The Integrated Distribution Framework and the Global Commission to End Energy Poverty: Exploring Pathways for Accelerating Universal Access to Modern Energy Services

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Significant progress towards universal access to affordable, reliable, and modern energy services[1] requires stakeholders[2] to be incentivized to act in ways that collectively expand access and improve service reliability. Commissioners with the Global Commission to End Energy Poverty (GCEEP)[3] are collaborating to define a comprehensive policy and regulatory framework to align such incentives and attract investment into low-access countries' energy sectors. The body of knowledge produced by the Commission was initially nucleated with the dissemination of an inception report developed by researchers at the MIT Energy Initiative [2]. The GCEEP Inception Report outlines two major focus areas: distribution and wholesale cross-border trade. In the below sections, key challenges pertaining to these focus areas and proposals for their amelioration are presented, as identified by the report.

Vicious cycles of financial trouble plague most discos

With very few exceptions, distribution companies (discos) in low-access countries are experiencing financial difficulties. This situation renders investments to expand electricity access infeasible.

- **Tariffs are insufficient to cover the costs of supply.** Revenues only cover total costs[4] in two countries: the Seychelles and Uganda. In at least 20 countries in sub-Saharan Africa (SSA), revenues do not even cover operating costs alone [3]. In many cases, political pressures prevent regulators from increasing tariffs.
- **Reliability suffers and customers are dissatisfied.** With tariffs below supply costs, discos are not incentivized to extend the grid and connect more customers. Furthermore, they oftentimes cut corners in needed maintenance activities and stop purchasing electricity at times when energy prices are not covered by tariffs. Reliability suffers, and in many cases, customers may be compelled to refuse paying bills, steal power, defect from the grid, or support politicians who promise lower tariffs.
- **Inefficiencies yield high costs of supply.** Technical and commercial losses stemming from poorly maintained networks, management inefficiencies, theft and unpaid bills, in addition to typically high wholesale electricity prices, result in high delivery costs. Geographically dispersed loads and weak demand further add to the cost of rural electrification. Because populations without access usually have low levels of affordability, extensive subsidies are necessary.
- **Discos are ill-equipped to raise capital.** Private financing remains elusive for unviable distribution activities. Furthermore, discos often bear increased risk of subsidies being insufficient or delayed.[5] In many low-access countries, poor legal and regulatory security exacerbate the issue.

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[1] The UN Sustainable Development Goal #7 (SDG 7) targets "universal access to affordable, reliable and modern energy services" by the year 2030 [1]

[2] Such stakeholders include distribution companies, governments, regulators, large investors, development financial institutions, customers, investors, mini-grid developers, and solar kit providers.

[3] The commission is comprised of members from development banks, private investors, utility leaders, policy makers, philanthropists, project developers, entrepreneurs, diplomats, and academics. Please see https://www.endenergypoverty.org/ for a complete list of commissioners.

[4] Total costs are comprised of operating costs and capital costs.

[5] This situation happens regardless of whether the utility is vertically integrated or unbundled. Subsidizing distribution is necessary because the distribution segment collects tariffs, fully pays the costs of the other segments, and is in charge of rural electrification. Rural electrification in areas with low and disperse demand has been subsidized in every country, whether developed or not. Tariff cross-subsidization has been a common approach to solve the deficit problem in developed countries. Nevertheless, cross-subsidization may only be a partial measure in developing countries given the general

The Integrated Distribution Framework (IDF) offers promise for accelerated electrification

The IDF[6] is a conceptual framework guiding business, regulatory, and legal arrangements. It aims to ameliorate major challenges that commonly interfere with distribution activities in low-access countries. Its guiding principles and defining features are outlined below.

- **The IDF is formulated to meet several key requirements** which are seen as necessary features of any viable approach to universal electrification.
  - **Inclusiveness.** A single entity must assume real responsibility for serving all consumers within a given service territory, with specified minimum levels of service quality that may depend on the cost of supply. In the absence of such a responsible entity, many consumers will be left behind.
  - **Permanence.** Such an entity must be committed to provide service permanently over time and its business model must be financially and environmentally sustainable.
  - **A mix of delivery modes.** A least-cost electrification plan generally employs various supply technologies, including mini-grids, standalone systems, and grid extension [5]. The judicious deployment of decentralized options constitutes a significant opportunity for cost savings and accelerated near-term progress. Recognizing that demand usually grows over time, a subsequent transition to grid access may be expected to occur.
  - **Harnessing external resources.** Engaging with external partners may be the only practicable way for incumbent discos to access capital, advanced technologies, and management expertise within an acceptable timeframe.
- **The IDF permits a wide range of business, regulatory, and legal arrangements.** It must be adapted to account for prevailing national circumstances.
  - **The incumbent discos, under the circumstances described above, must partner with private investors.** This is necessary regardless of whether the discos are privately or publicly owned. A promising partnership model takes the form of a long-term concession in which the concessionaire formed through the partnership assumes responsibility for managing the disco.
  - **The new entity managing the disco assumes the obligation to supply electricity to all customers and coordinate with independent mini-grid and standalone system providers.** It must also accept the roles of "default provider,"[7] "last resort supplier,"[8] and exclusive provider by grid extension. And crucially, it must be accountable for the electrification of every customer in an assigned territory and in a specified period of time. Independent off-grid suppliers may coexist with the incumbent disco, becoming de facto concessionaires in small territories. Regulation must clearly specify how these several agents would compete for or be allocated new customers, and it must further specify the options available "if and when the grid arrives."
  - **Subsidies are required since average tariffs, even if cost-reflective, do not cover rural electrification costs.** This is because rural electrification costs are more expensive per kWh than distribution costs for connected customers in urban and peri-urban areas. The fact that governments and regulatory authorities in developing countries are generally unwilling to adopt cost-reflective tariffs exacerbates the issue.
  - **Several strategies can be used to decrease the required volume of subsidies.** These include the use of least-cost electrification

low affordability of existing and potential customers and high ratios of non-electrified to electrified customers. Additional direct subsidies are often necessary.

[6] The IDF was previously referred to as the "Integrated Distribution Company" and it is the underlying approach behind the "Energy Company of the Future" (ECoF) concept currently being piloted in Nigeria. It was originally presented in: [4]; The IDF has since been refined in the GCEEP Inception Report: [2]. Although no country to-date has successfully combined all of the features of an IDF, each component has been implemented in different settings, forming a rich base of empirical evidence to support the IDF.

[7] As a "default provider," a disco must supply all customers that are not already served by mini-grid or standalone system providers.

[8] As a "last resort supplier," a disco must substitute for any mini-grid or standalone system provider that fails to meet specified service requirements.

planning models; advanced metering technologies to decrease operation costs and reduce the burden of theft and unpaid bills; direct- and cross-subsidization; upgraded customer engagement via local service offices; technical loss reduction; the promotion of energy efficient consumer appliances; demand stimulation via fuel switching [6]; and support of productive uses of electricity, among others. Promoting the integration of "access" with the "services" that electricity can provide must be prioritized by the new disco, enabling economic growth and human development.

Improving wholesale cross-border electricity trade promises significant value

While distribution-level solutions via the IDF are the primary focus of the GCEEP Inception Report, opportunities for wholesale-level improvements are also emphasized as they directly influence the reliability and price of grid power downstream.

- **Reducing costs and improving reliability is essential.** Reduced generation costs confer more affordable energy services and help to mitigate the need for subsidies. High reliability levels prevent grid defection and enable economic growth.
- **Regional energy resources need improved utilization and further development.** Many low-access countries lack sufficient demand to accommodate even a single large power plant. This is particularly true in SSA. Potential economies of scale in generation are missed due to low levels of demand and inadequate interconnection, resulting in high generation costs.
  - **Effective regional power system integration is required.** The benefits of regional power pools in SSA are largely untapped. Regional governance needs to be strengthened and flaws need to be addressed regarding rules for regional trading and transmission cost allocation.
  - **Centralized generation capacity should be expanded.** Private financing can help to fill major investment gaps in generation. In some cases, legislative, regulatory, and structural reforms are necessary to allow independent power producers to participate. Well-functioning power pools allow investments to be made at regional levels, improving economies of scale in generation. The likelihood that such investments are made will also increase with improvements to the creditworthiness of off-taking discos.
  - **Adequate transmission network infrastructure is needed.** Transmission is needed to interconnect national power systems and to bring low-cost large-scale generation to distant demand centers. Transmission expansion must be supported by framing regional visions of the power sector and by addressing regulatory flaws and uncertainties hindering the participation of private investors. Improved regional transmission planning and sound cost allocation rules for cross-border transmission projects are imperative.

References

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