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KNOWLEDGE BRIEF STIMULATING ENERGY DEMAND IN LOW- AND MIDDLE-INCOME COUNTRIES

Why aren't they consuming? Exploring barriers to electricity demand in sub-Saharan Africa

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This Knowledge Brief makes up part of a series of three which explore issues of electricity demand in low- and middle-income countries, which can be read together or as self-contained pieces. This Knowledge Brief examines the key barriers to boosting electricity demand in sub-Saharan Africa (SSA). The second brief describes historical and contemporary strategies from around the world that have been used to increase demand and it is available here. Readers can learn more about potential solutions in the third Brief which is available here.

NOTE ON METHODOLOGY

These Knowledge Briefs are based on ten semi-structured interviews with energy sector stakeholders with experience and expertise across SSA – particularly Rwanda, Kenya, Ethiopia, Uganda, Zambia and South Africa – and a synthesis of the existing literature. The interviewed experts included academic researchers, practitioners, and consultants and representatives of electric utilities, private sector energy companies and NGOs. Where the evidence stems from literature, relevant references are cited. All other statements throughout the series are supported by the findings from the expert interviews. For readability, those findings are generally not attributed to individual experts in the text.

Key Messages

- The provision of access to electricity alone does not guarantee growth in demand and consumption;
- The barriers to growing electricity demand span socio-economic, technical, and political factors;
- Barriers include: high electricity costs, limited awareness of potential electricity uses, poor access to electric appliance markets and financial services, and the complex political economy of electricity provision.
- To unlock the transformational potential of access to electricity, there is a need for better institutional mechanisms and stakeholder coordination in the energy sector.

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Introduction

Reaching universal access to electricity is a challenging task. Globally, hundreds of millions of people do not have the option to turn on lights, a fan on a hot day, or a radio or TV to listen to the news. In 2022, the number of people without access to electricity reached 775 million, an increase of 20 million, due to a combination of factors including the COVID-19 pandemic, inflation, and the energy crisis sweeping multiple parts of the world (IEA, 2022). This was exacerbated by Russia's invasion of Ukraine (UN, 2022).

This matters because energy access, including access to electricity and clean cooking fuels and technologies, is critical for improving human wellbeing and creating economic opportunities, propelling the overall socio-economic development and growth of communities and countries (Fuso-Nerini et al., 2018). However, simply providing access does not automatically drive demand or produce the desired development outcomes (Acheampong et al., 2021). Holistic thinking, which considers other critical development factors, and integrated approaches are needed to unlock the full potential of energy services (IIED, 2021). It is also necessary for the energy services to be reliable and of good quality so that they are able to meet different household needs, including for productive uses or income generation, at all times. At the same time, energy providers must be able to cover the cost of providing services, which necessitates adequate consumption to generate revenue. Yet, in newly connected households or businesses, particularly in rural areas, demand tends to be low due to low appliance ownership, limited skills and capacities for electricity use, and often limited financial capacity resulting in more conservative (and mostly basic) uses of electricity, among other factors (World Bank, 2019). As a result, energy service providers, whether energy utilities or private energy developers such as mini-grid operators, are looking for ways to stimulate demand to boost consumption and revenues (Torero, 2015).

The focus of this Knowledge Brief is on grid and mini-grid electrification pathways. Both these pathways heavily depend on levels of customer consumption for financial sustainability, which can in turn result in better quality electricity services at affordable costs to the end-users. This Knowledge Brief offers relevant insights for policymakers, energy utilities, and other energy service providers in SSA, as well as other energy sector stakeholders concerned with energy access planning and socio-economic development.

Key barriers to growing demand

Simply providing electricity access does not guarantee initial demand and increased consumption over time, particularly in households (eg Garg, 2022). All the interviewed experts agreed that issues of low energy demand are present in the countries in which they work or have expertise. Low and static demand are particularly prevalent at the household level, in both grid and mini-grid connected households. This is exacerbated by the choice of electrification strategies adopted by national governments. Such strategies are driven by a complex set of factors, such as the need to meet specific targets, accountability to donors and funders, and varying levels of understanding of household needs. However, they may be misaligned with households' ability to pay and their energy needs. Below, we discuss key barriers identified through a literature review and stakeholder interviews, with a focus on SSA.

Poverty, skills deficiencies, and nascent appliance markets

Poverty is a major obstacle limiting the uptake of electricity (World Bank, 2019). Evidence shows that in much of SSA low GDP translates into low levels of electricity consumption, while higher GDP typically means higher demand, with sectors such as transport, industry, services, and agriculture playing an important role in boosting consumption (ibid.; Hafner et al., 2018). Lack of financial capacity means that households either cannot afford the costs of connecting to electricity or, even when they do (whether through the grid or mini-grid solutions), they use very few appliances as they cannot afford to purchase more than just the basic ones, such as lights, mobile phone chargers, or small radios/TVs (Ayhan et al., 2022). This limits the opportunities for productive uses of energy that can help generate income and therefore boost economic wellbeing and growth.

Among the most important deterrents to the uptake of demand-boosting productive uses of electricity are the insufficient technical knowledge and skills of consumers to make use of productive technologies, and limited financial ability to purchase the relevant appliances or equipment (IIED, 2021). Limited access to financial services, such as micro-finance, low-interest loans, or repayment schemes, makes it harder for households to acquire appliances. Many electric appliance markets in SSA are still at an early stage of development, particularly for productive uses of electricity, and this has also been a significant barrier to uptake (Efficiency for Access, 2021). Where (some) appliances might be available, often no warranty services are offered, making consumers more hesitant to purchase appliances.

Reliability and insufficiency of electricity provision

Customers across SSA are burdened with poor reliability of power supply. A survey published in 2022 found that only 43% of Africans had access to a reliable supply of electricity, which is a change of just 3 percentage points since 2015. About 28% of connected households had power half the time, occasionally, or never (Afrobarometer, 2022). The World Bank Enterprise Surveys data also shows that customers across SSA experience on average nine outages per month, each lasting an average of 5.7 hours (Enterprise Surveys, 2024). This is due to several factors, such as droughts affecting hydropower production, poor maintenance of infrastructure, lack of reliable fuel supply, and insufficient transmission and distribution capacity (Sun et al., 2023). Frequent blackouts mean that consumers may stop relying on the grid due to its erratic and unreliable nature and that they will be less likely to purchase appliances or use electricity for productive activities.

As a response to grid unreliability, many customers stack energy sources (ie use multiple sources simultaneously). For example in 2018, close to 20% of M-KOPA solar home system customers in Kenya also had a grid connection, paying redundant fees for two different electricity systems (Shell Foundation, 2018). While an unreliable grid rationalises this strategy, it leaves customers with limited resources. Improving grid reliability could empower customers to depend on cheaper grid electricity, which can be as little as 1/15th of the per-unit cost of systems such as those of M-KOPA (Taneja, 2018). Worryingly, inadequate supply and diminishing confidence in service-providing institutions have been shown to heighten households' energy vulnerability[1] (Tesfamichael et al., 2021).

Zambia provides an example of a country that has experienced electricity shortages, with

[1] Energy vulnerability is a term used to describe households' experience of a socially and materially inadequate level of energy services (Bouzarovski, 2017).

impacts on demand. Residential electricity demand has been decreasing over time, in part due to increasingly frequent load shedding (Government of Zambia, 2022). This means that households get intermittent energy provision as there is no capacity to serve all customers or to do so reliably. In addition to insufficient generation capacity, the energy utility, ZESCO, prioritises the mining sector which is the largest consumer of electricity in the country. As a result, the residential sector suffers from brownouts and unstable electricity provision. In turn, mistrust of the electricity grid increases, ultimately making households consume less electricity.

While the industrial sector is prioritised in Zambia, elsewhere poor supply (eg low accessibility, high costs, shortages, etc) can also be a major constraint for industrial activities and businesses (Hafner et al., 2018). For example, Mensah (2018) studied electricity shortages across 20 African countries and found that they negatively impact employment, entrepreneurship and labour market participation in three ways: by constraining the creation of new businesses; by reducing the outputs and levels of productivity of existing firms, which reduces demand for labour; and by severely distorting the business climate, by compromising the trade and export competitiveness of African firms. These challenges were corroborated by the expert interviewees from both the public (utilities) and private sectors, who emphasised that they all translate into slower economic development and growth.

Transmission and distribution losses

Distribution losses are a key challenge for numerous utilities across SSA, and these place strain on the operations, management, and finances of the utility (Attia, 2022; Garg, 2022). Utility transmission and distribution losses on the African continent average 23%, but can be as high as 40% (World Bank, 2016). In addition to ongoing operational and capital costs, these distribution losses must be recovered. This can affect tariffs and lower affordability, consequently stifling demand (Carr and Thomson, 2022). The challenge of non-technical (or commercial) electricity losses[2] was highlighted by the interviewed experts and has been stressed as one of the most pressing issues among electric utilities in SSA (eg Shirley and Attia, 2020).

High electricity tariffs and connection costs

In SSA (excluding South Africa), average per capita electricity consumption stands at approximately 180 kWh (compared to 13,000 kWh in the USA and 6,500 kWh in Europe) (AfDB, 2019), and those who are grid-connected frequently experience brownouts or blackouts. Informal or illegal connections are common given that many are unable to afford to pay for electricity through formal channels, especially under regressive, but popular, pricing structures[3] (Huenteler et al., 2017). These difficult to monitor 'losses' lead to utilities and other power suppliers missing out on revenues.

As argued by Barasa (2021), without reliable consumers, the business of producing electricity is not a particularly profitable one, and it is the end-users who are most affected by increases in electricity bills. Countries such as Rwanda, Mali, and Togo have among the highest electricity prices globally at over $0.20 per kWh (compared to the global average of $0.14 per kWh) (Statista, 2023). This exacerbates already low levels of

[2] That is losses occurring due to unidentified, misallocated, or inaccurate energy flows, for example electricity theft or meter tampering, and where electricity is consumed but not billed, as opposed to electricity that is billed but not paid.

[3] A pricing structure where the more electricity a consumer uses, the lower the cost per unit.

demand. Even where there are subsidies to make electricity tariffs more affordable, costs to connect can remain prohibitively high. For example, before 2018, customers served by Kenya Power through the grid or mini-grids benefited from cross-subsidies for consumption tariffs (paying $0.14 per kWh in 2018, rising to $0.18–0.20 in 2023). However, they still had to pay a high fee to cover the costs of connection at $398 (reduced to $171 when the Last Mile Connectivity project (LMCP) commenced (GIH, 2018)). This made connections prohibitively expensive, even for those households within reach of the grid (Lee et al., 2016).

Another factor that can increase electricity tariffs is contracts that utilities have with independent power producers (IPPs). For example, in Kenya, current contracts with IPPs are unfavourable, with high costs of power which result in low profit margins for the utility. The high cost of power generation is reflected in the tariffs which can become unaffordable, particularly for lower-income consumers. This, in turn, negatively impacts both consumption (ie what the consumers actually consume) and demand (ie what the consumers may want to consume with current and future appliances).

Political economy of electrification

As argued by Osiolo *et al.* (2017), there are many actors involved in electrification efforts, and they each have their own agenda. Interviewees argued that, for some, it is 'just' to provide connections with little consideration for what happens after a household gets access. Such actors mostly care about the number of households that have been connected, rather than whether they can be viable customers who benefit from the opportunities electricity has to offer. With the connection targets achieved, the burden of 'unprofitable' or economically unviable connections falls on the utility (or the mini-grid provider). For example, since 2015, the Government of Kenya (GoK) has been implementing LMCP. By 2022, LMCP had connected over 740,000 customers to the grid (KPLC, 2022). However, a large proportion of the newly connected households have shown very low levels of electricity consumption as their needs remain very basic and ability to pay is low. This places a heavy financial burden on Kenya's distribution utility and creates tension between the goals of universal access to electricity and the financial sustainability of the power supply system (Tesfamichael et al., 2020).

Interviewees argued that other, more cost-effective methods of electrification could have been more appropriate in the Kenyan context. Those include mini-grid connections or solar home systems which have also been promoted under the Kenya Off-grid Solar Access Project (KOSAP). The political economy of funding in the energy access sector also plays an important role, as it can prove easier for governments to get funding for larger (ie grid-infrastructure focused) projects. As a result, governments pursue electrification strategies which may not be best suited to the needs and circumstances of the targeted end-users, or indeed the country. This, in turn, produces many new connections while at the same time driving down average consumption and revenue per connection.

Inadequate institutional mechanisms and lack of stakeholder coordination

A final challenge specifically identified by interviewees, has been a lack of institutional mechanisms that enable the well-functioning coordination of stakeholders. This coordination spans on-the-ground operation, administration, utility staff, regulatory management, and decision makers. In some instances, this has been amplified by the speed of electrification efforts, which have outpaced the development of adequate institutional frameworks. It was argued that this has meant that much energy

planning across SSA has been happening in silos, making it difficult to develop and implement holistic approaches to energy access planning. Such approaches would cover not only the provision of electricity, but also assessments of needs and ability to pay, efficient operations and maintenance services, capacity-building across all administrative levels, awareness-raising and education of consumers, the facilitation of access to other services (eg financial), and access to appliance markets. Lack of investment in the planning process and the channelling of funding straight into implementation, combined with short timeframes for delivery and impact, have been among the barriers to the development of more robust energy access infrastructure include lack of investment in the planning process and the channelling of funding straight into implementation. These, combined with short timeframes for delivery and impact, is inhibiting the extent to which energy access can deliver positive outcomes for both provider and consumer.

Conclusion

Drawing on expert interviews and a literature review, this Knowledge Brief has outlined several key challenges to increased electricity demand in SSA.

It is clear that simply waiting for electrification projects to generate spontaneous positive effects in rural and newly connected areas is ineffective.

As a result, the potentially transformative impacts of electricity access have yet to materialise. This poses serious challenges when governments' budgetary resources are under significant strain, and when the multilateral and bilateral donor community calls for higher investments in socio-economic sectors to achieve ambitious goals, such as the UN's Sustainable Development Goals (EnDev, 2021).

Therefore, ensuring effective and efficient allocation of these limited resources, channelled towards areas with the highest potential for positive impact, is crucial for success.

The second Knowledge Brief [LINK] explores some strategies that have been used in different countries to increase demand, which may hold relevance to countries in SSA.

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