m allocated among them. 330,000 off-grid households have been connected under PAYGo (31 percent of sales) and cash sales (69 percent of sales), with 75 percent of the subsidy ($23m) committed to these sales. About 40 percent of this commitment has already been disbursed, mostly against Milestone 1 (after installation) and some Milestone 2 (after 12 months of service) verification.

Reaching the remaining 8 percent of households allocated for electrification via OGS (to reach the 30 percent objective) will likely be challenging, with the remaining market being largely composed of households in hard-to-reach areas with limited ability to pay.

Key take-aways for designers

- Strong electrification planning and coordination, and clear policy guidance on the allocation of subsidies, play a very important role in the design of a good subsidy project.
- Availability of good-quality data on the population eligible for subsidies allows for effective targeting mechanisms.
- Despite their complexity, well-designed targeted subsidies can be delivered through companies.
- Digitizing eligibility checks and claims leads to efficient program management for both companies and administrators. With greater complexity, the need for digitalization increases to be able to ensure process quality, effective monitoring and fast processing. Important factors to consider for digitalization: local and company level data protection regulations and policies, compatibility with devices used by company agents, network coverage and reliability, and available local capacity for trouble shooting and improvements.

197 Manages eligibility tool, OMIS, onboards companies, receives claims and checks their validity, conducts verification of sales (through IVA) by means of desk checks and phone and field surveys.

- The periodic revision and adjustment of subsidy levels, allocation of subsidies to companies, and other implementation aspects, help keep the project on track.

3.5 Analyzing EUS of Nigeria's OBF for SHS under NEP

Since 2019, the World Bank has been supporting the Nigeria Electrification Project (NEP) to increase access to electricity services for households, public educational institutions, and micro, small, and medium enterprises (MSMEs). NEP is managed by the Rural Electrification Agency (REA), the implementing agency of the Federal Government of Nigeria, tasked with electrification of rural and unserved communities. One of the project's components, the Output-Based Fund (OBF) for SHS, promotes SHS through an RBF mechanism. It is a large and ambitious project component, with $60m of funding and the objective to improve energy services for millions of unserved and underserved households and MSMEs.

RBF was implemented in two phases. In the first phase, OGS companies were provided with a supply-side RBF ranging from 7 to 20 percent of the reference price for different product categories[198]. These grants were meant to finance investments in people, training, advertising, processes, and logistics. About 400,000 OGS products were sold across all 36 Nigerian states during this first phase. In the second phase, which was introduced in January 2022, RBF was increased to 40-60 percent, including a 20 percent end-user subsidy[199]. Over 1 million households have been connected since the end-user subsidy was introduced. The RBF project was interrupted in December 2022 due to funds being exhausted.

This analysis refers to that second phase providing the end-user subsidy.

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Table 13: Summary of design elements in Nigeria's end-user subsidy[200]

Design element	Selected option
Targeting	Untargeted
Eligible products and subsidy level	**Eligible products**: Quality-verified OGS products of Tier 1 and above. **Subsidy level:** fixed amount for each system size/ level of service category, proportional to price
Subsidy delivery	**Delivery channel:** Through companies via RBF **Company selection:** Open to all companies meeting minimum requirements, on a rolling basis until funds are exhausted **Subsidy disbursement:** one-off after verification **Fund management:** government agency with support of a grant administrator
Verification	Assisted by software platform drawing data from participating companies' CRM systems.
Exit	Transition to a more targeted subsidy structure

Key context factors for the design include:

- Nigeria experienced sustained inflation since the onset of the COVID-19 pandemic, coupled with the depreciation of the local currency, impacting prices of imported OGS inputs and deteriorating people's ability to pay for them.

- Very large market opportunity for OGS products, with (i) over 85 million people lacking access to electricity, and (ii) businesses and households connected to the electricity network facing unreliable and insufficient supply, a gap often filled with power from petrol and diesel generator sets that are costly and highly polluting to people and the environment[201].

198 The subsidy level varied based on the product category, defined by the MTF and a scale of 6 levels. Tier-1 level-1 products (the most basic) received 20% of a fixed reference price for products of that category, predetermined by a benchmarking study. Tier-5 level-6 products (higher-end products) received 7% of the reference price of products of that category.

199 20-40% of reference price given as supply-side subsidy, based on the product category, and 20% as end-user subsidy.

200 NEP's website and NEP's Implementation Manual.

201 World Bank, 2013. Press release : Nigeria to Expand Access to Clean Energy for 17.5 Million People

- An OGS market classified as “emerging”, with sales rapidly increasing but still a large electricity access gap remaining[202].
- High penetration of low-quality OGS products into the market. GOGLA research estimates that 73 percent of products in the market are non-affiliate products[203].
- Uneven penetration of OGS products in the country. 50 percent of OGS sales since 2019 are concentrated in four out of the 36 Nigeria states (Oyo, Kano, Ogun, Ondo). These four states only represent 16 percent of the Nigerian population[204].

Targeting

Given the large untapped market and underdeveloped OGS distribution and service networks, NEP prioritized the development of the market through:

- a supply-side RBF (of about 20-40 percent of the product’s price) to help companies expand operations and to enable them to serve more customers quickly,
- a lower end-user subsidy (about 20 percent of price), coupled to the supply-side RBF, to tackle widespread deterioration of ability to pay in the context of the pandemic.

For these reasons, an easy-to-implement **untargeted subsidy** was chosen.

Eligible products and subsidy level

All quality-verified OGS products providing Tier-1 access and above are eligible. A fixed unit rate in USD was defined for each product admitted into the program, based on its capacity and level of service (6 levels of service were defined). The **fixed rate** of the end-user subsidy was set at 20 percent of a reference product price for each service level, resulting in a subsidy ranging from $18 for an entry-level Tier-1 product, to almost $1,000 for PV systems of 2-kWp and above providing Tier-5 access[205,206].

The choice of a subsidy available to products of all sizes and proportional to price is aligned with the objective of scaling the market for the benefit of poor and wealthy populations alike.

Subsidy delivery

Consistent with the priority of developing a market for OGS products, and given the subsidy was untargeted, companies were chosen as a delivery mechanism, via RBF. Given the large market size, the large size of the project, and a growing competitive environment, the project was **open to all companies meeting minimum eligibility criteria**, on a rolling basis until funds are exhausted. Criteria were set up to ensure that companies have the capacity to deliver quality-verified products and after-sales service at scale, and to manage the reporting and audit requirements. A pre-qualification process was put in place for this purpose, managed by a Grants Administrator engaged by REA. After receiving approval from the project’s investment committee, companies get qualified through the signing of a grant agreement. To date, more than 50 companies have qualified for the OBF, including both local and international companies.

With regards to disbursements, qualified companies submit monthly or quarterly claims for systems sold within the period. The claim includes information on each customer who purchased a system, the product’s specifications, and pricing. After these claims are verified, the full subsidy is disbursed to companies. There is no cap placed on the total amount of subsidy companies can claim. Funds are allocated to companies based on their sales, on a first-come-first-serve basis.

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202 Lighting Global/ESMAP, GOGLA, Efficiency For Access, Open Capital Advisors 2022, Off- Grid Solar Market Trends Reports 2022: State of the Sector. Washington, DC: World Bank.

203 Lighting Global/ESMAP, GOGLA, Efficiency For Access, Open Capital Advisors 2022, Off- Grid Solar Market Trends Reports 2022: State of the Sector. Washington, DC: World Bank. Affiliate products are defined as products sold by companies that are connected to any of the partner organizations involved in the semiannual GOGLA sales data collection and which share their sales data. Tbis includes GOGLA members or companies selling products that meet VeraSol quality standards. Non-affiliate products are sold by companies that are not within the matrix of companies distributing affiliate products listed above. Much less is known about the quality and level of Tier access their products provide.

204 Data collected by REA under NEP.

205 The 20% refers only to the end-user subsidy amount that was to be passed on as a price discount to customers. The total amount of the RBF, including both a supply-side and end-user subsidy, ranged from 60% of the reference price of tier-1 level-1 products (equating to $55) to 40% of tier-5 level-6 products (equating to $1,946).

206 While subsidy rates were defined as USD amounts, subsidies were paid out in Naira, at the official exchange rate on the date of disbursement.

A Project Management Unit (PMU) established under REA was responsible for the overall implementation of the subsidy program. A Grant Administration firm was engaged to support subsidy implementation. This firm is responsible for tracking the grant allocations to companies, screening applicants against eligibility criteria at the pre-qualification stage, and tracking progress toward meeting the milestones and results achieved by the grantees. The Grant Administration firm also interfaced with the IVA to conduct claims verification and report back to the PMU for processing.

RBF management platform (Odyssey)

To simplify and accelerate administrative processes, REA put in place a software platform to manage the RBF activities, including receiving and treating companies' applications for pre-qualification, submission of claims by companies, supporting remote verification by the IVA, and reporting.

Verification

After receiving claims through the Odyssey platform, payments to companies are made after the verification of each sale has been conducted by the IVA. The verification process can be done through either (i) phone calls and field visits to a sample of end users within the claim, or (ii) by leveraging the data in the Odyssey platform. The latter verification method was introduced to accelerate the verification process. It played an important role in the exponential increase in sales during phase 2. The method is based on **Odyssey linking via an Application Programming Interface (API) with the companies' customer relationship management (CRM) systems.** Through the platform, the IVA verifies that for each claim made, a connection was made to an actual customer from whom payment has been received, and that the subsidy was used to reduce the price.

Exit strategy

It was planned that the subsidy would be progressively phased out. The very rapid uptake and rollout of this subsidy caused funds to be fully utilized before such progressive phaseout.

Results

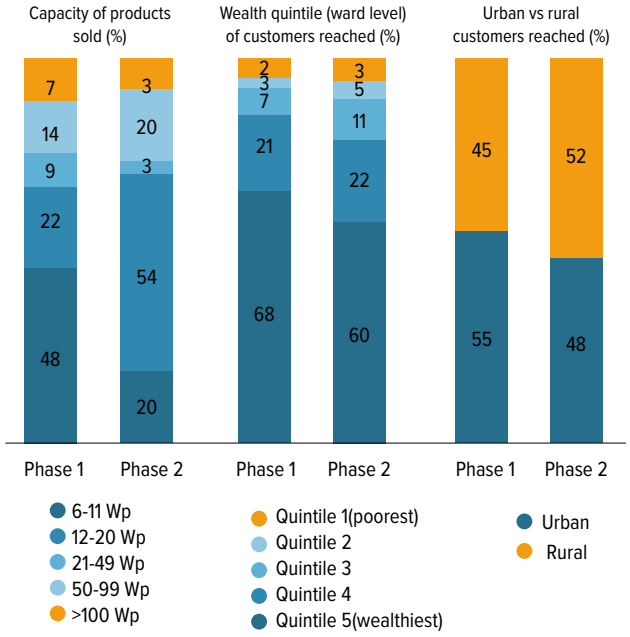
The project exceeded expectations, with almost 1.1 million devices sold, verified, and RBF paid for, against an original target of 340,000. Participating companies indicated that the subsidy made products much more affordable, made the selling of entry-level low-margin products viable, and allowed them to expand distribution networks to cover more states, and into more rural and poorer areas.

Figure 24 shows analysis of sales data collected by REA[207]. The comparison of sales under phase 1 of the OBF with that of phase 2 (when RBF was increased, and the end-user subsidy introduced) provides insights on the impact of the subsidy in terms of the profile of products sold and customers reached:

- The majority of OGS products sold in both phases were Tier-1 products of a capacity of under 50 Wp. During phase 2 though, there was a substantial shift from entry-level Tier-1 product to mid-tier Tier-1 products, probably as a result of products becoming cheaper and thus more affordable.
- Most OGS products were sold to customers residing in the wealthiest wards of Nigeria (wealth quintile 5), but the penetration of products into the poorer quintiles increased slightly during phase 2. This may be the result of products becoming more affordable, but also of companies expanding their distribution networks into harder-to-reach areas.
- The penetration of OGS products into rural areas increased slightly during phase 2 of the project, which is probably also a result of products being more affordable and companies expanding their reach.

207 This analysis was based on sales data captured by the Odyssey platform, including date of sale, system size, and GPS coordinates of the customer for the 1.4m products sold under the project. The location of customers was overlayed with ward-level poverty mapping and rural/urban classification produced by the World Bank.

Figure 25: Profile of OGS products sold, and customers reached, by project phase



The project's most important criticism was that available funds ran out abruptly, without proper communication to companies. Without RBF and end-user subsidies, participating companies had to increase prices, switch back to selling higher-end products targeted at wealthier households (instead of the entry-level low-margin products), and some had to downsize and collapse the distribution networks they had expended during the project.

Way forward

In December 2023, the World Bank approved the Nigeria Distributed Access through Renewable Energy Scale-up (DARES) project. This project will provide RBF and end-user subsidies for SHS. While the project is currently under design, it is anticipated that the subsidy structure will include (i) geographic and economic targeting to increase penetration among the poor and hard-to-reach populations, (ii) a more robust monitoring, reporting and verification framework.

Key take-aways for designers

- Untargeted subsidies are very useful to support the acceleration of market development, allowing participating companies to scale up operations and expand their networks progressively. However, the impact on reaching the poor and hard-to-reach populationswas limited.
- Accepting companies into the project on a rolling basis and allocating funds on a first-come-first-serve basis helps achieve results quickly. Notably, without proper monitoring and management of funds, there is a substantial risk of overcommitting funds.
- Verification of claims assisted by software significantly reduced processing time and helped sales increase exponentially. More research is needed to determine the accuracy of this verification method versus more traditional phone and field surveys.
- Continuous monitoring, adaptation of the design, and communication with companies and stakeholders are critical for the sustainability of the project.

04. Appendix

This appendix provides information on additional resources for the design of subsidies for off-grid solar and clean cooking products.

End-user subsidy lab website

The EUSL website contains a repository for useful resources in the design and implementation of subsidies, including:

- Country case studies
- Relevant reports and resources
- Presentations and recordings of webinars

Resources from existing subsidy projects

Some of the subsidy programs cited in this document provide publicly available documentation on the design of their subsidies, such as:

- Rwanda REF Window 5: Operations manual
- Uganda EASP: Operations manual

Other resources

- Linkages between end-user subsidies and other public finance mechanisms: Designing Public Funding Mechanisms in the Off-Grid Solar Sector
- Linkages between end-user subsidies and policy development: Off-Grid Solar Policy Toolkit

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