

Green Technology Diffusion: **The Case of GIVEWATTS Green Lanterns**



The Challenge

Roughly 1.4 billion people in the world have no access to electricity, and another 1 billion have only sporadic access.¹ To light stoves and lamps, those without grid access turn to so-called traditional fuels, including kerosene, wood, and biomass. Spending on such fuels takes up a significant share of household income in poor communities. Kerosene lamps are expensive, dim, and inefficient.

Meanwhile, the use of traditional fuels indoors negatively affects health, particularly of women and children who spend more time indoors. Kerosene lamps release high levels of fine particulate matter into the air. Health impacts can range from poisoning due to ingestion, lung cancer due to long-term inhalation, and serious burns due to kerosene's high combustibility.²

At a Glance:

GIVEWATTS services to fight energy poverty

- Environmental challenge: Expand access to electricity without using fossil fuels
- Technology solution: An innovative distribution model for solar-powered lanterns in rural, off-grid schools
- Technology dissemination: Design and manufacture of solar lanterns in India, deployment in Kenya, future expansion into markets in Africa and Asia
- Transactions: Sourcing from Green Light Planet, customer identification and maintenance through local agents, partnerships for new product development
- WIPO GREEN: Platform to identify new partners, customers

A lack of access to reliable electricity has cascading effects for economic and social development. An estimated 90 million school children in sub-Saharan Africa attend schools without electricity – this means no computers or internet access, no heating or cooling, and no classes after dark. At home, students are forced to study under dim lamplight, or to seek illumination in public places like gas stations. Compounding this problem is the fact that many children, especially girls, are responsible for gathering firewood or other fuels for the family, a time-intensive activity that encroaches on study time.³ For the overall economy, it has been estimated that poor access to electricity can hamper GDP growth by as much as 5 per cent.⁴

Heavy reliance on traditional fuels in developing countries also has a devastating environmental impact. The soot produced in biomass combustion produces dangerous black carbon, which is the second largest contributor to climate change after carbon dioxide.⁵ And 6 per cent of annual global deforestation can be attributed to fuel wood and biomass collection.⁶ A shift to a clean indoor light from kerosene lamps could offset 0.156 tons of carbon dioxide per light per year.⁷

Solution Developed by GIVEWATTS

GIVEWATTS is a non-profit organization that connects rural communities to safe, healthy, green, and affordable sources of light. GIVEWATTS, based in Switzerland and operating in Kenya, is registered as a non-governmental organization (NGO) and receives support from donors. At the same time, it operates much like a for-profit entity.

GIVEWATTS sources high quality solar lanterns from a manufacturer in India, Green Light Planet, then distributes them to Kenyan schools and to families that lack access to the grid. Schools are provided the lanterns free-of-charge. In addition, interested households may purchase them, at cost and interest-free, over the course of three to six months. This approach gives families a sense of ownership and ensures the lighting solution is targeted to their needs. It also creates a stream of modest income that supplements GIVEWATTS donor funding, enabling the model to remain sustainable and thus to grow.

For all recipients, GIVEWATTS maintains the lanterns for two years. Typically, maintenance requires no more than changing the lamp's battery, a task that can be performed by a member of the school community. Since the lamps are under warranty, they can even be exchanged by Green Light Planet in the event of a failure.

This approach enables members of the local community to rebuild their trust in renewable sources of power. Most of these communities have already interacted with solar powered lamps that failed due to poor quality, leaving users to return to their old kerosene lamps. The GIVEWATTS guarantee helps customers to discover that reliable clean energy lamps do exist.

1. United Nations Foundation, "Achieving Universal Energy Access," 2012, at www.unfoundation.org/what-we-do/issues/energy-and-climate/clean-energy-development.html
2. "Kerosene: A Review of Household Uses and their Hazards in Low- and Middle-Income Countries" in *Journal of Toxicology and Environmental Health*, 2012, at http://ehs.sph.berkeley.edu/krsmith/publications/2012/kerosene_review_12.pdf
3. Practical Action, *Poor People's Energy Outlook 2013*, at <http://practicalaction.org/poor-peoples-energy-outlook>
4. International Renewable Energy Agency (IRENA) *Prospects for the African Power Sector, 2011*, at www.irena.org/DocumentDownloads/Publications/Prospects_for_the_African_PowerSector.pdf

In exchange for maintenance services, GIVEWATTS requests that communities provide information about the lanterns' impact on student performance and living conditions. The data collected is used to make improvements to the business model, and to inform the design of future products. Statistics have been encouraging. For instance, one of the first schools that received lanterns from GIVEWATTS was initially ranked forty-third in its district for test scores. Following installation of the lights, teachers could assign homework, and students could read and study after dark. A year later, that school was ranked first in the district.

Technology Dissemination

By deploying high quality solar lanterns, GIVEWATTS transfers green energy technology embodied in a product, together with maintenance services, to its customers. Dissemination of clean, affordable lighting provides a platform for better education and improves living standards. Moreover, by working with local agents on marketing, distribution, and maintenance, GIVEWATTS helps to improve the local knowledge base. GIVEWATTS is in the process of expanding its activities beyond Kenya, to cover several new markets in Africa and Asia.

The recipient schools in Kenya are selected as a result of research carried out by local sources and interviews with the schools' head teachers, village leaders, and parent-teacher associations. As neighboring communities learn of an installation nearby, leaders often approach GIVEWATTS to request that it expand to their location. The demand-driven approach for distributing the lanterns, and the feedback provided by the participating communities, helps GIVEWATTS to refine and improve the value of its services.

GIVEWATTS procures all of its solar lamps from Green Light Planet, to ensure consistently high quality and supply, and distributes them in Kenya. Green Light Planet registers trademarks for its products but, at present, does not patent its technology or designs due to difficulty enforcing such IP rights in the markets where its products are made and distributed. Until now, GIVEWATTS has not designed the products it distributes, and thus does not own any IP rights.

GIVEWATTS solution to fighting energy poverty focuses on superior delivery and deployment of technology, as opposed to product development. A lack of accountability and poor existing distribution networks have been major challenges to dependably delivering lights in rural areas in Kenya. Furthermore, warehouses or storage facilities do not exist outside urban areas to facilitate distribution. GIVEWATTS adds value by creating reliable channels for distribution and services, including maintenance.

5. Yale Environment 360 "World's Pall of Black Carbon Can Be Eased with New Stoves," March 2010, at http://e360.yale.edu/feature/worlds_pall_of_black_carbon_can_be_eased_with_new_stoves/2250/

Outlook for GIVEWATTS Green Energy Solution

So far, GIVEWATTS has placed over 7,000 lamps, serving 35,000 users in Kenya. The program's success in Kenya has led to requests from schools in other African and Asian countries for solar lanterns. GIVEWATTS is in the process of securing funding to begin expanding into new markets in Tanzania, Congo, and Philippines.

GIVEWATTS' success derives in large part from its focus on users' needs, and the constant integration of customer feedback into its business model. Early on, GIVEWATTS' research revealed that people at the bottom of the pyramid consider reliability to be even more important than price. GIVEWATTS' leadership therefore opted to source from Green Light Planet, even though its lanterns are slightly more expensive than competing offerings, because its products are more durable than other lamps. Ensuring maintenance of the lanterns for two years, in exchange for data, has provided a direct feedback channel that enables the organization to consistently upgrade its model.

In addition to solar lanterns, GIVEWATTS is entering the clean cookstoves and water filter markets. The organization is currently piloting a project in three Kenyan villages to develop and deploy proprietary clean cookstoves. The trial involves two charcoal-burning stoves – one metal and one ceramic – and one wood-burning stove. Initial feedback has been positive, with some families reporting a decrease in charcoal use of 50 per cent, and there have been many requests for the stoves. The organization also plans to partner with a company based in Lausanne, Switzerland, to design a renewable-energy-powered water filter for deployment where water purity is a concern.

GIVEWATTS is a WIPO GREEN partner. GIVEWATTS anticipates that WIPO GREEN will enable it to extend its reach and impact, through identification of new partners, new customers, and new channels for distribution of its green lighting and other solutions. The lanterns distributed by GIVEWATTS have been included in the WIPO GREEN database.

6. Sovacool B.K., The political economy of energy poverty: A review of key challenges, Energy for Sustainable Development, 2012, at www.sjsu.edu/people/dustin.mulvaney/courses/envs116/s1/1-s2-1.0-S0973082612000373-main.pdf
7. www.pfpi.org/pdf/empiricalStudy_energy_poverty.pdf

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