

Financing national energy access: a bottom up approach



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Key messages

The right money where it's needed most

Investments in national energy systems have increased in recent years, with the rising acknowledgement of the vital role of energy in improving health, education, economic opportunity and a plethora of other development objectives. Decentralized energy systems in particular have shown growing promise, both commercially and developmentally; attracting new funding from a range of sources. However, it is widely recognized that this new financing is not enough, and not all of the correct type, to ensure the world reaches its challenging goal of universal, sustainable and modern energy access by 2030.

The *PPEO 2017* uses bottom-up integrated energy planning tools to model the national technology mix and financing required to achieve Total Energy Access (TEA) in Kenya, Bangladesh and Togo.

Our methodology is the first to take an end-user needs approach to national rural energy planning and financing. The result is holistic and defined by the needs and preferences of communities that are rarely consulted, and seldom prioritized in national energy planning. We match this with a review of global and national energy financing: both the barriers faced and potential opportunities to embrace. The results will help inform planners, donors, and other financiers about the mix of technologies and the type of funding and support that are needed to best and most expediently meet the needs of those who lack energy today.

The financing gap for energy access

Beyond national policies and plans, the availability of finance is a central driver of progress towards achieving universal access to electricity and clean cooking.

The IEA (2012) estimates that \$49 bn a year over 20 years, or \$979 bn in total will be required to achieve energy for all. Other modellers have argued that this is an over-estimate, with figures depending on assumptions about the efficiency of appliances and the level (tier) of energy provided.

However, what is clear is that a large gap remains. In 2013, \$13.1 bn was invested in energy access, with 97% targeting electricity and only 3% spent on clean cooking. Much of this was concentrated in a few countries, and 'overwhelmingly, these energy access investments went to the power sector, either to increase generation capacity or to extend transmission and distribution networks'. (IEA 2012)

The finance gap: a bottom-up perspective

The 2016 edition of the *PPEO* focused on the issue of national energy planning, and the extent to which this ignores those without energy access. We used our Total Energy Access approach to develop energy access plans with 12 communities in Kenya, Bangladesh and Togo, based on the needs and preferences of the communities.

In this edition, we scale these community energy plans to the national level. Using the needs and preferences expressed within them, we create estimates for the technology mix for cooking and electricity that would close the national access gap. We generate national financing estimates, and using community figures on willingness to pay, we estimate the financing gap.

We explore the energy access finance picture in each country, and report on consultations with national sector experts to identify key financing barriers and opportunities. We recognize that getting additional finance to the

right places with the right terms is a necessary, but not sufficient condition for realizing energy aspirations of these communities. A range of other actions will be required, but without the right finance, progress will remain painfully slow.

Findings and implications

Technology mix

- **Distributed electricity systems** (mini-grids and stand-alone systems) **are the least-cost solution** for meeting the needs of the majority of those remaining un-connected: serving 58% of un-connected households in Bangladesh, 73% in Kenya and almost 100% in Togo. The distributed energy sector should account for between 80% (Bangladesh) and 100% (Togo) of future finance for electricity access. This is an indication not of how expensive distributed solutions are, but of the high marginal cost of connecting dispersed users to the national grid.
- Mini-grids will form the largest part of the solution in Kenya (39%), but are only viable for a smaller proportion of those currently un-connected in Togo (16%) and Bangladesh (6%).
- The finance gap for clean cooking depends on the type of provision. Communities expressed a strong preference for clean fuels and technologies. Based on this, national financing needs to rise to levels close to those for electricity access.

Financing required

- There is **a significant jump in costs at higher levels of power**. Our model is based on current prices and the efficiency of widely available appliances in each country. As prices reduce, and the efficiency, affordability and availability of appliances improves, this could significantly reduce the cost of electricity access.
- National energy access plans and financing must include **productive and community uses of energy**. This can require stand-alone systems with high power

	Electricity access		Clean cooking (user-choice)		Advanced biomass cookstoves ¹	Improved biomass cookstoves ²
	Total	Per person/yr	Total	Per person/yr		
Togo	\$4.9 bn	\$93	\$2.1 bn	\$20	\$0.8 bn	\$0.6 bn
Kenya	\$26.0 bn	\$72	\$27.8 bn	\$43	\$8.4 bn	\$3.4 bn
Bangladesh	\$75.2 bn ³	\$134	\$43.1 bn	\$18	\$77.4 bn	\$37.0 bn

Table 1: Cumulative cost of provision of national energy access plans to 2030

¹ Tier 3 or above of the World Bank multi-tier framework.

² Tier 2 of the World Bank multi-tier framework.

³ If electricity needs of SMEs and small-holder farmers are excluded: total is \$37.7 bn, or \$67 per person/year.

The scale of the challenge



Distributed electricity systems (mini-grids and stand-alone systems) are the least-cost solution for meeting the needs of the vast majority of those that remain un-connected.



If people's preference for switching to clean fuels is taken into account, the costs of delivering on clean cooking are at a comparable level to those for electricity access.



National financing strategies need to address energy for productive uses as urgently as household needs. This can account for a substantial part of the costs of provision.



National financing strategies need to integrate with other sectors to address needs for water pumping, power for schools, or street lighting which are high priorities for communities, and relatively cheap to supply.

capacities. In Bangladesh, these account for a large proportion of the cost of delivering energy access.

- Some community energy access needs only represent a tiny fraction of the overall cost of provision, but are a high priority for communities. Street lighting represented less than 1% of our electrification finance estimate in Bangladesh and Kenya, and 7% in Togo.
- Even poor communities are prepared to contribute to energy access needs, but a **financing gap remains**. The amount they are willing to contribute depends in part on income levels, and in general people are prepared to contribute less for cooking than for electricity.

National landscape of energy finance

- **The lack of maturity of energy access markets** in Togo is reflected in far lower levels of investment (\$0.9 bn currently committed). Kenya has the highest planned investments (~\$2.8 bn), with less in Bangladesh (\$1.6 bn, although figures were hard to establish).

- The **balance of investments** between grid and distributed solutions continues to be skewed. In Kenya, despite large new commitments, only 15% is for distributed energy, and in Togo only 5%. In Bangladesh, investments in stand-alone systems are 25% of the total. Investments remain dramatically skewed towards electricity rather than clean cooking.
- The **barriers to energy access finance** in Togo relate to a policy and regulatory environment that has yet to embrace distributed solutions, coupled with higher levels of poverty. Finance institutions remain unwilling to support consumer or enterprise loans without sufficient scale of operations and track record.
- In the more mature markets of Kenya and Bangladesh, barriers relate to specific policies which could help reduce the cost of distributed electricity and clean cooking solutions (e.g. tax exemptions, or streamlining of licensing requirements). Consumer finance in Kenya through PAY-GO systems, and support to solar home-system companies through IDCOL in Bangladesh have been important channels for helping rural households access energy products.
- In all countries, action and awareness is needed to **address gendered barriers to energy finance** for women as both consumers and entrepreneurs.

Priorities and solutions



In pre-commercial markets (for both distributed electricity and clean cooking), public-sector support is needed for rapid market activation and closing the affordability gap.



In more developed markets, support that leverages private-sector investment is needed to reduce investment risk and avoid destroying local markets.



Finance is often needed in smaller amounts and through national financial systems to cater for small and medium companies.



Financing systems can actively promote gender equity in energy access, critical for more sustained, appropriate and equitable solutions.

Recommendations

Our case studies and models highlighted how each nation differs in its technological needs and preferences, demand levels, willingness to pay and costs of provision; and also in the maturity of its markets. One-size-fits-all approaches for energy access will not work.

We highlight three overarching obstacles to, and simple solutions for, realizing global energy access financing objectives at scale, which can be implemented immediately and would have significant impact.

Problem: In line with PPEO 2016, it is clear that current national energy planning methods, policies and regulations will not deliver universal access by 2030.

Solution: Bottom-up planning provides a more accurate picture of the technologies needed and the scales on which they are required. Only when we know the true scale of the distributed technologies needed, can we adapt the correct financial tools, and bring in the right financiers, to end energy poverty in an appropriate, expedient and economical way.

Problem: Most low energy access country markets for energy services are pre-commercial, and the private sector cannot be expected to enter them without significant support.

Solution: Broad-based market activation initiatives are required to build-up knowledge, shared goals, trust, and a wide-ranging enabling policy, regulatory and financing environment to foster opportunities for market building and last mile service delivery. Importantly, partnerships

between civil society, the private sector and government will be fundamental in actual delivery of energy services in many cases due to the low population densities and vast distances between many energy poor regions.

Problem: Development finance institutions (DFIs), donors, philanthropists, impact investors, and other concessional financiers lack familiarity with pre-commercial energy access market needs, and the instruments and approaches required to scale finance for universalizing access by 2030.

Solution: DFIs and others must incentivize their staff to move away from old approaches, and to find ways to embrace smaller but more appropriate solutions and adapt them to the institutional and financial constraints they work under. This will require aggregation tools, early-stage risk capital and challenge fund development, and above all, working on the fundamental, but often critically ignored issues of cooking and the gender gaps and barriers within current tools.

Future editions

This briefing report on the *Poor people's energy outlook 2017*, is the second volume of a three-part guide to transforming the way the world must think about, and act on, energy service delivery if we are to eradicate energy poverty by 2030 in line with global goals. The 2016 edition focused on energy planning and policy making for universal access. This 2017 edition focuses on financing national energy access plans; and the 2018 edition will show how to deliver universal access in practice.

The PPEO series draws on Practical Action's 30 years of experience working with communities in Africa, Asia and Latin America to improve their access to energy. It highlights what it means to live in energy poverty, the expressed needs and priorities of the energy-poor, and how the global community can make energy access more affordable, appropriate and sustainable. Practical Action has documented its experience in numerous publications and technical advice, through our Consulting, Publishing, and Practical Answers enquiries service.

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