Will private-sector finance support off-grid energy?

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Providing the world's poor with modern energy services represents an investment challenge. The United Nations Sustainable Energy For All (SE4All) initiative estimates that energy access in developing countries requires investments of US$ 45 billion annually by 2030 to step up to this challenge[1]. This means that the US$ 9 billion per year currently invested in energy access has to be quintupled – not an easy task considering the scarce budgets of the public sector, especially in developing countries.

In my eyes, providing the 1.3 billion people without access to electricity, and the 2.7 billion people dependent on traditional biomass for cooking[2], with modern energy services will not be achieved without the private sector financing a significant share of these investments. Hence, the question of whether the private sector will finance off-grid rural energy is decisive. The good news is that the private sector – in theory – has the economic presence to provide financing at the required scale, with global capital markets amounting to more than US$ 200 trillion[3]. However, private-sector investors and financiers, be it debt providers or equity sponsors, require certain conditions to make them feel confident of investing at a significant scale. Given the high number of people lacking access to modern energy services, such conditions barely exist in the off-grid energy sector.

What are these conditions? Of course there is a range of different types of investors in the private sector, but it is safe to say that most investors primarily consider three main parameters: return, risk and scale.

Return on investment

Unlike most donors or the public sector, private investors demand a return on their investments above a certain threshold, also called the hurdle rate. In other words, the revenues from a private-sector-financed electrification

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project need not only to cover the depreciation on the equipment, the operational expenditure such as wages, debt service and interest expenses to a bank, for example, but also to provide an annual income for the equity sponsor above a certain hurdle rate. To increase revenues and help surpass the hurdle rate, several sources of value might be combined in a business model – such as national government subsidies or revenues from global carbon markets. Recent research has shown, however, that the most important source of income will be the payments made by the energy consumers themselves – the villagers[4].

In order to guarantee sustained income over the entire lifetime of the investment, business models for smart villages need to ensure a positive income dynamic in the village[5]: the use of modern energy services should lead to an increase in income for the villagers. This helps to ensure that they can afford the consumption of these modern forms of energy in the long run and thereby provide sufficient long-term return for the private investor. But how high is the hurdle rate? How much return is sufficient? This depends strongly on the second relevant factor: risk.

Risk of investment

The minimum return an investor demands depends on the risks present in a project. Each additional risk adds to the hurdle rate. Certain risks can even act as a "show-stopper", making projects entirely unattractive for private-sector investment. Private investors – particularly those willing to invest in long-term infrastructure such as that required for electrification – are typically risk-averse. At the same time, many electrification projects are plagued by high risks stemming from different stakeholders at various governance levels (Table 1).

Some risks can be addressed through the business model of the electrification entrepreneur, but others are beyond the entrepreneur's control and need to be addressed by the public sector. An example of such a risk for an investor is when a village that has been electrified by a private-sector investor becomes incorporated into the main electricity grid: the main grid's cheaper and often heavily subsidised electricity tariffs undermine the private-sector investor's business model[4].

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Scale of investment

Private investors typically dislike small project scales. This is due to the considerable effort

Table 1 Common risks in electrification projects, stakeholders driving these risks and their governance level[4,6]

Risk	Stakeholder	Governance level
Regulatory risk *permits, market access, power market regulation*	Public sector	National/(local)
Grid extension risk *arrival of main grid*	Electricity utility/grid operator/grid regulator	National/sub-national
Technology risk *quality of equipment and project planning*	Technology supplier/ engineering contractor	International/ national/(local)
Operations risk *operating and maintaining equipment*	Project developer	Local
Financing risk	Financial sector	National/international
Customer payment risk	Villagers	Local
Public acceptance risk	General public	National/local

and high costs in evaluating potential sources of return and risk for each project. Different project types often also require different legal arrangements, leading to additional costs. These evaluation and structuring costs typically occur long before an investment can generate returns and typically do not increase strongly with project size, which makes larger investment more attractive.

At the same time, almost all projects providing modern energy services to villages require relatively small-scale investment[7]. For household-scale services such as solar lanterns, efficient cook stoves or solar home systems, micro-finance vehicles can be appropriate. However, solutions at the village level, such as electricity mini-grids, require scales of investment which are on the one hand too large for micro-finance investors but on the other too small for typical (energy) infrastructure investors.

Box 1 Policy options

Related to return

- In order to provide adequate *return* for investors, the public sector could provide co-funding through private-public partnerships[8]. But subsidies also play an important role[4]. Policy makers at the national level can remove regulations that cap energy revenues at very low rates.
- Many countries do not allow electrification projects to collect electricity tariffs higher than the often highly subsidised grid rate, despite the fact that villagers have a much greater willingness and capacity to pay[4].
- At the international level, policy makers designing carbon markets with offset mechanisms, or supporting nationally appropriate mitigation actions (NAMAs), can provide differentiated support for projects with a high development impact[9]. As energy access projects typically have a high development impact they would profit from increased carbon revenues.

Related to risk

- Addressing investment *risks* is often called de-risking[10]. To de-risk an investment, risks can be mitigated by addressing their root causes, as in policy reform; risks can be transferred to third parties through guarantees or insurance vehicles; or risks can be compensated by increasing the expected return.

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For village-level solutions, a future option is to bundle several independently operated mini-grids in various villages under one legal investment entity. While this increases the planning, training and operational efforts, it not only allows reaching investment scales which are more interesting for infrastructure investors, but carries a second potential advantage: due to the pooling of several villages, the diversification of risks could lead to a portfolio effect, reducing the minimum rate of return required by the investors.

Policy implications

Policy makers from the global to the local governance level who aim to increase the contribution of the private sector to off-grid rural energy finance can help to create more favourable conditions for private-sector finance. Understanding the three key criteria of private investors is a good starting point.

- Research on grid-connected renewable energy projects[6] has shown that mitigating risks is the most cost-effective approach, followed by risk transfer.
- Compensating risks is typically inefficient. In the case of smart villages, this implies a smart-village strategy that includes policy reform to reduce or completely eradicate policy-induced risks. Where such reform is not enough, or is prevented by political realities, risk transfer instruments should be provided by national governments through their national development banks, or international institutions such as regional development banks or the World Bank.
- To date, risk transfer instruments specific to the smart village do not exist and should be developed.

Related to scale

- A smart-village policy strategy with clear goals is important to reach *scale*. While concepts will have to be tailored to individual villages, from an investor perspective it is important that too many competing concepts are avoided, allowing for relatively standardised business models.
- The governance level of such a strategy depends on the country size: in larger countries, such as India, a strategy on the sub-national level (federal states) could be most effective; in smaller countries, a national or even regional strategy would make sense in order to reach investment scale.

Recommendation

Policy makers in donor countries but also in developing countries should support future research on the topics listed in Box 1 with respect to the development and expansion of smart villages in developing countries.

Key questions concern the quantification of risks, the size of the portfolio effects, the prospect of combinations of grid extension and off-grid electrification, and the feasibility of policy reform – especially given a new international momentum due to the SE4All initiative and the post-Kyoto climate policy.

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