



# Are long-term service-based delivery models the solution to sustainable energy access for social institutions?

GRÜNE BÜRGERENERGIE  
(GREEN PEOPLE'S ENERGY)  
RESULTS CASE STUDY

Lessons learned from a pilot in Benin



<b>Country</b>	Benin
<b>Implementer</b>	GBE Benin & CIDR Pamiga
<b>Target groups</b>	Social institutions
<b>Other stakeholders</b>	Solar companies
<b>Project duration</b>	01/2022 – 09/2023

## PROJECT APPROACH

In Benin, only about 18% of the rural population has access to electricity. In rural electrification, one focus is on off-grid solar systems, as grid expansion is often slow and diesel generators are expensive and polluting. Social institutions (SIs) like health centres and schools very often have no grid electricity. The lack of electricity limits the quality and quantity of social services.

In Benin, the typical approach to provide off-grid solar power to such facilities is to donate solar systems and train their staff in maintenance. Unfortunately, this approach demonstrated little long-term success. Solar systems installed for the benefit of SIs regularly fail because social institutions do not have the technical and financial capacity to manage and maintain the installed solar systems.

According to surveys conducted by the Green People's Energy (GBE, Grüne Bürgerenergie) Benin project between 2020–2021, more than 69% of the solar systems installed up to five years prior by various electrification efforts (donors, government, charities) in health centers were no longer functioning.

In order to ensure the sustainability of solar systems installed for the benefit of SIs, the German cooperation-financed GBE Programme implemented by GIZ, pilots service-based delivery models in Benin that are based on a long-term commitment of a service provider (i.e. a solar company) to maintain the system and of the client (i.e. the social institution) to pay a monthly fee. The model is described in more detail in a knowledge brief entitled *From Procurement to Performance: Towards a private sector-led, service-based model to scale up sustainable electrification of public institutions by Sustainable Energy for All (SEforALL)* in collaboration with World Bank/Energy Sector Management Assistance Program (ESMAP).

Through this model, the ownership, operation and maintenance of the systems rest with the solar company for at least five years. At the end of the contract period, the SI can decide to extend the service through another contract. The priority of this model is not the sale of equipment to the SI, but rather the rental of functioning equipment over a longer period. If the SI wants to take ownership of the system at the end of the five years, the contract will either specify a pre-determined price or allow for a negotiated payment. The approach also ensures a contractual relationship between solar companies and SIs: if the SIs do not prepay their monthly fee for electricity, the solar system is locked and will not operate. If the system is malfunctioning, then the solar company cannot charge the SIs for the service. With this approach, GBE Benin aims to not only electrify SIs, but also to build experience with the private sector in implementing such service-based delivery models.



Picture 1: A fridge at the orphanage allows the cook to store fresh food for longer

In addition to the technical assistance provided to stakeholders, GBE Benin pays incentives to companies after installation and verification of the systems, following a Results-Based Financing (RBF) approach. The incentive is determined by the size and type of solar systems installed and is known in advance by the company. The incentive allows for a reduction of the monthly fees charged to SIs, bridging the viability gap between the cost of service provision (especially at the beginning when the number of installations is low) and the ability to pay of the SIs.

Two different activities are carried out in parallel to pilot the approach:

- 1) The non-governmental organisation CIDR Pamiga runs a tender for the electrification of a group of private and religious SIs by one company using the approach described above. In this case, CIDR Pamiga is responsible for the management, implementation, and monitoring of the activity, including awareness raising among the SIs and facilitation between the SI and the solar company.
- 2) Direct implementation by GBE Benin in collaboration with six companies to pilot the approach on a smaller scale.

## METHODOLOGY OF DATA COLLECTION

The data for this case study report was collected through a review of project documents and qualitative interviews with two representatives of GBE, two representatives of solar companies, three representatives of CIDR Pamiga, and finally four representatives of the government partner, Beninese Agency for Rural Electrification and Energy Management (ABERME, Agence Béninoise d'Électrification Rurale et de Maîtrise d'Énergie). Altogether 11 stakeholders were interviewed. The case study was carried out between March and April 2023. At that time, some project activities were still ongoing. Accordingly, the effects captured are not exhaustive.

## KEY FINDINGS

### Project Achievements

At the time of the case study, six SIs are electrified within the two activities running in parallel (CIDR Pamiga and GBE). Out of the six SIs, three were electrified through each activity, with additional six contracts signed between companies and SIs waiting to be electrified (equally split between the two activities). Further contracts are being processed and are expected to be finalised before the end of the project. According to one interviewee, the final number of facilities with solar systems is likely to be 29 instead of the planned 60.

All systems are remotely monitored by the solar companies and the data is shared with GIZ via the open-source energy data platform Prospect. In the future, this will allow government partners such as ABERME to also monitor the performance of the systems remotely.

How institutions generate the money for the monthly fees depends on the type of institution: Schools use part of the tuition fees, orphanages use a part of the monthly budget from donations, and health centres use part of the revenue they charge for their services. Some of the SIs have small productive activities such as selling cold drinks or yoghurt from their solar-powered fridges. In the case of non-governmental and civil society organisations, they may ask for donations or fees from the community or members.

The size of the photovoltaic systems being installed depends on the needs and type of SI, starting with a configuration of 1 kilowatt-peak (kWp) plus 1,6 kilowatt-hour (kWh) storage capacity.

According to a company representative, the "installations have been well adapted to the end-users needs". The systems are well suited to provide reliable electricity and meet the needs of the people in these areas without grid connection. For example, the installed 1,6kWp solar system is allowing an orphanage to power refrigerators, kitchen devices, and ventilators. Similarly, a 4,6kWp system for a health facility provides enough power for lighting, cooling of medicines, vaccines, and food in refrigerators, as well as for charging phones and powering computers. The largest system so far of 14kWp powers a new community radio station.

### Intermediate Impact

With respect to the social impacts of the project, the interviewees report that electrification is notably improving health services, for example by allowing villagers to receive medical treatment after sunset. Interviewees also stated that the improvement is expected to reduce the mortality rate in the rural areas.

In the case of an electrified orphanage, respondents reported a significant improvement in the quality of life for the orphans. The orphanage can now offer a wider variety of food to the children and produce its own yoghurt, which they can also sell to generate income. The children can now read and study after sundown, and enjoy much less noise and pollution as the PV system has replaced a diesel generator.

In terms of economic impact, interviewees noted that the project's activities will reduce costs in the long term and support the country's solar industry by increasing demand and interest in solar systems. This will enable solar companies to offer this business model to other SIs as well as private customers, thereby strengthening the country's market for renewable energy systems.

Environmentally, the solar system is much less intrusive than diesel generators, which produce noise and pollution. Furthermore, diesel has to be transported to the remote locations of the facilities, which in itself causes greenhouse gas emissions and traffic. In addition to the environmental benefits of the solar system, the contracting model takes care of waste and recycling, e.g. of the batteries.

In addition, this project approach contributes to the longevity of energy access, as the five-year lease with maintenance obligation provides secure energy access for a longer period of time than donated systems. This is, in fact, the main contribution of the GBE project in Benin, where solar companies are not used to renting systems and taking on operational responsibilities, and social institutions are not used to being clients but rather beneficiaries of donations: the ongoing contractual relationship ensures that both sides of the contract contribute to this longevity.

Furthermore, the government partner ABERME reports that its organisational capacity has improved as a result of working with the project. In particular, project management skills within ABERME are being improved through the digital applications used in the project (linked to the remote monitoring of solar systems, which ABERME also intends to use for its own projects).

## Challenges in Project Implementation

Although the GBE experience has been successful in piloting electrification through a service-based model, the implementation of such models has faced challenges. Overall, it is the view of some stakeholders that the project would have benefited from a longer lead time to clarify and refine processes and procedures, and to increase stakeholder involvement. As a result of insufficient time for these preparations, the project was off to a slow start. One reason for the delay is the necessity for discussions between the various stakeholders to introduce the long-term rental approach. This may explain the relatively low number of installed solar systems in the SIs. It is noteworthy that the SIs that have been able to make use of this approach so far are all non-governmental facilities (however, some public SI signed contracts already and are about to be electrified).

A particular challenge of the project was to find the right terminology for this novel business model. The technically correct term Fee4Service was at the beginning (due to English-French language barriers) understood to mean “free for service”. “Leasing” was proposed, but Beninese law requires solar companies to have a license to offer leasing services, which not many companies have. In the end, long-term rental was the most widely understood and accepted term - it could be explained by analogy with a car rental situation. This challenge of finding the right term initially caused some delays and numerous misunderstandings with government partners, especially the Electricity Regulator, who initially saw the model as a sale of electricity and demanded a lengthy approval process, only to later clarify that this was not necessary.

SI often have low liquidity because they do not have a reliable source of funding. They are used to receiving donations of solar systems, which has reduced their willingness to pay for system rental. Due to their specific income situations, the facilities face a real challenge with the costs of the monthly fees. For most smaller systems they amount to approximately EUR 22 monthly over five years. On the other hand, for this fee they can expect reliable energy access. The companies monitor the systems remotely to guarantee the functioning and efficiency of the installed systems.



Picture 2: Launch workshop with representatives of social institutions

## Lessons Learned

Awareness-raising and communication efforts towards key public and private sector actors are needed to facilitate the understanding of this innovative approach.

In general, a more concise description of the business model with clarified financial and legal models tailored to the local context could have reduced several ambiguities that caused misunderstandings between various stakeholders during the project implementation. In the best case, these aspects would be clarified at the earliest possible stage in cooperation with all stakeholders.

From the perspective of the small solar companies, the payment scheme of the approach is difficult since it requires the pre-financing of installations. First, the upfront capital is needed to bridge the period of up to three months between ordering equipment and receiving the RBF incentive from GBE, as companies do not receive any upfront payment. In addition, GBE's payment – made after installation and verification – only covers part of the total cost, with the remainder spread over the five years of the contract, to be recovered slowly through the monthly fees from the SI. This increases the need for long-term funding for the business, which is a challenge for many small local companies.

When it comes to equipment ownership at the end of the contract, GBE is open to both options, with or without equipment transfer. Due to the novelty of the long-term rental approach, and despite several workshops explaining the options, both SI and the solar companies were initially unsure which option to choose. This proved particularly challenging when an option was selected and agreed between the SI and the solar company, and then the SI wanted to change the option, requiring a recalculation of the RBF incentive and a change in the contract between the SI and the company, as well as between GIZ and the company. For replication in other projects, this capacity limitation of SI to understand the financial and legal differences between options should be taken into account. While the non-transfer of ownership model results in lower monthly fees for the SI, many SIs find it conceptually challenging to pay for a solar system and not end up owning it.

If the SIs became the owners of the system, they would also be responsible for disposing of the used batteries. This is problematic because of the limited number of waste disposal sites in rural areas, which could lead to improper disposal of batteries and ultimately harm the environment. One suggestion from the solar companies to address this challenge was to introduce a recycling fee for used batteries (suggested 1% of the battery price) to be paid by the end-user during the contract period, which would oblige the solar company to recycle used batteries. This would help protect the environment.

## Sustainability of the Intervention

The service-based delivery model ensures a sustainable operation of the systems: if they fail, the solar company is in charge of repairing them. The regular payment of fees is ultimately making it possible for the solar company to build on a solid (albeit small) stream of reliable revenues. Thus, this provides an environmentally and economically more sustainable solution than the conventional alternatives, e.g., donation of the solar systems with a loose commitment to maintenance.

With respect to sustaining the project results technically, the project counterpart ABERME plans to involve technical colleges to train students in solar systems. In terms of the market development, one of the solar company representatives interviewed stated that his company has adopted the service-based business model and is offering it to other customers.



Picture 3: Verification consultant checking the quality of the solar installation

## CONCLUSION AND OUTLOOK

The project's service-based delivery model approach is conceptually sound. It is an appropriate approach to address a shortcoming in rural electrification in Benin and is adapted to local conditions and challenges. It is particularly relevant for health centres and schools, where electrification is urgently needed to improve rural services. Interviewees praised the project's approach and activities for ensuring the long-term use of solar systems while reducing noise and greenhouse gas emissions.

There is a high potential for further uptake of the business model as the need for electrification in rural areas of Benin remains high. Consequently, further projects will use the project's service-based delivery model, including in the northern region. This is also reflected in the planned activities of the political partner, ABERME. ABERME is currently planning the electrification of 750 public SIs using a model they have adapted from the GBE experience. In addition, the lessons learned will be translated and integrated into the agency's strategic planning. Similarly, Energising Development, another GIZ project active in Benin, is looking to continue the approach for non-governmental SIs after GBE.

## MORE INFORMATION

Energypedia:  
[Green People's Energy Knowledge Hub](#)

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Green People's Energy  
Dag-Hammarskjöld-Weg 1 - 5  
65760 Eschborn

T +49 6196 79-0  
<https://www.giz.de/de/weltweit/77417.html>

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