

Case study summary

D.light Design, India and global

D.light is making low cost, high quality, durable solar lanterns available to people in developing countries that have never had access to modern light. The company has a mass market strategy that is reaching large scale sales and improving the lives of thousands of people around the world.

There are 1.6 billion people in the world without access to electricity who rely on kerosene, candles and other fuel-based sources for lighting.

D.light has developed solar-rechargeable LED lanterns to provide bright, clean and affordable alternatives to kerosene lanterns.

- Solar lanterns are designed by D.light to be low cost, high quality and durable.
- Products developed, tested and designed by D.light's own design team located in Hong Kong and manufactured and assembled in China.
- There are three basic models: Nova, Solata and Kiran, ranging from 0.3Wp to 1.3Wp. All use LED lights.
- D.light develops its products based on hundreds of hours of field research with end users in India, Africa and elsewhere.
- Solar lanterns cost end users between US\$10 and US\$45, depending on the model.
- D.light has sold over 220,000 solar lanterns in 32 countries, with main markets in India and East Africa. Lights are benefiting around 1.1 million people.
- Solar lanterns sold to date are reducing CO₂ emissions by 44,000 tonnes a year.
- PV lanterns allow children to study for longer hours and more effectively.
- Other benefits include extended shop hours, more efficient agricultural activities, mobile phone charging facilities and craftwork in the evening.

D.light was set up in 2007 by Sam Goldman and Ned Tozun to design and sell affordable solar lanterns in developing countries. The company's headquarters are in Hong Kong and it has offices in India, China, Tanzania and the US. It has 73 employees and sells its lanterns through local dealers, networks, and distributors in 32 countries around the world, with the majority of its sales in India and East Africa.

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India statistics 2006/7

(UNDP)

GDP: US\$736/year per person

CO₂ emission: 1.2 tonnes/year per person

80% of people live on less than US\$2/day

44% of people lack grid electricity

Location



"I saw my uncle using a Nova and I really liked it – there's more light, and less smoke."

Lallan Sahu, Tripurarapur village



Demonstrating a D.Light Nova lamp at a stall in Chamieyani, India

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Case study

D.light Design, India

Background

There are 1.6 billion people in the world without access to electricity. They often rely on kerosene and other fuel-based sources for lighting, but these produce air pollution and are a fire hazard. Kerosene is also expensive, with ongoing fuel costs that range from 5% to 65% of a household's monthly income, depending on the region and income level of the family.

D.light was set up to tackle this problem. It has developed a product line of solar-rechargeable LED lanterns to provide bright, clean and affordable alternatives to kerosene lanterns and candles.

The organisation

D.light was set up in 2007 by Sam Goldman and Ned Tozun to design and sell affordable solar lanterns in developing countries. It has grown rapidly since it began selling its products.

The company's headquarters are in Hong Kong and it has offices in India, Tanzania, China and the US. It has grown from its two founders to 73 employees in just three years. D.light sells its lanterns through local dealers, networks, and distributors in 32 countries around the world, with the majority of its sales being in India and East Africa.

D.light Design, Inc is a social enterprise registered in the US, obliging directors to act in a socially just manner, prioritising social benefits over profit. It is a multinational energy enterprise, targeting all developing countries. The company is funded by Silicon Valley and Indian venture capitalists.

The technology

How does it work?

Solar lanterns are designed by D.light to be low cost, high quality and durable. All products to date are solar lanterns with LED lights. Currently three basic models are in production.

The largest of the lanterns is the Nova (launched June 2008), which has a 1.0 or 1.3 Wp detachable photovoltaic (PV) module with an outdoor cable. It has four light settings, from task lighting to nightlight. The Solata (launched June 2008) has a 0.625 Wp detachable PV module with an outdoor cable. The smallest and least expensive model is the Kiran (launched October 2009), which has an integrated 0.3 Wp PV module.

The company's research, development and design team has designed all three lanterns, and continues to work on new products and models.

Each lantern includes a rechargeable battery and charge controller. The expected lifetime of the PV module is at least 10 years, and the battery needs to be changed approximately every one to two years. The LED light has an estimated lifetime of 50,000 hours. The lifetime of the other parts depends mostly on use and care of the solar lanterns.

How much does it cost and how do users pay?

US\$1 = Rs 50 (Indian Rupees) [April 2010]

Solar lanterns cost end users between US\$10 (499 Rs) for the basic Kiran, and US\$45 (2,250 Rs) for the top-range Nova.

The technology in more detail

LEDs (Light Emitting Diodes) are semiconductor devices that emit light when an electrical current passes through them. Their high efficiency allows them to be used in lanterns with smaller batteries and PV modules.

D.Light has used a variety of rechargeable batteries, including lead-acid and NiCad, but is gradually phasing these out and moving to use NiMh batteries in all lanterns

Apart from the PV module and battery, the other key component in a solar lantern is the charge controller. This is an electronic circuit that controls the use of the battery, preventing it from being over-charged or discharged too deeply, both of which can damage it.

The Nova lantern has a handle so that it can be carried or hung up from the ceiling to light a room. A typical day of charging provides about four hours of light on the brightest setting, but up to 150 hours if used as a nightlight. One version of the Nova includes a charger for mobile phones.

The Solata is a desk lamp, with settings that provide between four and 15 hours of light from a day of charging.

The integrated PV cell in the Kiran lantern means that it has to stand outside in the sun to be charged. It can provide all-round light for a room or a market stall, for between four and eight hours

"I hope I'll be able to reach every household in my area eventually, because the electricity situation is just getting worse – it's so unpredictable. And people will realise that solar is the solution to this."

Rural Entrepreneur Vijay Pal,
Mohkamganj village

Most customers pay for the lanterns up front from a local dealer. Some dealers offer credit to customers they know well, but on an informal basis. There have been some pilot projects with micro finance institutions, including SKS, to provide loans for the solar lanterns, but they have not been taken up on a large scale. Some large employers have bought lanterns in bulk and sold them to their employees via monthly salary deductions.

How is it manufactured, promoted and maintained?

The products are developed, designed and tested by D.light's own design team, located in Hong Kong. They are manufactured and assembled in China. D.light develops its products based on hundreds of hours of field research with end users in India, Africa and worldwide, and is therefore able to provide customers with a product they want.

D.light markets the lanterns directly to rural customers, using road shows, sales vans, and go-to-market campaigns. It markets the products through distributors, dealers and rural entrepreneurs (REs). REs are local entrepreneurs who buy a few solar lanterns at a time from dealers and sell them at a profit in their own village. Local dealers and REs explain the benefits of the lights and stage demonstrations in markets and villages. They also use the internet, posters and videos to market their products. Some REs allow potential customers to try a lantern for a few days before committing to buying it.

The solar lanterns come with a six month warranty. Each has a serial number and warranty card which carries the stamp of the dealer and the mobile number of the RE who sells it. If needed, the lantern is replaced for free during the first six months. After that, the rural entrepreneur or dealer will order spare parts to repair the lantern.

Benefits

By May 2010 D.light had sold over 220,000 solar lanterns in 32 countries. On a basis of five people per household, its lanterns are benefiting around 1.1 million people.

Environmental benefits

The main environmental benefit of solar lanterns is the replacement of kerosene, so reducing carbon emissions.

D.light estimate that a typical kerosene lamp, used daily, burns about 80 litres of kerosene each year, thus emitting 0.2 tonnes/year of CO₂. The 220,000 solar lanterns sold to date are therefore saving at least 17 million litres/year of kerosene, and reducing CO₂ emissions by at least 44,000 tonnes/year. The savings may be higher since many D.Light lanterns replace more than one kerosene lamp.

Social benefits

One of the most significant social benefits of the lights is the improved studying environment they create. D.light solar lanterns give a much clearer, brighter and more dependable light that is conducive for studying¹. Customers often report that their children have increased their studying time each night by between one and four hours.

Burning kerosene contributes to indoor air pollution, which kills 1.6 million people each year. Kerosene lamps also lead to fires that cause severe burns and deaths. Solar lanterns do not emit any harmful or polluting fumes.

Depending on the brightness setting, a fully charged lantern provides enough light for a typical evening. Farmers use them to go into the fields at night to water crops without fear of snakes. People can also stay up after dark to do chores and talk to neighbours, enhancing social life in the communities.

¹ Govindasamy Agoramoorthy & Minna J. Hsu, Lighting the Lives of the Impoverished in India's Rural and Tribal Drylands, Published online: 21 March 2009, Springer Science + Business Media, LLC 2009



Anjid Sahu studying by the bright light of a D.light Nova lantern at home in Tripurarapur.

"I bought it mainly for the children, so they could study longer. It is so much better than kerosene. They couldn't study for long with the kerosene lamp up close because it hurt their eyes."

They used to study for maybe one hour at most; now with the light it's three hours – from 7pm till 10pm."

Geeta Devi, Chamieyani village



Geeta Devi, mother of three with her D.light Kiran lamp.

Economic and employment benefits

Owning a solar lantern allows savings in household income by avoiding the purchase of kerosene. In India, kerosene is subsidised at US\$0.30 (15 Rs) per litre, so supplying one kerosene lamp costs about USD\$2 (100 Rs) a month. On this basis a Kiran lamp pays for itself within five months and even the most expensive Nova in less than two years. However, each household is entitled to only three litres of subsidised kerosene per month, and at the informal market price of US\$0.50 (25 Rs) or more per litre, the payback time is even shorter. There are also income generating activities that come from owning lights, such as extended shop hours, mobile phone charging and craftwork in the evening.

As a company, D.light directly employs 73 people spread across its five offices in India, Hong Kong, Tanzania, China and the US. There are now approximately 420 rural entrepreneurs selling D.light products, and D.light works with over 100 distributors and almost 400 dealers. In India, all of the staff except one are Indian.

Potential for growth and replication

There is an enormous potential global market for solar lanterns, given that 1.6 billion people lack electricity and many others have unreliable supplies. D.Light has worked to produce high quality lanterns at low cost, and its sales have grown rapidly over the past three years.

Carbon finance may help to bring the price down further. D.Light solar lanterns have been approved by the UNFCCC for a carbon offset project in India, in which carbon reductions resulting from the use of lanterns will be accurately measured and carbon credits paid for. This will allow D.light to continue to expand and make its products more accessible and affordable to its customers.

D.light plans to become market leaders in off-grid consumer electronic products.

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This report is based on information provided to the Ashden Awards judges by D.light, and findings from visits by members of the judging team to see its work in India.

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Suresh Divedi, photo shop owner, working with a Nova lamp, Bara.

"I let them use the lights for a day or two before asking for money, so they can try them out and see for themselves how good they are."

Vijay Pal, rural entrepreneur, Mohkamganj village



D.Light's solar lanterns at a stall in Chamieyani, India

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