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EnerSHelF

EnerSHelF
Business Brief
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Photovoltaic energy solutions for Ghana: Considerations for business development

The EnerSHelF project aims to enhance the reliability and sustainability of energy supply for health facilities in Ghana through photovoltaic (PV)-solar hybrid systems. The project combines the work of engineers, meteorologists, and development economist. Based on the research findings, this business brief offers considerations to investors or business developers, who are active or seek market entry in the Ghanaian PV market. Three fields of considerations are presented. First, the policy environment, second, socio-economic considerations with specific emphasize on the diffusion of PV solutions for healthcare facilities, and third, technical considerations.

Jonas Bauhof[1], Katja Bender[1], Stefanie Meilinger[1]

With contribution from: Callistus Agbam[1], Kennedy Alatinga[2], Ana Maria Perez Arredondo[1], Jan Bliefernicht[3], Paul Bohn[4], Catherina Cader[3], Samer Chaaraoui[1], Edward Dodzi[5], Katrin Lammers[3], Avia Linke[3], Emmanuel Ramde[5], Windmanagda Sawadogo[3], Thorsten Schneiders[4], Andrés Andrade Velásquez[6], Rone Yousif[1]

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[1]International Centre for Sustainable Development (IZNE), University of Applied Sciences Bonn-Rhein-Sieg, Sankt Augustin, Germany. [2]Faculty of Planning and Land Management, SD Dombo University of Business and Integrated Development Studies, Wa, Ghana. [3]University of Augsburg, Augsburg, Germany. [4]Cologne University of Applied Sciences, Cologne. [5]Kwame Nkrumah University of Science & Technology, Kumasi, Ghana. [6]Reiner Lemoine Institute, Berlin, Germany.

The Policy Environment

The diffusion of photovoltaic (PV) energy solutions in Ghana is characterized by a long-term process with reforms which can be distinguished in three phases:

1986 – 2000: Demonstration, research, and development

2001 – 2010: Scale up and attempts to institutionalize

2011 – 2020: Legislation and institutionalization of policy measures

Throughout these phases, the concern for energy security and power crisis ('dumsor'), the declining prices for PV panels, and international agreements to combat climate change were the primary driver for progress. However, the discovery of large oil and gas resources in Ghana caused a slowdown in the process of the diffusion of PV solutions. Up until today, main concerns for policymakers regarding the energy supply is the development of the country's petroleum resources. PV continues to play a role on the policy agenda, but the pace of reforms remains an open question. This causes uncertainty regarding the attractiveness of the market for investors and business developers.

There is also a considerable level of uncertainty regarding regulatory frameworks. Laws and regulations underwent constant changes or were not thoroughly implemented. Currently, for large scale projects, business developers and investors need to consider the moratorium on Power Purchase Agreements (PPAs) for new renewable or thermal power plants. This includes the development of new projects but also previously granted licenses, which were partly revaluated and withdrawn.

The regulation of feed-in tariffs also requires a close observation. A newly developed regulatory framework came into action at the beginning of 2023. A net metering scheme for renewable energy was introduced by the PURC (Public Utilities Regulatory Commission), allowing consumers to produce their own electricity through solar or wind generation and feed in excess electricity production to the national grid. By doing so, they can reduce their electricity bills. A future evaluation of the net metering scheme's success is advisable to measure its implementation and give comprehensive recommendations to potential customers.

Key messages

- Closely monitor current regulatory developments.
- Due to the PPA moratorium, private customers as the primary target group are recommended.

Socio-economic considerations

EnerSHelF collected data across 197 private, mostly small, health facilities on electricity consumption and energy supply. The average electricity demand was 33 kWh/day and almost all facilities were connected to the grid. Due to blackouts and unreliability of electricity supply, 76% relied on additional fuel generators and the experiences with PV solutions is scarce. Only 5% either had very small solar cells for lightning and battery charging or have installed a small-scale PV-solar system as a supplementary electricity source. In total 57% were dissatisfied with the current reliability of power supply. Of those who expressed dissatisfaction.

Further analysis revealed that health facility managers are open to change if alternative options promise a credible improvement in the reliability of energy access. Offering flexibility in sizing the system is advised, though. For health facility managers, 100% autarky is often not desired but an increased stability of electricity supply when blackouts occur. Hybrid systems that combine the supply from the grid with PV solar systems are the preferred option. Overall, respondents believe that they could offer better healthcare services if the electricity supply would improve – and PV solutions could fill this gap.

Nevertheless, there is a knowledge-gap regarding the cost of PV systems and 27% of surveyed health facilities expressed the option that the monthly electricity costs from a PV system are higher than from the national grid. Providing the correct information that solar energy is cheaper – excluding investment costs – is an important task for solar companies. Additionally, it is crucial to develop flexible instruments for financing investment costs and ensuring the availability of maintenance expertise. This could include lease-based solar-as-a-service products to connect health facilities with local or international investors, who can balance out the initial investment costs. However, the inflation and depreciation of the Cedi requires additional attention.

Concludingly, there is a market potential for PV solutions in the health sector in Ghana. However, financial burdens and a knowledge-gap must be crossed and require business-developers to increase the attractiveness for investment.

Key messages

- Information campaign to raise awareness of PV energy solutions and their applicability.
- Offer specific financing options for PV system for health facilities to ease the investment burden.
- Offer flexible hybrid system designs to fit the needs of the health facility.

Technical considerations

The planning of PV systems requires context-specific consideration and data. Research of the EnerSHelF project shows that using higher resolution of load data helps to recognize load peaks more efficiently than the often-applied 15min resolution. For health facilities, strong fluctuations within the internal electricity grid have the potential to damage sensible medical equipment. Incorporating battery storage to a PV system can balance major fluctuations. Batteries can also help to overcome blackouts, however, the capacity should be linked to the length of blackouts whereby the frequency of blackouts has decreased in the past years. As batteries are the most expensive component of PV-hybrid systems, the smallest possible setup can decrease the investment costs significantly for the consumers.

Regarding the maintenance of PV systems, the cooling of the battery storage if installed is pivotal. If not cooled properly, they are likely to be damaged within a short period of time. Especially when using lithium-ion batteries, the disposal and replacement is difficult. Here, it is advised to use lead-acid battery, as they are cheaper and widely available in Ghana. However, cooling remains to be important. Additionally, the high temperatures and dust during harmattan season should be considered as well as both reduce PV power production Regular cleaning of the panels should be considered in the maintenance schedule. Offering training to local constructors and partners can have a positive effect in this regard.

The accuracy of satellite data to measure the solar irradiance is likewise important for planning a PV system. Based on EnerSHelF's research, SARAH-2 satellite data delivers the best results for Ghana. Using accurate data can decrease the cost for solar companies offering guarantees of certain solar power yield. Inaccurate data can lead to dissatisfaction of customers and mean a breach of contract and financial penalties for the company.

When planning off-grid PV energy solutions for health facilities – especially in rural areas – considering the electricity needs of surrounding communities can be an additional argument for consumers and especially health facilities to choose a PV system: Systems can be sized according to load peaks and excess energy could be sold or used in the community. Scalable solutions can ease the expansion of the system when needed. However, local regulations and frameworks should be considered carefully.

To help planning PV energy systems, EnerSHelF developed two tools: A webtool offering first information on system planning in the health sector. And second, the planning tool MIGUEL[1], which helps in sizing the system based on certain parameters and an easy-to-use interface. EnerSHelF showed, that forecast based control algorithm will reduce negative impacts with regard to costs and emissions due to blackouts.

Key messages

- Use a high resolution to measure load data to identify load peaks.
- Ensure cooling for battery storage.
- Use lead-acid batteries for better availability and lower price.
- Offer training to ensure a sufficient maintenance of the system.
- Use SARAH-2 satellite data for accurate solar irradiance data.
- Consider the electricity need of surrounding communities, when planning off-grid PV systems in rural areas.
- Use sophisticated planning tools.
- Consider forecast-based operation.

EnerSHelF Quick Facts

- **Project:** EnerSHelF – Energy Supply for Healthcare Facilities in Ghana
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Energy Supply for Healthcare Facilities in Ghana

EnerSHelF is an interdisciplinary German-Ghanaian project of political economists, engineers, and partners from the private renewable energies sector. The project deals with the sustainable and reliable energy supply for healthcare facilities in Ghana.

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