GET.invest
Mobilising Renewable Energy Investments

Decentralised Rural Infrastructure: Energy as a Service Approach in the Context of Universal Access in Sub-Saharan Africa

GET.invest is co-funded by

german cooperation
DEUTSCHE ZUSAMMENARBEIT

Norway

Ministry of Foreign Affairs of the Netherlands

Sweden
Sverige

Austrian Development Cooperation

Published by

Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

Registered offices
Bonn and Eschborn, Germany

GET.invest

Friedrich-Ebert-Allee 32 + 36
53113 Bonn, Germany

T +49 228 44601112
E info@get-invest.eu
I www.get-invest.eu
I www.giz.de

Place and date of publication
Brussels, October 2024

Lead Authors
Caroline Nijland, Zachary Bloomfield (Advisors to the GET.invest Finance Catalyst)

Contributors
Alexandre Tourre (Easy Solar), John Keane (SolarAid), Thomas Samuel (MOON)

This publication was produced with the co-funding of the European Union, the German Federal Ministry for Economic Cooperation and Development, the Norwegian Agency for Development Cooperation, the Ministry of Foreign Affairs of the Netherlands, the Swedish International Development Cooperation Agency, and the Austrian Development Agency. Its contents are the sole responsibility of GET.invest, implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, and do not necessarily reflect the views of the aforementioned co-funders.

GET.invest is a European programme that mobilises investment in renewable energy in developing countries. It is hosted on the multi-donor platform GET.pro (Global Energy Transformation Programme), and co-funded by the European Union, Germany, Norway, the Netherlands, Sweden, and Austria.

GET.invest is co-funded by

Table of contents

1 Executive Summary ____ 4

1.1 Key Challenges ____ 4

1.2 EaaS as a Solution ____ 4

1.3 Strategic Recommendations ____ 4

1.4 Conclusion ____ 5

2 Introduction & Context ____ 5

2.1 Unprecedented Challenges facing Universal Access ____ 5

2.2 Defining Energy as a Service (EaaS) ____ 7

2.3 Financing Landscape for Energy Access ____ 9

3 Potential Models for EaaS Deployment ____ 11

3.1 AssetCo as a part of National Government ____ 12

3.2 AssetCo as a Limited Company ____ 14

4 Conclusion & Recommendations ____ 17

4.1 Recommendations ____ 17

5 Glossary of Terms ____ 19

1 Executive Summary

This report investigates the potential of implementing the Energy as a Service (EaaS) model to bridge the significant energy access gap in Sub-Saharan Africa. With over 730 million people in the region lacking basic access to electricity, and projections showing that 620 million people will remain unconnected by 2030, approaches like EaaS are critical to achieving universal access.

1.1 Key Challenges

The current landscape of rural electrification in Sub-Saharan Africa is hindered by several major challenges. Traditional models such as grid extension are not viable in low-density areas, and while Pay-as-you-go (PAYGo) systems have provided some relief, they are often short-term solutions that fail to ensure long-term sustainability. High upfront costs, the risk of non-functional assets after payment periods, and inadequate financing models further exacerbate the issue. Additionally, the fragmented approach to financing energy access projects, which often mirrors venture capital models, is inadequate for the scale required to achieve universal access.

1.2 EaaS as a Solution

EaaS is a promising model to overcome these barriers. EaaS shifts the financial and operational burden from households to service providers, who offer energy as a utility service rather than selling the infrastructure outright. This approach can reduce the adoption barriers for low-income households by reducing upfront investments and ensuring long-term service.

1.3 Strategic Recommendations

To effectively implement EaaS, the report recommends several strategic actions:

1) **Establish an EaaS AssetCo:** Collaborate with national governments and SHS distributors to create a dedicated organisation (AssetCo) that will deploy solar home systems (SHS) at scale, particularly targeting underserved and remote communities.
2) **Integrate Subsidies into Service Contracts:** Embed subsidies directly into service contracts to make energy access affordable for the poorest households. This ensures that the cost burden is managed through the service structure.
3) **Provide Technical and Market Support:** Invest in technical assistance and market-enabling activities that support the capacity of governments and private sector operators. This includes developing favourable policies, regulatory frameworks, and providing necessary training and support.
4) **Enhance Stakeholder Coordination:** Promote collaboration among donors, governments, and private sector entities to share risks, optimise resources, and align efforts towards achieving universal energy access.

1.4 Conclusion

The adoption of the EaaS model represents a critical shift towards a more sustainable and scalable approach to energy access in Sub-Saharan Africa. By addressing the financial, operational, and structural barriers currently limiting progress, EaaS has the potential to play a pivotal role in achieving Sustainable Development Goal 7 (SDG7)—universal access to affordable, reliable, sustainable, and modern energy. The report underscores the urgency of coordinated action and investment to realise this vision and close the energy gap that has persisted in the region for too long.

2 Introduction & Context

This briefing note, authored by Caroline Nijland and Zach Bloomfield, senior GET.invest Finance Catalyst Advisors, with strategic guidance from GET.invest management and consultations with key stakeholders including Moon, Bamboo Capital, Acumen, Easy Solar, SolarAid, InfraCo Africa and Stichting Doen, explores the potential of Energy as a Service (EaaS) to address the challenge of universal energy access in Sub-Saharan Africa. The analysis and recommendations are solely those of the authors and do not represent official views of GET.invest or the consulted representatives. AS glossary of key technical terms is provided in annex.

2.1 Unprecedented Challenges facing Universal Access

There remains a major gap in access to sustainable electricity for a huge portion of the population in Sub-Saharan Africa. IRENA[1] - an agency promoting renewable energy globally - estimated that a little more than 730 million people lacked basic access to electricity in 2020; further, IRENA also estimates that at least 620 million people will remain unconnected by 2030 at current electrification rates. Most, if not all, of these unconnected people are living in a state of poverty.

According to GOGLA[2] - an industry association representing off-grid solar energy -, affordability analysis estimates that 456 million of the currently 730 million unserved people would be able to afford a Tier 1 solar energy kit through rent-to-own terms, which are mostly delivered through Pay-as-you-go (PAYGo) technology[3]. If forced to pay the full cost upfront, the number of people able to afford tier 1 service drops to only 3 million. This indicates that end-user financing is essential to provide the poorest population with Tier 1[4] energy access, but that it is not sufficient to close the affordability gap.

[1] International Renewable Energy Agency.
[2] Global Off-Grid Lighting Association.
[3] A financing model (Pay-As-You-Go) allowing customers to pay for solar energy systems in small, affordable instalments over time. In the paper PAYGo is treated as a placeholder for all rent-to-own approaches.
[4] Tier 1 is the basic level of electricity access as defined by the Multi-Tier Framework (MTF) for measuring energy by the World Bank and The Energy Sector Management Assistance Programme (ESMAP).

Critically, 275-300 million people, or around 40-50 million households, still will not be able to afford Tier 1 even with PAYGo terms.

Further, the notion of PAYGo may not realise the desired end-state of universal access. Once the PAYGo terms are completed and the asset is fully owned by the household, the associated battery might stop functioning properly or sufficiently to provide power as required. Thus, the household is left with a semi- or non-functional asset that may contribute to e-waste, since long-term servicing and warranty are usually not included in a PAYGo contract. Some stakeholders argue that PAYGo alone should not even constitute "access," as it is inherently short-term and doesn't ensure sustained services beyond the financing period.

Thus, there is a rising consensus among stakeholders that end-user finance, through PAYGo or results-based finance, is not a sufficient approach to reach full access in much of Africa. Not least because of affordability, but many stakeholders also critique this approach because it puts most of the risk of rural electrification on the household rather than the government, utility, or rural electrification agency.

Affordability may also be more limited than previously thought, as the ability to pay among the poorest communities may be lower than estimated and could worsen, especially in the presence of any economic shocks. For example, because of the COVID-19 pandemic, per capita income has declined in many countries; for 40% of emerging market and developing economies it is not expected to return to pre-pandemic levels for several years. Severe inflation and devaluation of local currencies further affects the macro-economic situation of the communities, worsening the affordability levels of the communities even for a Tier 1 energy access level.

Grid extension for low-density communities is not a viable option in the near term, and perhaps may never be. This implies that decentralised generation and distribution is the least-cost effective option compared to grid extension for most unserved and underserved communities. Simultaneously, declining SHS technology costs and increased performance of progressively more compact components increases the potential of SHS to deliver access to many unserved and underserved communities, if delivered through the right service structure.

Many approaches, from national rural electrification schemes to private sector-led innovation in business models, financing approaches, and technology configurations are being explored as potential solutions to universal energy access. However, there are a few key constraints that will continuously hinder deployment at the scale required to reach full access:

— **Policy and regulatory environment**: National governments set most of the policy priorities and regulations that create the incentives to which the private sector responds in delivery models, currently. Further, national utilities and rural electrification agencies take most of their strategy from national policy documents. In most cases, simpler, more streamlined approaches are

ignored while more complex financing and delivery approaches (e.g., grid extension through PPPs, mini grids) are pursued.

- **Household ability to pay**: Households, especially in rural areas where access rates are the lowest, have little cash income that is available for novel services, including energy. Thus, buying solar home systems outright and even through pay-over-time models is often out of reach. This translates in low potential revenues for utility providers and makes it less economically viable to invest in certain areas/regions without significant subsidies.
- **High capital and operating cost**: Especially relative to expected revenues, operators face relatively high deployment and operating costs to serve these "last mile" households with energy access services. This requires either heavy grants in the financial structure, high end-user fees (which are untenable to the households needing service) or both. Financing costs compound this challenge, even if only short-term finance is required.
- **Economic growth and limits of a market-based approach**: The target households are at the base of the economic pyramid and are often in rural areas, lacking opportunity for securing economic value from novel access to electricity. Even with broader economic development and targeted interventions to alleviate poverty and improve access to essential services, reliance on subsidies may persist.
- **An additional key constraint is the fragmented approach to financing energy access projects.** The current financing approach treats the sector as a high-risk niche with financing tools that mirror those used to capitalise technology startups in developing countries. Innovation is seen as the main means to achieve access, so these tools tend to cluster around venture capital and venture debt approaches, seeking the most "innovative" companies. However, this may contrast with the fundamental structure of energy access, which is core infrastructure services would otherwise be seen as provision of basic social services in most developed countries. Venture capital models are too small and expensive to deliver access at scale, even with the occasional unicorn.

Thus, it is critical to adopt an approach that addresses these challenging constraints, considering household income, the demanding operating environment of "last mile" access, and the economic prospects for these households in the coming years. Furthermore, integrating national government priorities and aligning policy and regulation around rapid access are essential to meet SDG7. Energy-as-a-Service (EaaS) offers this solution.

2.2 Defining Energy as a Service (EaaS)

Energy as a Service (EaaS) traditionally refers to the model used by utilities, where a standard service fee, usually based on per kWh usage, is charged to consumers through regular metering. Subscribers are not directly burdened with the capital expenditures of the infrastructure that delivers power to their homes or businesses. They pay instead for the power they use on a regular basis. In many countries, ratepayers are categorised based on power use, user type (commercial vs. residential),

income level, and other qualifying factors. In these schemes, certain user categories may pay higher service fees to cross-subsidise other user groups.

CASE STUDY: MOON

Moon, a GET.invest Finance Catalyst client, is actively demonstrating the scalability of the Energy as a Service (EaaS) model in Sub-Saharan Africa through targeted pilots in hard-to-reach rural areas. By leveraging upfront grant financing, Moon installs Solar Home Systems (SHS) at no cost to the customer and offers energy on a fee-for-service basis. This approach removes the barrier of high upfront costs and reduces monthly payments, making energy access affordable even for households living below the poverty line.

In Togo and Senegal, Moon has successfully connected several thousand households to sustainable energy, achieving penetration rates of over 80% in some villages. These pilots have shown that with the right product, model, and financing, it is possible to deliver energy services to some of the most underserved populations. Moon's efforts provide a clear proof of concept that EaaS can be scaled to achieve universal.

While this approach works well in areas where the grid is established and well managed, the approach generally used in rural electrification in SSA over the past few decades has instead focused on the provision of infrastructure through direct sales to households as SHS or similar kits. In many cases, these infrastructure sales (even on rent-to-own terms) are far too expensive. No robust piloting of a basic service contract approach, like that used in grid-connected power services, has been attempted in rural electrification. Without such an approach, reaching the scale and penetration rates necessary to achieve universal access is unlikely.

Thus, drawing on the traditional EaaS definition, this paper applies the same principles but for unelectrified populations. Specifically, EaaS in this case is defined as an approach to wider renewable energy access aimed at facilitating novel service to communities, particularly those in remote or underserved areas, without necessitating a substantial upfront investment in infrastructure from the electrified households. EaaS's primary goal is to reduce the adoption barrier for customers by eliminating or substantially reducing upfront & maintenance costs while also reducing monthly payments to reach high penetration rates, even in these rural and remote communities. It also seeks to ensure sustainable equipment use in the long term.

EaaS provides the most compelling use-case in the context of "pre-electrification" services, providing limited capacity as a steppingstone towards larger systems or grid access. It is specifically intended for

households living at or near absolute poverty. This market segment essentially needs basic levels of light and electricity (mainly lighting, charging mobile phones, and powering radios). Some households may, over time, elect to add additional hardware to complement EaaS services, but they would always be guaranteed the minimum service through the EaaS system for predetermined, affordable rates. However, for much of the population served by EaaS, Tier 1 service will remain their primary and possibly only service level on the horizon.

This deployment of EaaS is suited to areas with the lowest incomes and must offer long-term maintenance and replacement services to adhere to its sustainability principles. Payments are made for energy provision through fixed, regular payments. Some stakeholders indicate that this monthly rate should be equivalent to USD 2-4 per month.

2.3 Financing Landscape for Energy Access

The financing landscape for EaaS in Africa faces significant challenges, particularly in the context of renewable energy. Global economic conditions, including rising interest rates, have made debt more expensive and have shifted investor focus toward opportunities that promise higher returns with lower risk. This has led to a more cautious approach to financing EaaS and other decentralised energy projects. However, recent announcements of substantial investment programs by the World Bank and Acumen highlight a growing recognition of the sector's importance and potential. These investments may help address some of the current financing hurdles, particularly for strong impact-focused projects and companies.

A critical issue identified by many stakeholders is the approach to financing energy access: the current financing approach treats the sector as a high-risk niche with financing tools that mirror those used to capitalise technology start-ups in developing countries. Innovation is seen as the main means to achieve access, so these tools tend to cluster around venture capital and venture debt approaches, seeking the most “innovative” companies. However, this may contrast with the fundamental structure of energy access, which is core infrastructure services would otherwise be seen as provision of basic social services in most developed countries.

Because of these two key challenges and other secondary challenges, mobilising resources for off-grid electrification, including EaaS, is a generally upwind endeavour. While national programs such as the Nigeria Electrification Project have achieved success in securing large financing tickets, other initiatives struggle to attract substantial resources. Even specialised financial intermediaries, which are dedicated to facilitating investment in off-grid energy projects, have encountered some hurdles in mobilising significant funding. While there have been some successes in increasing financing to off-grid energy, there are no estimates that show that Africa will be anywhere near achieving universal access by 2030 with current approaches.

Thus, re-channelling existing financing efforts for effective off-grid (pre-)electrification is crucial for achieving universal access, especially as EaaS for remote, rural, and poor communities. Collaboration between governments, development agencies, private investors, and local communities is also vital to unlock financing opportunities and ensure the successful implementation of off-grid electrification projects, ultimately advancing progress towards universal energy access.

CASE STUDY: Critical Role of Subsidisation in Scaling EaaS (from Practitioners)

A detailed financial analysis, conducted by practitioners and shared with the authors, highlights the crucial role that internal subsidisation could play in the success of the Energy as a Service (EaaS) model. This analysis suggests that mitigating costs through subsidies may be essential for achieving widespread adoption and ensuring the sustainability of energy services, especially for low-income households in Sub-Saharan Africa.

In Togo and Senegal, Moon has successfully connected several thousand households to sustainable energy, achieving penetration rates of over 80% in some villages. By embedding subsidies into service contracts, monthly payments could be reduced significantly increasing affordability and penetration rates. This approach might enable the service to reach 80% of the target households, deploying 520,000 systems among 650,000 households. Subsidisation is also seen as critical for covering ongoing maintenance and replacement costs, which are necessary for the long-term viability of the service. The analysis indicates that, with subsidies, the financial burden on households could be significantly reduced, ensuring that even the poorest communities maintain access to essential energy services.

The World Bank suggests that to reach universal energy access by 2030, the sector needs to serve an estimated additional 228 million people with products that provide a Tier 1 level of service or higher. This is lower than GOGLA's estimate of 275-300 million people that cannot afford Tier 1 service, even with PAYGo terms, but still a sizable population out of reach of current approaches. The World Bank further estimates that this will require USD 6.6–11 billion. Although some energy companies in the field believe that the goal could be achieved with around USD 6 billion, challenging the higher estimates provided by the World Bank.

Sun-connect, using the 60 Decibels Income Inclusivity Rate, reports that the SHS PAYGo sector serves slightly wealthier customers than the national poverty rates suggest. For comparison, the 60 Decibels Agriculture IRR is 0.64, and for Financial Inclusion, it's 0.58. In rural areas, where poverty rates are three times higher than in urban areas, off-grid products have a greater impact and higher customer satisfaction. Solar lanterns, in particular, offer the most comprehensive energy access, highest impact, and greatest customer satisfaction. The World Bank estimates that USD 4-5 billion in debt financing

and USD 3-4.3 billion in subsidies are required to bridge the affordability gap, reinforcing the need for subsidies as highlighted by EaaS advocates.

According to the World Bank, supply-side strategies, such as lowering production costs or providing incentives to energy companies, have been used to reduce the initial high costs of bringing energy services to consumers. These mechanisms helped bridge the gap between what consumers can initially afford and the market price. However, in markets where these strategies have been in place for a long time and most potential customers who can afford energy services have been served, there remains a segment of the population that still cannot afford even the basic energy services. In these cases, the World Bank suggests that direct demand-side subsidies, which directly reduce the cost for the consumer, may be necessary to reach the remaining underserved populations.

3 Potential Models for EaaS Deployment

An alternative approach is needed, one that employs a traditional, large-scale infrastructure finance model. This approach prioritises basic social needs over maximising returns, whether financial or social. EaaS for decentralised electrification offers this foundation and merits considerations by donors and funders interested in Africa's economic and social development.

The main differentiator in Energy as a Service (EaaS) is the shifting of risk from the customer to the provider. This risk transfer is fundamental to the EaaS model, where the provider assumes responsibility for the asset's performance, maintenance, and associated risks, allowing customers to benefit from energy services without the burden of ownership. The focus should therefore be on how risk is managed and allocated between the provider and the customer, rather than on who owns the assets.

The key objective of the EaaS structure, therefore, is the provision of basic energy services, such as 3 LED lights and phone charging, for a fixed and affordable rate to every household in a specified geographic area. The point is to achieve access without complex underwriting and credit risk analysis at the household level, but rather to achieve mass deployment as quickly as possible of Tier 1 electricity services to unelectrified households. To achieve this, there are two key structural options to consider:

1) **AssetCo** as a government agency, ministerial department or organ (i.e., a part of the government)
2) **AssetCo** as a limited company

Each of these models is described in terms of general structure, key roles, flow of capital, and high-level pros and cons in the remainder of this section. A common feature of both models is the use of a separate operations contractor (or OpCo) responsible for installing and maintaining the units. In

practice, there would likely be multiple SHS distributors acting as operations contractors to the EaaS company, installing and maintaining Tier 1 units owned by the EaaS entity within specific geographic areas, which could span national boundaries. Most countries in Africa have a relatively well-established network of private SHS distributors capable of meeting this need. Therefore, this discussion focuses on the capital and legal structures required to secure sufficient funding to scale EaaS as a financing scheme, rather than the detailed operational models for unit deployment.

3.1 AssetCo as a part of National Government

3.1.1 Basic Structure

In this model, the government retains full ownership of the AssetCo, perhaps through a rural energy agency or similar existing entity. Each country would need to establish the mechanisms and requisite organs within existing or new agencies, and it is unlikely that a regional approach would be feasible. All establishment would be according to national law and is presumed to follow applicable regulations and legislation. 100% of the shareholding of the AssetCo would be retained by the government.

Unless the government entity delivers, installs, maintains, and collects service fees at the household client level, it will need to undertake some form of procurement for one or more of these activities to outsource to the private sector. This could take the form of a formalised Public-Private Partnership. PPPs encompass various contracting modalities and determining the most suitable one is beyond the scope of this discussion. However, in essence, this would involve the government soliciting bids from OpCos for installation and maintenance of Tier 1 units, as discussed above. Because it is a private company, these operators would need to operate at some measure of profitability in the scheme; thus, capital subsidies would largely fall on the government's responsibility but could be backed by grants and concessional loans from donors.

Different PPP modalities such as Design-Build-Finance-Operate-Maintain (DBFOM), Build-Operate-Transfer (BOT), Build-Own-Operate-Transfer (BOOT), or Design-Construct-Manage-Finance (DCMF) could be employed, depending on factors like existing country PPP practices, preferences, and national regulations. Successful PPPs hinge on the government's capacity to manage PPP contracts, including tendering and negotiation with private providers. Therefore, the success of this model hinges on the assumption that the government possesses adequate expertise, particularly in financial, technical and legal aspects related to defining contracted services and payment terms, which ultimately ensure affordability for end-users by indirectly subsidising services. Such capacity needs could also be addressed through complementary technical assistance and capacity building programmes.

3.1.2 Flow of Capital

The government would undertake all financing obligations on behalf of the AssetCo, likely through a combination of grants and loans. Because of the shareholding structure, it is likely that any loans

provided would be in the form of sovereign-guaranteed financing, similar to that used in the aforementioned Nigeria Electrification Plan and used regularly for project and policy-based lending by all MDBs. Financing terms are likely to be concessional to comply with IMF regulations on national debt capacity, sourcing capital from DFIs that can provide long-term concessional finance (e.g., IDA at World Bank and similar). Lead-times for financing are expected to be long, since sovereign-guaranteed lending operations are usually originated on multi-year time horizons in accordance with bilateral country strategies negotiated between country governments and MDBs.

Some stakeholders propose that the OpCo(s) also serve as fee collection agency, and some even go as far as to propose that the fees collected be treated as the sole remuneration under the O&M contract at a pre-determined per-household monthly service fee. In such cases, there is no re-flow of fee revenue from collections to the government, but rather that this fee revenue covers all operating expenses. Capital expenses for unit acquisition are therefore subsidised and financing costs plus principal are absorbed by the government; grant contributions from donors could offset this cost to the government. While it would technically be an option for the government entity to field its own operations and maintenance functions, it is unlikely that this would be cost effective nor efficient.

3.1.3 Pros and Cons

PROS

- **Universal access**: The government can prioritise extending energy services to underserved and remote areas (pre-electrification); it can also marshal the resources required in a unique way at the national level, especially from donors and concessional lenders.
- **Alignment with national policy:** The government can ensure that the EaaS model aligns with national energy access goals and public welfare and adheres strictly to national energy policies.
- **Portfolio segregation**: May allow for traditionally more expensive, less revenue-generating clients to be isolated from grid-connected ratepayers, better enabling national utilities to focus on improving financial performance on a narrower, better-suited portfolio of connected clients.
- **Lower cost of capital**: Due to IMF debt sustainability regulations, most governments where EaaS would be a priority could rely on concessional rates from MDBs.
- **(Formal PPP approach) Risk sharing**: Risks are shared between the public and private partners based on their respective capabilities to manage the risks. This strengthens risk management and reduces typical inefficiencies and costs associated with unilateral risk-bearing.

CONS

- **Financial constraints**: Funding is subject to government budget constraints, which can be unpredictable due to economic and political factors; success critically hinges on the availability of concessional finance from MDBs and bilateral support from donors since most governments will not have available resources to fund an AssetCo.
- **Risk of politicisation**: Energy projects under mandate of government ownership tend to be subject to shifts in political priorities and changes in administration that can undermine strategy and efficiency.
- **Less market driven:** If there is no pressure to be competitive and profitable, government owned AssetCos might be less driven to improve service quality, control and reduce costs or meet consumer demands; this can be partially ameliorated through well-structured and transparent OpCo contracts.
- **Limited innovation**: May lack the incentive to innovate and adopt new technologies or business models which negatively impact the effectiveness and sustainability of energy services.
- **(Formal PPP approach) Complex contractual conditions:** The legal and financial governance model of PPPs may be complex, requiring adequate expertise and resources to execute for the private sector and for less experienced public entities.

3.2 AssetCo as a Limited Company

3.2.1 Basic Structure

Unlike the government-owned model, this approach involves a fully privatised AssetCo. Operational control is governed by standard corporate practices, removing direct government involvement in day-to-day operations. However, this does not imply that the AssetCo's shareholding must be solely comprised of private investors. Examples like InfraCo Africa illustrate how donors and/or governments can provide equity funding for a corporate asset owner, which then operates as a limited company in multiple countries. It is probable that national or regional government bodies would be represented in the governance structure of the AssetCo.

The critical distinction in this approach is that the national government in each country would neither own nor manage the underlying assets directly. Instead, the "private" AssetCo would own the assets through its balance sheet. This structure allows for mobilising government-channelled support for the deployment of units owned by the AssetCo, such as results-based finance and public sector loan guarantees, without making the national government responsible for the operations and maintenance of the installed kits.

In this model, the AssetCo procures qualified units through standard business practices, adhering to applicable laws and regulations. It manages the importation and deployment of these units accordingly. Operational and maintenance tasks would likely be carried out directly by the private entity or through subcontracting arrangements.

3.2.2 Flow of Capital

The role of subsidies is paramount in this approach, to ensure affordability for target EaaS client households. Recognising the disparity between operational costs and end-user service rates, someone must provide financial support in the form of grants or concessional loans. This subsidy mechanism helps bridge the gap, allowing the AssetCo to offer services at rates that align with the economic capacities of impoverished communities.

This could be structured as a passthrough of concessional financing drawn by the national government to the AssetCo (without repayment by the AssetCo) or it could be direct concessional financing provided through a donor, MDB, or DFI to the AssetCo.

Most grant resources, if not all, will need to be paid up-front to mobilise enough capital to acquire the assets in the first place. Any concessional loans, regardless of how channelled, will need long grace periods and very low effective interest rates to make them feasible within the narrow margins and ongoing operational costs. Simplicity in both grant and loan terms will be key.

Due to the diverse regulatory environments across African countries, a multi-country approach is feasible but may require the establishment of local subsidiaries to operate in some or all countries. This is, however, a proven approach for many energy sector project developers and operators, as well as other infrastructure project companies. Similarly, a financing approach could transcend national boundaries, enabling collaboration on funding mechanisms while respecting the autonomy of each country's regulatory and legislative context.

Further, every effort must be made to not reinforce monopolistic conditions by selecting only one provider per country. Wherever possible, concessional financing should be made available to as many viable players as there are in any given regional or national market. In other words, the availability of cheap money should not in itself be the sole factor in determining who provides the services to households.

In addition, there is a need to adequately ensure transparency in line with international best practices (and ideally EU regulations governing state aid) for the selection of management of and governance members overseeing the AssetCo. This same emphasis on transparency and a competitive approach should be applied throughout the operating approach of the AssetCo.

3.2.3 Pros and Cons

PROS

- **Increased efficiency and innovation:** Private entities, driven by profit maximisation and innovation, possess the ability to act swiftly and efficiently without governmental intervention, potentially resulting in improved asset management, reduced costs, and enhanced customer service.
- **Fast decision-making**: A privatised model allows for swift decisions in response to market changes and macro-economic and political events, which ultimately leads to more agile management, resilience, and adaptation to new challenges and opportunities.
- **Access to capital:** Limited companies, regardless of shareholder, have had more streamlined access to a variety of funding sources; this access to broader funding sources may facilitate quicker scaling without waiting for national government budget allocations or approvals (but would still hinge on securing funding from donor governments, outside the bilateral sovereign lending planning process)**.**
- **Specialised technical and management expertise:** Private entities prioritise staff training and development to stay competitive, benefiting from streamlined management structures suited to fast-paced industries and unforeseen challenges; they can also secure, or release expertise as dictated by changing market conditions.
- **Attracting talents**: can often offer competitive salaries, benefits, and growth opportunities, attracting skilled professionals and a talent pool.

CONS

- **Prioritisation for profit instead of public interest:** Private entities typically aim for profit maximisation which might conflict with broader public interests. They will not always prioritise to service the people with the lowest income levels, the disadvantaged populations, as this segment, although a huge segment, is not profitable; however, the right governance structure could ensure that profit maximisation is not an objective of the AssetCo.
- **Market fluctuations and financial risks**: Private companies are more susceptible to market dynamics and economic downturns. Financial distress, shortage of liquidity or limited access to funding in the financial markets may disrupt the services they provide and thus put the long-term objectives and sustainability of the business at stake.

— **Regulatory compliance risks:** While private AssetCos must be compliant with national regulations, they might prioritise limited compliance to maximise profits, sometimes at the expense of safety, environmental standards, or quality.

4 Conclusion & Recommendations

The deployment of Energy as a Service (EaaS) in Sub-Saharan Africa offers a promising pathway to achieving universal energy access, particularly for the most underserved and remote populations. By shifting the financial burden from end-users to service providers and integrating long-term maintenance into the service model, EaaS addresses critical barriers such as affordability, sustainability, and scalability. However, to realise its full potential, this approach must be supported by a robust and coordinated effort among governments, donors, and private sector players.

For too long, energy access initiatives in the region have been hindered by fragmented financing, over-reliance on short-term innovations, and models that fail to scale. The EaaS approach, rooted in the principles of large-scale infrastructure financing, offers a more sustainable and equitable solution. By prioritising the deployment of basic energy services through a structured and subsidised model, EaaS can help close the energy gap in Sub-Saharan Africa, contributing to broader social and economic development goals.

The following recommendations are intended to provide guidance to practitioners and financiers who are keen on reaching universal access in Sub-Saharan Africa.

4.1 Recommendations

Establish EaaS AssetCo: Donors should collaborate with national governments and SHS distributors to establish an EaaS AssetCo to deploy tier 1 SHS units across Africa, where there are substantial populations of unserved, especially rural households. As a pilot, the AssetCo could be established to provide services a select country. Donors will need to contribute start-up equity for the AssetCo commensurate with the operating budget, inventory and subsidisation requirements. Depending on the pilot countries selected, a small contribution from the governments could be used to show ownership, but this is not required to begin pilot operations.

1) **Implement Built-in Subsidisation**: The AssetCo will require a built-in subsidisation approach to provide these SHS units at the USD 2-4 per month end-use service rate required to reach the target population; to be efficient, this should be built into the end-user service terms. This subsidisation should not be provided as a direct payment to households outside the service contract; rather,

subsidisation should be embedded in the AssetCo capital structure or held off balance sheet as a separate grant vehicle. In either case, the subsidy must be embedded in the service contract terms (to households) for simplicity and ease of management at the household level.

2) **Provide Technical Assistance and Market-Enabling Activities:** Donors should provide more technical assistance and engage in market-enabling activities to support a robust ecosystem for decentralised energy infrastructure. This will require some engagement and further support to build the capacity of governments, especially in building a policy and regulatory environment that supports a decentralised infrastructure approach to energy access beyond the current grid's reach. Equally important will be the delivery of more technical assistance and capacity building to private sector and non-profit operators that support energy access and economic empowerment of the AssetCo target clients that are on the verge of being able to afford more robust power systems, and especially to be able to capitalise on the availability of that power to increase household income and wealth over time.
3) **Strengthen Policy and Regulatory Frameworks:** Governments should develop and implement supportive policies and regulatory frameworks that encourage the deployment of EaaS. This includes streamlining permitting processes, offering tax incentives, and ensuring the regulatory environment is conducive to attracting private sector investment. Engaging in continuous dialogue with stakeholders to address regulatory barriers is crucial for the successful implementation of EaaS models.
4) **Promote Public-Private Partnerships (PPPs):** Encouraging PPPs can leverage the strengths of both the public and private sectors. Governments and donors should facilitate the formation of PPPs to share risks and benefits, ensuring that both public welfare and profitability are addressed. Transparent and fair contracting processes should be established to build trust and ensure the long-term sustainability of projects.
5) **Deepen Community Engagement and Ownership:** Engaging local communities in the planning and implementation of EaaS projects is vital. This includes conducting awareness campaigns, involving community leaders in decision-making, and providing training on the use and maintenance of SHS units. Community buy-in and ownership can significantly enhance the sustainability and impact of the projects.
6) **Utilise Technology to Enhance Monitoring, Verification and Evaluation:** Implementing robust monitoring and evaluation systems using the latest technologies, such as IoT and mobile platforms, can provide real-time data on the performance and impact of EaaS projects. This data can be used to make informed decisions, improve operational efficiency, and ensure accountability to donors and stakeholders.

5 Glossary of Terms

AssetCo: A specialised company responsible for owning and managing the infrastructure assets (e.g., solar panels, batteries) required for EaaS. The ownership structure of AssetCo can vary, ranging from government-owned entities to fully privatised companies.

Concessional Financing: Loans or grants provided on terms more generous than market rates, often with lower interest rates and longer repayment periods. Concessional financing is typically used to support projects in developing countries, including those related to energy access.

Decentralised Generation: The production of electricity close to the point of use, often through small-scale renewable energy systems like solar panels. This contrasts with centralised generation, where electricity is produced in large plants and transmitted over long distances.

Decentralised Infrastructure: Infrastructure that is distributed across multiple locations rather than being centralised in a single area. In the context of energy access, decentralised infrastructure refers to small-scale energy systems like SHS that are deployed locally to serve specific communities.

E-Waste: Discarded electronic devices and components, which can become an environmental hazard if not properly managed. In the context of PAYGo systems, e-waste can result from batteries or other components that become non-functional after the payment period ends.

Energy as a Service (EaaS): A business model where customers pay for energy services without owning the underlying infrastructure. In the context of rural electrification, EaaS aims to provide basic energy services (e.g., lighting, phone charging) to unelectrified populations with minimal upfront costs.

Multi-Tier Framework (MTF): A tool developed by the World Bank to measure energy access across multiple dimensions, such as capacity, duration, reliability, and affordability. Tier 1 represents the most basic level of access, while higher tiers indicate more comprehensive energy services.

Off-Grid Electrification: The provision of electricity to areas not connected to the national grid. This typically involves the use of decentralised energy solutions such as SHS, mini-grids, or micro-grids.

Operational Company (OpCo): A company contracted to perform the day-to-day operations of installing, maintaining, and servicing the energy systems deployed under the EaaS model. OpCos may also handle fee collection from customers.

Pay-as-you-go (PAYGo): A financing model where customers pay for energy services in small, regular instalments rather than upfront. This model is commonly used for solar home systems (SHS) but may not guarantee long-term service quality after the payment period ends.

Public-Private Partnership (PPP): A cooperative arrangement between public and private sectors to finance, build, and operate projects. In the context of EaaS, PPPs may be used to deploy and maintain energy systems while sharing risks and responsibilities between the government and private companies.

Results-Based Finance (RBF): A financing approach where funds are disbursed based on the achievement of specific, pre-agreed outcomes. In energy access, RBF might be used to incentivise companies to deliver energy services to underserved populations.

Sovereign-Guaranteed Financing: Loans or credits provided to a country with a guarantee from the national government that covers repayment of principal and interest. This type of financing is often used for large-scale infrastructure projects, including energy access initiatives.

Solar Home Systems (SHS): Stand-alone solar power systems that provide electricity for household use, typically including solar panels, batteries, and sometimes inverters. SHS are often used in off-grid areas to provide basic electricity services.

Universal Energy Access: The goal of providing reliable, affordable, and sustainable energy to all people, aligned with SDG7. In the context of this paper, it refers specifically to achieving this goal in Sub-Saharan Africa, where a significant portion of the population remains unelectrified.

Venture Capital: A form of private equity financing that provides funds to start-ups and small businesses with high growth potential. In the context of energy access, venture capital is often used to finance innovative energy companies, although it may not be suitable for large-scale infrastructure projects.