

Rural electrification in times of corona

Off grid | Travel restrictions imposed by countries in response to the coronavirus pandemic have contributed to a slowdown in investment in rural electrification projects. Thomas Hillig examines the extent of the investment freeze and possible solutions to get capital flowing into much needed projects again

More than a billion people around the globe do not have access to electricity. The power generation infrastructure in many countries is insufficient. The COVID-19 crisis has revealed the various weaknesses in the power sector while at the same time solar-home systems and mini-grids were used for short-term troubleshooting and for providing a reliable electricity supply to hospitals and health centres.

The solar power revolution could help overcome this unsatisfying situation long-term. Solar allows for a more decentralised approach to power generation. An attractive characteristic of solar power is that scale is less important than for traditional fossil fuel power plants: small generation units can be built in a relatively inexpensive way.

Mixed signals: An insolvency followed by flood of new money

Last year, the sector was shocked when one of the mammoths of the industry, the German solar-home systems (SHS) company Mobisol had to file for insolvency. Many speculations surrounded this insolvency: Were costs out of control? Was it the financing structure that heavily relied on debt? Was Mobisol only the tip of the iceberg? Would other rural electrification players follow soon? Mobisol's insolvency raised concerns for many investors who had already invested in rural electrification companies or considered investments. This is not only true for rural electrification with solar-home systems but also for access-to-energy solutions with mini-grids.

The situation calmed down when Mobisol was rescued and taken over by the French utility ENGIE last September and when BBOX received a US\$50m investment from Mitsubishi at around the same time. The sector's doomsday mood quickly flipped over to pure euphoria.

Solar-home systems are the investor's darlings

Solar-home systems (SHS) are micro-power plants with integrated energy storage that provide electricity to individual buildings or households. SHS typically provide DC power that can be used without any problems for lamps and mobile phone charging. For newly electrified households, these are typically the main power needs. The electricity from SHS is not fully comparable to AC power that we are used to in developed countries. More sophisticated appliances such as televisions, fridges or air conditioning units typically require AC power. To overcome these limitations, SHS providers pursue two different solutions:

- Development and provision of DC appliances
 - Conversion of DC power to AC power
- DC solutions for television, refrigerators, or air conditioning are typically much

more costly than standard AC appliances — comparing new to new. Far more importantly, already existing AC appliances cannot be used directly. This is a significant drawback as in many developing countries second-hand appliances play a crucial role. On the other hand, converting from DC to AC adds substantial extra costs.

From an economic point of view the attraction of SHS lays in the fact that they can fish more easily for relatively wealthy customers as they are not bound to the limit of villages. Moreover, the risk is not associated to any centralised assets. This is why solar-home systems have been the investor's darling from the outset.

Certain voices in the international development community insist that developing countries merit the same power quality as western nations and that SHS would not be enough. These voices often advocate mini-grids.



Smarter due diligence processes could help investment flow into rural electrification projects once again

Credit: SunFunder

Mini-grids: autonomous small-scale power plants, storage and distribution on village-level

AC mini-grids resemble a miniature version of the power infrastructure that we know from western countries. Today, on the generation side, mostly solar power plants plus battery energy storage are used, often combined with diesel generators or biomass plants for securing the energy supply during bad weather periods or as a cheaper option during night-time.

In comparison to standard grid infrastructure, mini-grids are much smaller: typical plant sizes are in the range of 10-35kWp solar and less than 100kWh battery energy storage for 150-400 connected households. Mini-grids are typically isolated and completely autonomous. AC mini-grids provide electricity of high quality that can be used by private, commercial and small industrial off-takers. Well-designed mini-grids are considered to provide electricity of a quality that is comparable to sophisticated national grids. The downside is that mini-grids require investments in a rather complex power generation and distribution infrastructure.

Innovation as an enabler: cheap smart meters and mobile money

A new generation of relatively inexpensive smart meters that can be coupled with mobile money solutions allows for remotely controlling the energy sales in an automated way. Pay-as-you-go (PAYGo) systems allow for setting up payment methods for decentral energy sales that imitate pre-paid mobile phone solutions. The end-customer must “top up” his energy account before consuming the electricity. This approach enables SHS- or minigrid-operators to manage the payment behaviour in an automated way and to optimize the money collection process. The approach avoids losses due to failure of payment. The downside is that the solar power output is determined at the moment of the investment when the technical parameters of the plant are specified. If the electricity from a system is not consumed it cannot be sold elsewhere. Forecasting future electricity needs is a key discipline — above all for minigrid developers as minigrids can hardly be removed after construction. SHS companies face more flexibility. In case of non-payment, it is relatively easy — at least from a technical

point of view — to dismantle, remove and relocate SHSs.

Are SHS and mini-grids complementing each other?

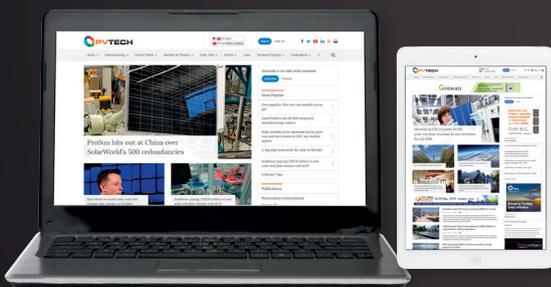
Both SHS and mini-grid companies have to choose their customers carefully in order to come up with an economically viable business case. SHS providers choose the best customers on a country level or from certain regions in which they operate. Not everyone can afford solar energy. Mini-grid developers make two choices: first, they choose a village, then they choose in a particular village the customers that can pay for electricity and that are easy to access.

As a certain willingness and ability to pay for solar power is required, both approaches have the tendency to address primarily the rural middle class. Subsidies that are often incorporated in both approaches do not necessarily reach the poorest of the poor. It becomes obvious that development efforts must be undertaken beyond electrification. Mini-grid developers have to deal with the disadvantage that they cannot fish for the wealthiest clients in target areas



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but have to deal with the realities in a particular village. They need to find enough off-takers around a centralised solar-power plant that can actually afford to pay for electricity. Often, within the village they are less demanding than SHS providers regarding the ability to pay for electricity and provide energy access also for poorer households.

Without productive use no rural development

The hope of the international development community was that electrification would trigger economic growth immediately. However, many rural electrification players have realised that the reality is not so easy. Electrification is a necessary precondition for rural development, but it requires much more than just electricity. And this is a problem – at least for the mini-grid developers. They typically oversize the solar power plant in regard of initial consumption to be prepared for their customers “climbing up” the energy ladder. If the development process does not kick in, their market is not sufficiently large to operate the mini-grids efficiently.

COVID-19: Full throttle or full brake for rural electrification?

The COVID-19 pandemic is highlighting the importance of critical infrastructure and could potentially speed up the development of both mini-grids and solar home systems. Mini-grids, with their ability to provide resilience, seem to be a perfect fit for hospitals and larger health centres while SHS would rather be used for small health centres. International development organisations could see in rural electrification a proven solution for providing first aid during a local outbreak in the pandemic.

Though these advantages clearly exist there are also numerous new hurdles, which could slow down the development. The pandemic and associated lockdowns have left their marks on the solvency of the off-takers. Payment losses from both SHS and mini-grid customers are so far rather topics that are discussed behind closed doors. However, it is obvious that business cases that were hardly favourable before require during the pandemic significant support from the international community. In times when the domestic economy is struggling it is questionable how reliable this support will remain or if it will be rather be expenditures that will be cancelled

first if national budgets are under pressure due to recessions.

The corona pandemic will also interfere with the processes of rural electrification players. A possible second wave in Asia could create issues regarding the supply chain. Lockdowns in rural areas have already caused some delay because sales activities and installation that require physical presences were postponed. The pandemic also put pure survival into focus of many remote and rather poor households. Down-payments that are required for new solar assets lose importance.

We have also observed a similar phenomenon in some parts of the administration of the target countries for rural electrification investments; sometimes civil servants from rural electrification agencies have been for fighting the pandemic and cannot fulfil their tasks to drive forward SHS or mini-grid projects. Long-term investments in these critical power infrastructure projects require a strong backing from the local administration.

Due diligence as bottlenecks for investments and virtual approaches to move forward

Though the first wave of the pandemic did not affect Africa as much as feared in the beginning, lockdowns slowed down investment from international development organisations – even if the funding was not withdrawn, travel bans hindered due diligence activity by mini-grid and SHS developers. Typically, a sample of existing installations is checked on-site, end customers are interviewed and thorough discussions are conducted with the SHS or mini-grid players before investing substantial sums. For months, these on-site activities have been almost impossible to conduct by potential investors from Europe or the US. This is why investments into SHS and mini-grid players have receded during the pandemic.

Already in the past we have seen that due diligence was rather expensive and timely for investments in rural electrification. We proposed streamlined approaches to save money and time for investors and rural electrification players. In the pandemic, the situation has exacerbated substantially. Given that travel restrictions still exist we see the absolute need for virtual due diligences. With our experience of two very thorough due diligence processes in Africa and India, we see ideally prepared to shortcut entrenched habits and have developed a remote due diligence approach that will

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Investments are rather postponed than cancelled

The good news from the rural electrification side is that so far only very few funds have been withdrawn, the process is rather slowed down due to technical reasons – throughout the value chain of rural electrification players such as customer acquisition or installation of the systems and also on the investors side. It does not take a crystal ball to see that this might change for the worst if the pandemic continues longer than expected. ■

Author

Thomas Hillig founded THEnergy in 2013 as a specialised consultancy focusing on energy generation for industrial and commercial consumers. The main areas covered are renewable energy microgrids and remote hybrid power plants for sectors such as mining, tourism, telecommunication, or agriculture. THEnergy combines Hillig's previous experiences working at Alstom Power in conventional energy generation and at Innotech Solar. At the beginning of his career, Hillig consulted leading companies from the transport, telecommunication and construction sectors.

