Solar Lantern Rental System (SLRS)

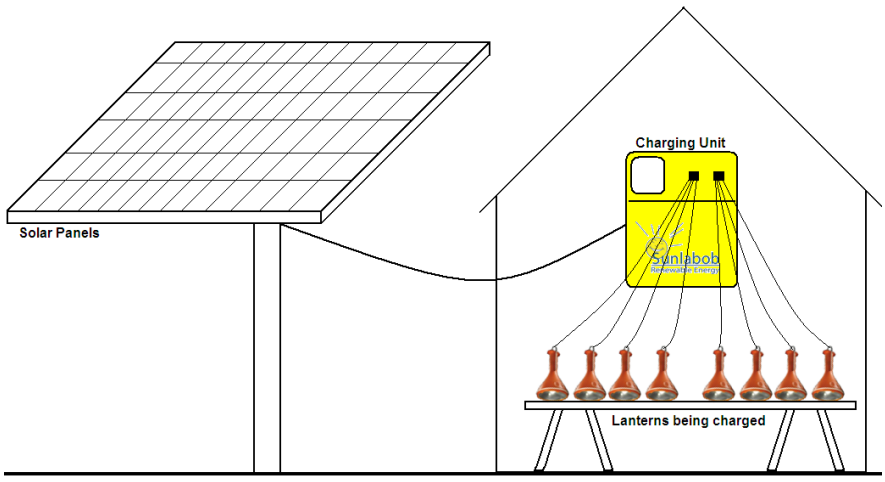
Introduction

Millions of people in rural areas around the world do not have access to electricity for lighting. Sunlabob has developed an innovative solution driven by three key principles that are a result of 10 years of rural development experience. First, service-oriented solutions offer a sustainable approach to lighting for those with limited access to capital. Second, organisations must work with communities to create self-sustaining micro-enterprises in order to ensure future development. Third, reliability is one of the most important traits of appropriate technology.

By adhering to these three principles, the award winning solar lantern rental system (SLRS) offers a safe, bright, clean, reliable, and affordable alternative to the use of kerosene for lighting in the poorest off-grid communities. Moreover, the access to mobile phone charging ensures greater village connectivity.

System overview

The SLRS is based on a centralised charging station which consists of one large solar panel (including mounting frame), one charging unit which contains a storage battery, a varied number of charge connectors, a charge controller to regulate the system, and 20 to 50 lanterns. The charging station is ideal for villages, communities and centralized populations. This system represents a sustainable solution that ensures a proper use and maintenance of the installation via the creation of a micro enterprise in each village.



Every rental cycle, the system provides the user with variable hours of lantern operation (dependent on brightness level) or equivalent use of a mobile phone charger, radio, or any other 5 V device that can be charged from the USB charging socket on the lantern. After this time the lantern's battery will be depleted.

Once the lantern has been used for the operable hours the user must take it to the village technician, who operates the charging station. For a small fee, a used lantern can be exchanged for a charged one. The village technician keeps part of this money in exchange for running the micro enterprise and

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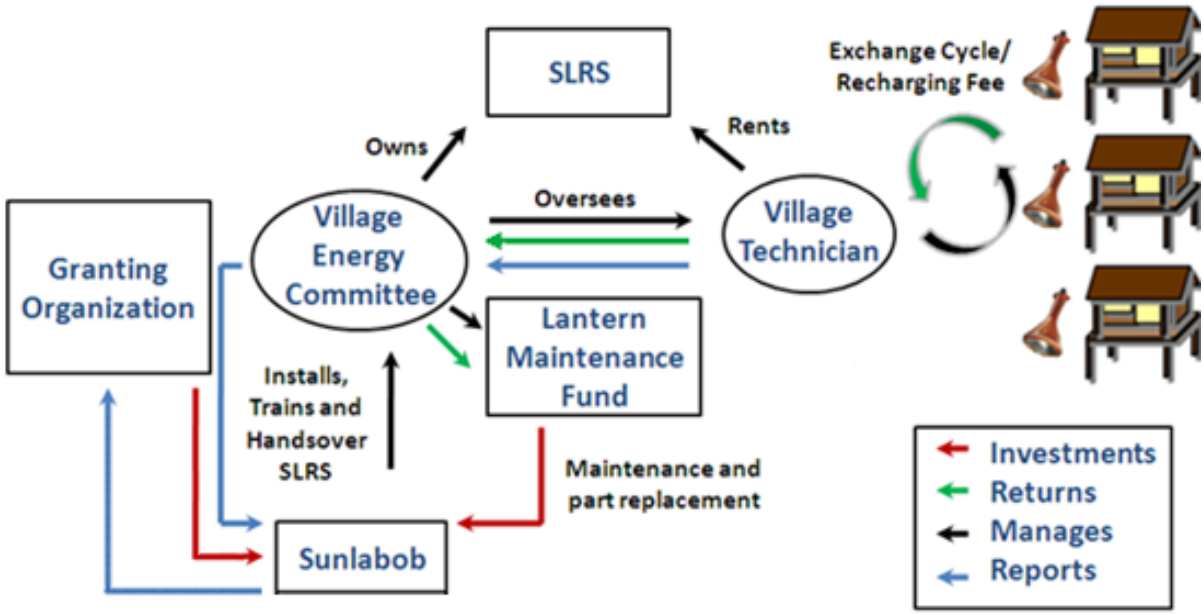
the rest goes into the lantern maintenance fund for the future replacement of components (mainly batteries).

The system installation and hardware is initially sponsored by a donor organisation, with technical and entrepreneurial capacity building incorporated into the installation process. Supporting the village entrepreneur is a village energy committee, which oversees operation of the system and management of a maintenance fund. Eliminating the initial, and often high, capital cost required for villagers to improve their lighting source removes any risk for them to trial the system; this results in rapid adoption. Below is a diagram showing the stakeholders and their responsibilities:



The lanterns

The Pico Lantern is a multifunctional mobile or stationary lighting device that has been specially designed to meet the needs of rural households and outdoor enthusiasts. With three light intensity levels, the Pico Lantern is suited for all kinds of applications.

The **robust** Pico Lantern is one of the only solar-powered lanterns to be independently tested by the world-renowned Fraunhofer Institute for Solar Energy Systems, and it received high marks with the following comment:

"Well performed design and construction, professional quality and high usability."

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The lantern has many advantages over similar products due to some of the following characteristics:

Type	Pico Lantern Characteristics
Battery	5 V (4 X AA NiMH battery 2,100 mAh, low self discharge), environmentally friendly, > 500 cycles
Lighting levels	Normal: 50 lm, 16.5 h; Low 20 lm, 55 h; High: 120 lm, 5.5 h
Light colour	3,950 to 4,300 K, warm white/cool white mixture
Switching	Switching on/off or between light intensity settings uses capacitive touch, no moving parts
DC charging input	Solar Module U_{MPP}> 7 V, U_{OC}< 25 V (max. 1.5 A @ 7 V) or battery 12 V (max. 800 mA), unique charging socket size
Charge controller	Technologically advanced, integrated charge controller with Maximum Power Point Tracking capabilities
Housing	Water and impact resistant, glow-in-the-dark ring for ease of locating
Cell phone recharging	Ability to recharge cell phones and to run low-consumption devices via a USB port
Fitting	Steel hoop with seven notches for positioning (45° steps)
Weight with batteries	~ 570 g, Lantern dimensions: 296 x ∅ 155 mm
Temperature range	Ambient: -20 to +50°C with LED temperature warning at 0 and +40 C
Warranty	2 year warranty on electronics
Type of protection	IP 65, protects against dirt and rain, floats if dropped in water

System benefits

The direct benefits of high light output and robust and reliable design are immediately apparent to the end user. Feedback from villagers using the system indicates they are very happy with light output, recharge cost, and reliability. The light is usually used for cooking/eating, children studying, and working in the evening, though it also facilitates social gatherings.

The lanterns themselves are waterproof, dustproof, and able to withstand drops of 3 meters, making them perfect for rural environments. They can produce 120 lumens on the highest setting, and have a 55-hour run time on the lowest. Reliable mobile phone charging increases connectivity, allowing villagers to access information networks.

Beyond the provision of high quality lighting, several other major impacts are realised. The reduction in lighting bills puts a significantly lower financial burden on households. Also, revenue generated by the system is kept within the community, providing income for the village technician and system maintenance. The SLRS project creates jobs, generates income opportunities, and enables a better setting for micro-enterprises in off-grid communities through improved lighting. Additionally, there is a reduced impact on health and carbon emissions.

The role of the village technician is ideally suited to women in the village as it can be done alongside housework or other home or shop based jobs. Appointing women to the village energy committee also gives them a greater voice in their community. The lighting also benefits women by making cooking more comfortable, allowing a longer and less intense working day, and helping with tasks that require a bright light (like thread work).

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