



RURAL ELECTRIFICATION: Clean and Sustainable Solar Lighting Replaces Kerosene - Women & Children are the Prime Beneficiaries

10'000 Rural Households in India



Concept Note towards Round A (2016) of Social Investment

Executive summary

1.3 billion People have no access to electricity world-wide¹. About one in five persons still lives in darkness. The situation is particularly precarious in Africa (600 million) and in South Asia (600 million). Additionally, smoke hazard, pulmonary tract infection and fire-related accidents from candles and kerosene lamps extract over 3 million lives every year.

In India, 350 million people are un-electrified (29% of the population) and over 500'000 lives are lost annually to indoor air pollution². Despite the maturity of the local solar PV industry and the presence of several NGOs and social enterprises that are active in the area of social entrepreneurship, rural electrification is halting. The extent of the challenge is enormous. The focus of the solar PV industry is on commercial projects rather than rural electrification. NGOs are not as strong as in Bangladesh, for example, where they are an established national institution and have had a significant societal impact. Appropriate technology, after-sales customer support and project monitoring & evaluation are also weak or totally lacking.

The initial phase of the project in 2016 envisages the rural electrification of 10'000 family units across 100 villages in two southern states of India. The cost per family unit is CHF 54 with 60% covering product cost & delivery, 25% for training and customer support, 10% for project monitoring and evaluation, and 5% for governance and local advocacy. The 5C-CoRE™ model for rural electrification, developed by swissmango gmbh in Switzerland, is applied.

Each family unit receives two 3W LED lamps, each of which provides 5 times as much light as the sooty kerosene lamp, thereby saving eyes and health. Additionally, mobile charging is also possible. The system can be upgraded to support a fan, a laptop and even a TV!

A total investment of CHF 540'000 is targeted to cover the 100 villages, i.e. CHF 5'400 per village. The social investment provides a return of 11% p.a. in Indian Rupees. A one-time grant of CHF 100'000 is also sought to initiate the programme with three local NGOs, which will provide the last-mile connectivity. The project provides employment for 48 persons.

The investment sought is in multiples of a single village electrification unit of CHF 5'400.

The objective is to eventually electrify 1 million rural homes over the first 5-year period and to expand to the more difficult terrain in the northern tribal belt of India as of year 2.

¹ PwC/World Economic Forum Report, Geneva, Aug 2013 | ² UN, New Delhi, 2015

Efforts need to be Redoubled to Achieve the UN Goal of Universal Access by 2030

76 million households and 350 million persons lack access to electricity in India³. Kerosene is still used for lighting, resulting in soot, pollution and senseless accidents. 500'000 lives are lost annually due to indoor air pollution alone. Children and women are the primary victims.

Rural electrification projects have seen success in Bangladesh where the Grameen Shakti initiative of Prof Mohamed Yunus has resulted in significant electrification of hitherto unelectrified populations. Similar results have been achieved by Selco in India. However, neither of these solutions impacts the Bottom of the Pyramid (BoP) communities.



Commercial solutions which are based on 70Wp or larger solar PV panels are too expensive and not affordable for poor rural families.

Solar lanterns are extremely popular but often use unreliable and ad-hoc technology and components. They are not built to be rugged due to the price-sensitive market. They are limited in scope and durability and non-scalable.

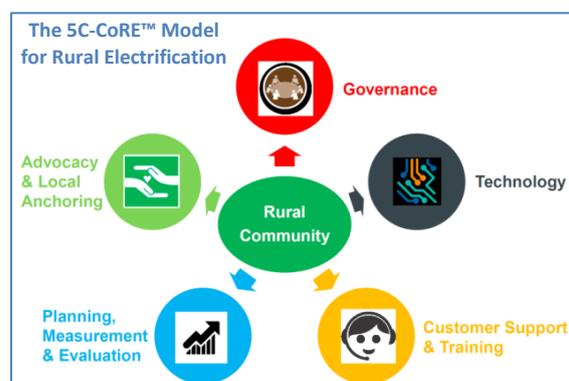
The government's focus on the expansion of the electric grid results in slow deployment, and remote communities are never reached. Power cut and blackouts are rampant too. National institutes such as TERI (The Energy Research Institute) have engaged in pioneering projects such as *Lighting a Billion Lives*⁴; the impact is however limited to geographic pockets, and rather insufficient in reach compared to the extent of the unmet demand. Local entrepreneurship needs to be fostered.

Training, customer support, village solar clubs and local advocacy that can address the social acceptance and sustainable deployment of new technologies are also weak or missing.

The 5C-CoRE Model is Holistic and Sustainable

The 5C-CoRE™ model for rural electrification addresses the five critical components of rural electrification⁵. These include:

- Governance
- Appropriate technology
- Training and customer support
- Planning, measurement and evaluation
- Advocacy and local anchoring



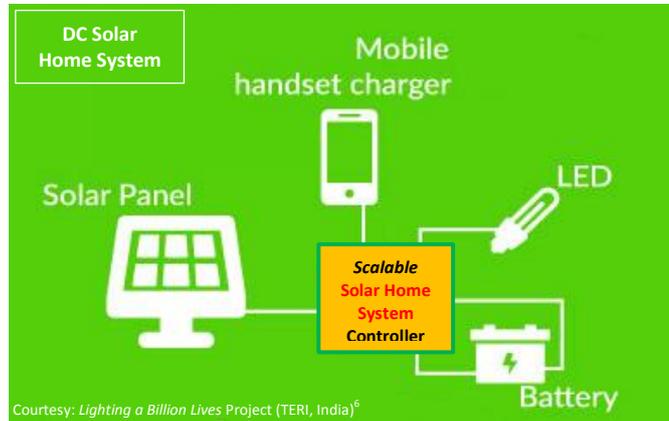
This means that emphasis is not restricted to the appropriate technology to address the specific needs in the rural environment, and to the financing model alone, but includes issues of governance and local advocacy of the issue

of sustainable energy as well as training & customer support and the critical aspects of planning, measurement and evaluation to ensure a holistic and sustainable approach.

Scalable Technology and Sustainable Social Business Model

The innovation and development relate to the technology as well as to the business model.

The technology consists of a solar home system (SHS), which includes a solar panel, a solar charge controller, a sealed lead acid battery, two 3W LED lamps and a mobile charging adapter. The solar charge controller is selected such that it is compatible with a range of capacities from 5Wp to 90Wp. The basic version is a 5Wp to ensure popular affordability for BoP families. Other configurations are possible and a solar client may elect to upgrade to a higher system after the basic system has been paid for.



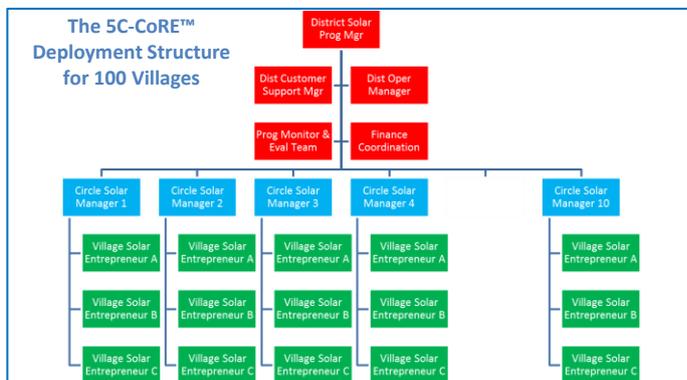
Courtesy: Lighting a Billion Lives Project (TERI, India)⁶

5Wp to 90Wp Scalable Solar Home System with 2x or 4x LED Lights and Mobile Charging Function

Basic System	5Wp		2x 3W LED lamps + Mobile charger
Basic Plus System	10Wp		4x 3W LED lamps + Mobile charger
Comfort System	20Wp		4x 3W LED lamps + Mobile charger + fan
Comfort Plus System	90Wp		4x 3W LED lamps + Mobile charger + fan + 220V AC output

The business case is prepared for a 5Wp solar home system. In the case of the 90Wp Comfort Plus System, a 100W inverter is included to provide 220V AC supply for a TV, laptop or other domestic appliance. This is however not envisaged for the first year of the project.

The business model innovation ensures that the aspects of governance, training & customer support, planning monitoring & evaluation (PME) and local advocacy are built into the structure of the organisation that deploys the rural solar electrification project⁷.



The organisational structure to cover 10'000 families in 100 villages comprises three tiers.

The district level organisation (red) ensures the central functions of program management, operations, customer support, monitoring & evaluation and finance & accounting.

Ten solar circles (blue) are organised under the district office. Each circle caters to 10 villages or 1000 solar clients. Hence, the ten circles together cover 100 villages and 10'000 solar clients.

⁶ www.labl.teriin.org (adapted) | ⁷ Amirtham, Arun Sam, AfricaLink, pp 23-24, Jan/Feb 2015

Under each circle, there are 3 village solar entrepreneurs (green) to ensure customer interface and to deal with operational, training, customer service and financial issues at the village level.

In all, there are 30 village solar entrepreneurs, 10 circle solar coordinators and 8 staff in the district office, adding up to a team of 48 persons, to cater to 100 villages or 10'000 solar clients. As the project grows, efficiencies can be improved by accommodating more circles under a single district and more villages under each circle. Geographic constraints would have to be taken into account.

This organisational structure is embedded within existing successful NGOs to ensure organisational context, credibility, speed of deployment, familiarity with the terrain and local practices, as well as to operate within a basis of trust and established relationships with rural communities and the local governments.

There will be a tie-up with three partner NGOs during the first year. One of them will serve as the coordinating NGO and assume the functions of the district solar office.

The Financials and Business Plan ensure Returns compatible with a Social Venture

The components in the build-up of the business case are as follows:

	<u>Cost of the Project (10'000 users)</u>		<u>Cost per Solar Client</u>
Equipment cost	CHF 320'000.00	50%	CHF 32.00
Operations cost	70'000.00	11%	7.00
Training and Customer Service	160'000.00	25%	16.00
Planning, Monitoring & Evaluation	63'000.00	10%	6.30
Governance and Advocacy	30'000.00	5%	3.00
<i>SUB-TOTAL (excluding Grant component)</i>	<i>643'000.00</i>	<i>100%</i>	<i>64.30</i>
GRANT (project set-up and deployment)	- 100'000.00		-10.00
<i>NET PROJECT COST</i>	<i>543'000.00</i>		<i>54.30</i>

The total budget foresees a social investment of CHF 540'000.00 as well as a grant amount of CHF 100'000.00 which will cover the first-time setting-up and deployment of the project.

The social investment is recovered through an initial down-payment of CHF 1.50 (INR 100) by the solar clients and a daily usage fee of CHF 0.15 (INR 10), which is collected on a weekly basis for one year. The recovered funds along with accrued interests result in total annual proceed of CHF 604'000.00 against the initial social investment of CHF 540'000.00

This represents a yield of 11% (in INR terms) on the social investment. Due to forex hedging costs, this would result in a yield of 5% to 6% in CHF⁸.

Reinvestment at the end of the first year to participate in the social investment for year 2 is possible and encouraged, but not mandatory.

⁸ Based on hedging cost of 5%

Results are Monitored continually through the Deployment Period

The project will be deployed in four phases following the assurance of sufficient social investment and project grant funding by September 2015:

Phase A	Q4/2015	Alignment with NGOs and finalisation of product specs
Phase B	Q1/2016	Deployment to initial 3000 families (30 villages)
Phase C	Q2-Q3/2016	Deployment to a total of 10'000 families (100 villages)
Phase D	Q4/2016	Evaluation of results and consolidation of learning

The following results will be monitored along the duration of the project on a monthly and quarterly basis:

RESULT	PARAMETER / INDICATOR
1. Project Results	<ul style="list-style-type: none"> - Penetration level (# families/household benefitted) - Deployment rate (# households per week) - Organisation development (# Staff on-board) - Training intensity (# household trained in the basics of solar PV)
2. Technical Results	<ul style="list-style-type: none"> - Deployment ease (time to install a solar home system) - Incidence rate (# incidents per wk – PV, controller, bat, LED, other) - Uptime (% time all installed systems are functional)
3. Financial Results	<ul style="list-style-type: none"> - Recovery rate (% on-time payment instalments recovered per wk) - Distress rate (% payments delayed > 2 wks or defaulted)
4. Social Results	<ul style="list-style-type: none"> - Improvement in family life and interaction - Educational impact for children - Health impact - Gender parity impact
5. Project Learnings	<ul style="list-style-type: none"> - Overall satisfaction with solar home system - Aspirations for the future - Applications identified for future innovation and development - Demand in neighbouring villages / communities

Quarterly reports will be made available to social investors and to grant donors. There will be a presentation of the results of the project in January 2017 in Zurich. A project visit will be organised in Q1/Q2 2017 in case of interest from the investor community.

Multiple Stakeholders ensure Accountability

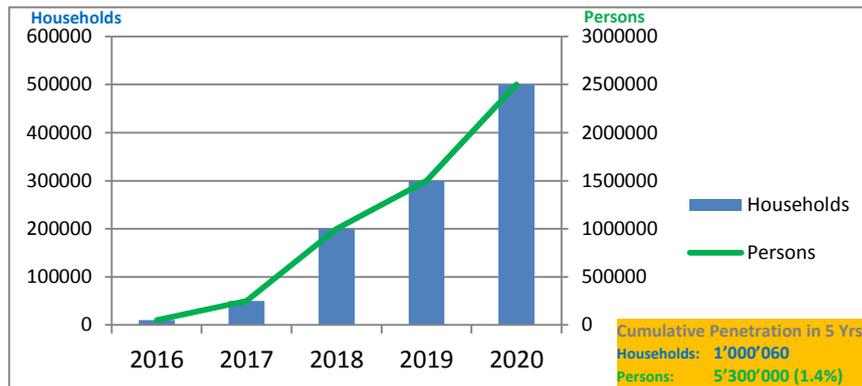
The stake holders are:

- i) Participating villages (specifically households involved and local govt leaders)
- ii) Partner NGOs
- iii) Local government in the region
- iv) Social investors and Grant donors
- v) Suppliers in India and outside India
- vi) swissmango gmbh (programme management and technology provider)

The Social Initiative has the Potential to Reach 1 Million Rural Households in 5 Years

The project will be implemented in a total of 100 villages in Tamilnadu and Andhra Pradesh. A total of 10'000 households are expected to benefit from the project.

The experience and learnings gained from this first year of rural solar deployment will be built upon to expand the project to 1 million households over a five-year period.



The target of 10'000 households in 1 year or 1 million households in 5 years might seem ambitious, but the reality is that even such an ambitious initiative still only covers 5.3 million persons or just over 1.4% of the un-

electrified population in India! Hence, replication potential will have to be a major concern and objective of this project.

The target is also to grow the initiative to a 25 MCHF social enterprise over 5 years.

A Timely Social Venture During the UN Decade of Sustainable Energy for All

A social investment of CHF 540'000.00 has the potential of electrifying 10'000 un-electrified homes in 2016 and can reach over a million un-electrified homes in India by 2020.

The model is both scalable and sustainable.

This initiative furthers the objective of the UN Decade of Sustainable Energy for All⁹ (2014-2024) and the aspiration to provide universal access to modern energy services for all by 2030. It also responds to the call of the UN Sustainable Development Goals¹⁰ (SDG), which recognise energy as a fundamental enabler for overall human development.

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About zeropoverty

zeropoverty is a csr initiative of swissmango gmbh which recognises and actively contributes to the UN sustainable development goals (SDG). The sustainable development goals recognise gender parity, health, food security & good nutrition, water & sanitation, sustainable energy, job creation & equitable growth and natural resource management as seven out of the 17 goals towards achieving a holistic and sustainable future for the most vulnerable people and communities on planet earth.

Energy is a crucial component within the SDG-mix and has implications for all the other SDG goals.

(Rev: V2.0 / 03 August 2015)

⁹ www.se4all.org/decade/ | ¹⁰ www.sustainabledevelopment.un.org/sdgsproposal

Appendix 1: Potential Partner NGOs and Local Governments

The last mile connectivity is provided by NGOs that are active in the field, have experience in micro-credit for livelihood, have an established track record and credibility, and who have won the trust of the local communities.

The list of partner NGOs will be finalised following a due diligence process in Q3 2015. Further expansion is planned in partnership with organisations in Africa and in Singapore.

Appendix 2: Preliminary Specification of the Solar Home Systems¹¹

Configuration Components	Basic	Basic Plus	Comfort	Comfort Plus
Solar PV Module	5 Wp	10 Wp	20 Wp	90 Wp
Solar Charge Controller	10 A	10 A	10 A	10 A
Sealed Lead Acid Battery	12 V / 4 Ah	12 V / 7 Ah	12 V / 14 Ah	12 V / 80 Ah
LED Lamps (200 lm each)	2 x 3 W	4 x 3 W	4 x 3 W	4 x 3 W
Mobile charge adapter	1 x	1 x	2 x	2 x
Mini Fan (12 V / 12 W)	-	-	1 x	2 x
220 V AC Output	-	-	-	100 W (max)
Year of Launch	2015/2016	2016/2017	2017	2018

Only the Basic model will be launched in 2016 for affordability reasons. Basic Plus and Comfort models will be launched in 2017 based on customer survey results. Comfort Plus model will be launched as of 2018 based on customer survey results.

Additionally, solar kits varying from 250 Wp to 1000 Wp will be installed for schools, primary healthcare centres and village office buildings based on the ability of the community to finance such installations.

Appendix 3: Rural Electrification Technology Selection Matrix¹²



¹¹ © swissmango gmbh, Altendorf | ¹² Amirtham, Arun Sam, AfricaLink, pp 23-24, Jan/Feb 2015

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