PHOTON FUND

IMPACT LOAN FUND FOR SOLAR LIGHTING IN NEPAL

February 2014

The Niche and the Need

The Photon Fund ("The Fund") aims to bring light to rural Nepal—providing the financial and technical mechanisms necessary to meet the demand for solar home systems (SHS) in the South Asian nation's countryside, while generating solid returns for institutional investors.

Over a fourth of all Asians spend their nights contending with darkness, with no access to an electrical power grid that provides affordable light and energy. This lack of access is particularly pronounced in Nepal. In 2012, the International Finance Corporation identified that around 3 million families live off-the-grid across the country, relying on kerosene lamps as their primary source of artificial lighting. Not only is this source of light expensive: with fuel easily costing several percentage points of a household's budget, kerosene lanterns result in an aggregate fuel spend nationwide of USD 190 million per annum; they pose as a health hazard to the family; and they produce environmentally harmful black carbon emissions. The Photon Fund mobilizes capital to replace kerosene lanterns as well as upgrade less-efficient solar lanterns currently in use, with solar home systems—installations that are capable of solar power generation and storage, along with light production. The Fund deploys the investible assets of Photon's institutional investors as a joint venture (JV) with Nepalese local financial institutions (LFIs) to provide lease financing to poor households, which are able to commit a stream of monthly payments deriving from their kerosene fuel savings.

Investment Thesis

Solar home systems can be prohibitively expensive for a poor household (Nepal's GDP per capita in 2012 was USD 707), costing well in excess of USD 200 for an installation with ten years' useful life. On the flip side, the per-liter cost of kerosene has ranged from USD 0.80 in urban areas to up to USD 2.00 in remote areas. With average historical consumption of kerosene per household amounting to 3.2 liters a month, this translates into a household monthly spend of USD 2.40 to USD 6.40—compared with a solar home system's all-in cost of USD 2.37 per month. The Fund provides the lease financing to allow the end-consumer zero up-front cost, in exchange for the stream of cash flows that result in investment returns for the Fund. This is enhanced considerably by government subsidies currently in place for the installation of SHS across the Nepalese countryside. SHS is subsidized in Nepal by the Alternative Energy Promotion Centre (AEPC). The AEPC program has constituted over 75%-80% of SHS installations, with an estimated 400,000 installations by 2013 (in other words, out of 3 million total households, this translates to a penetration rate of just under 15%; majority of the households in the more remote rural areas still need the installations).

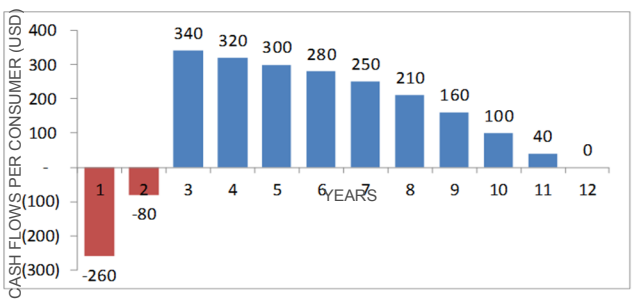
The Fund is targeted at institutional investors wanting to diversify their alternative asset portfolios. Positioned as an impact loan fund, with investible size USD 3.5 million, and minimum investment of USD 0.5 million, the Fund is expected to generate 14.7% p.a. internal rate of return (IRR) over a 12 year period, with a net present value (NPV) estimated at USD 651,016. This assumes approximately 20,000 households reached, with a 20% implied annual percentage rate (APR) on their lease, a 10% default rate, government subsidies of USD 100 per installation, and operating expenses / management fees of 1% per annum. Net cash inflows on the portfolio are shown in the table below-center.

RETURNS

IRR	14.7%
NPV	651,016

ASSUMPTIONS

Fund Size	3,500,000
APR	20%
Cost of Funds	10%
Loss %	10%
OPEX %	1%

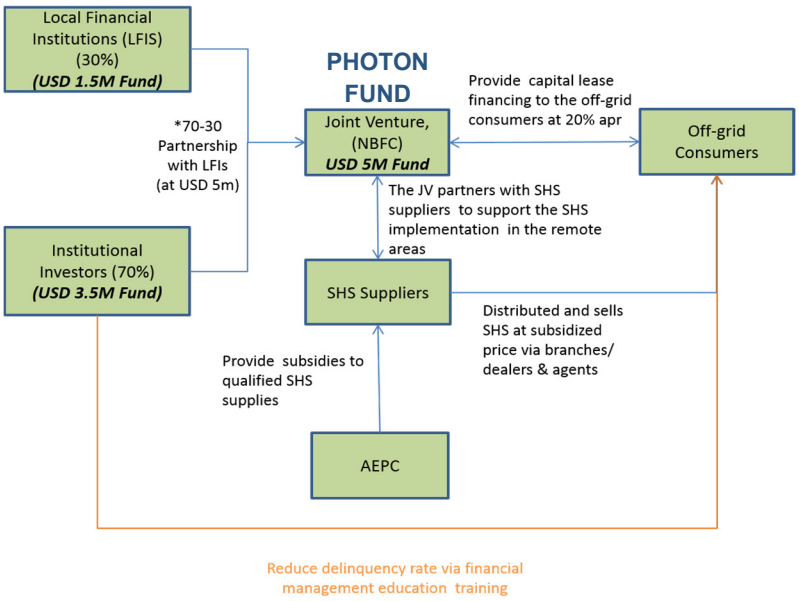


- *3 million Nepalese households are off the grid*
- *Nepal faces severe power shortage, or at least 12-14 hours of load shedding every day*
- *Annual Nepal kerosene spend nationwide of US 190 million*
- *A Nepali supported by the Photon Fund obtains over 30% fuel savings over a 10 year period, while enjoying clean and green technology.*
- *The Fund consists of USD 3.5 million is raised from institutional investors like pension funds, family offices, and university endowments*
- *A complementary USD 1.5 million is invested alongside this, representing the stake of local financial institutions (LFIs), who have the expertise as well as the incentive to share in the responsibilities of administering the loan portfolio*

Investment Vehicle

The Fund is envisioned as a USD 3.5 million investment into a joint venture (JV) with local financial institutions (LFIs) in Nepal, who in turn invest an additional USD 1.5 million to create a USD 5 million pool (i.e. a 70% - 30% split). The LFIs are able to contribute their local expertise, networks, and due diligence capabilities in relation to the Nepalese consumers who will be leasing the solar home systems (SHS). (The institutional investors will be invited to contribute additional social impact by providing pro-bono financial education for consumers.)

The JV is geared to provide capital lease financing to off-grid consumers at a 20% annual percentage rate (APR), covering the full up-front cost of SHS installation. The JV is able to reach out to the consumers via the SHS suppliers, who deal directly and provide after-installation service to the consumers.



*LFIs are responsible for operations and collections of loans from consumers; institutional investors who are willing to chip in their time assist in developing a program to educate local consumers on how to manage their loans

Impact Measurement

Institutional investors who participate in the Photon Fund generate impact that spans a variety of financial, social, and environmental dimensions, including:

- Savings of least 30% of fuel costs for addressable market of 20,000 households (initially);
- Improved health and safety conditions (lung diseases, fire hazards) by shifting these households from sole dependence on kerosene into clean and green solar;
- Reduced consumption / burning of kerosene amounting to over 800,000 liters annually, positively impacting the environment;
- An increase in economically and socially empowered suppliers and micro-entrepreneurs who will benefit from the development of the envisioned ecosystem;
- Heightened awareness on the global stage for the issues surrounding solar lighting in Nepal in particular (and developing countries in general).

Success in Nepal could mean exporting this model to other frontier markets for solar light technology, such as Cambodia, Indonesia, and several African countries (and hand in hand with this, potential new future tranches of the Photon Fund being invested into these markets).

Regulations

- Up to 50% subsidy on solar lighting product price; no established credit financing mechanism
- Currently no subsidy on kerosene, although government proposes subsidy of USD 0.13 per liter up to 5 liters per month
- No import duty on solar cells, modules/panels, LEDs; 10% duty on batteries, ready-made solar lanterns

Key risks(mitigants)

- Reliance on solar subsidies. (Institutional push needed to rally AEPC grant funding support.)
- Creditworthiness of clients. (Microfinance/microentrepreneur partners' expertise is crucial.)
- Durability of the solar systems. (Mitigated by rapidly improving technology, due diligence process, a myriad of suppliers.)
- Poor / inclement weather. (Explore utilizing better battery technology, hybrid systems e.g. hand-cranked generators.)
- Small transaction size, remote locations, cumbersome SHS installations. (Leverage LFIs, microentrepreneurs with local knowledge.)
- Risk of adverse regulations. (Engagement in political process.)

Main references

- International Finance Corporation. Lighting Asia: Solar Off-Grid Lighting (2012).
- Elizabeth Tedsen / Eco Logic. Black Carbon Emissions from Kerosene Lamps (2013).
- Steve Dahlke. Solar Home Systems for Rural Electrification in Developing Countries (2011).