

CREATING GLOBAL AWARENESS FOR ELIMINATING LIGHT POVERTY IN THE WORLD: TO REPLACE HAZARDOUS KEROSENE LAMPS WITH CLEAN AND SAFE SOLAR LAMPS

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ABSTRACT

In this age of economic globalization and digitalization of every sphere of life, over 2 billion people world over are still burning unsafe kerosene to light up their evenings. Besides being a slow poison that the kerosene fumes are, in India alone, 2.5 million people meet with kerosene related fire accidents, which include 350,000 children. There is nothing good about kerosene, yet many national governments provide subsidy and promote this killer fuel indirectly. Even after 100 years of invention of electricity the modern world is leaving behind a third of world population without access to electricity and forcing them to use the deadly kerosene lanterns. The power-hungry world has so far failed to divert even a negligible portion of its grid electricity to those who burn unsafe kerosene for lighting. While the world with constantly increasing population demands more and more energy, the fast growing industrial developments long for even more energy supply thus making the scenario worse.

We, at NEST, have undertaken a lighting mission to see that there is widespread use of clean and safe solar lamps in place of hazardous kerosene lamps. A systematic approach coupled with worldwide network for the dissemination of solar lamps across the world is really the answer to one of the most neglected issue of the world. NEST's sole mission is to provide clean lighting solutions across the globe through a comprehensive network, resources and distribution channels. A global campaign, to create an extensive awareness about the hazard of kerosene and ultimately eliminating the 'light poverty'* in the world, is the need of the hour, because there is much more to providing light to these disadvantaged people. By providing light, we not only eliminate the health and fire risks but also increase their confidence, self worth and improve their lives by facilitating their children to educate. There is terrible poverty for food, clothing, and shelter everywhere. Light poverty is equally terrible, as there's no life without light. NEST aims to help eliminate the light poverty in the world.

INTRODUCTION

World leaders have pledged to act to change the future shape of the global energy economy. One can afraid that the world will be left with even worse scenario with the energy matters, as the so-called leaders are again aiming at only 'energy economy' rather than 'energy security'. They essentially mean to ensure uninterrupted supply of energy to support merely 'economic' and 'commercial' activities which trigger only economic growth rather than overall human development. Otherwise, how can you explain the plight of 2 billion people – more than the world's population in Edison's time – who 100 years later, since the era of invention of electricity, still, have no access to electricity?

In the past, man has behaved just as a child with a new toy gun in its hand and not knowing the consequences. It's time now for the present world leaders and energy promoters, in particular, to look at the energy distribution more equitably. Energy plays an important role in the development of modern society. When there's tug of war between the increasing population and the increased demand for electricity by the modern society coupled with the compulsion of combating global warming it may be doubted that those 2 billion people will ever be considered for providing even a minute fraction of electricity to meet their basic lighting needs. If at all we are serious about overall development of the world while 'handling' the environmental issues, we must consider providing solar lighting solutions to the households where unsafe, inefficient, polluting and dangerous kerosene lamps are used. At present, affordable solar lamps are the only answer.

It's the myth that kerosene is cheaper. In fact, the rural poor who use the kerosene for lighting are those who pay more for the light service than their urban counterparts. Kerosene lamps are very inefficient and give very little light output (Lumen) towards the cost they pay to buy kerosene. Also, a staggering 260 million tons of CO₂ (2002 World Bank) is let out to atmosphere by burning kerosene which contributes in enhancing global warming. There is nothing impressive about kerosene fuel, except its elimination. Why, then, the governments subsidize such a dirty fuel? Undisputedly, kerosene has become synonymous with

poverty and it must be banned as a lighting fuel if we are serious in eradicating poverty in the world.

So far, the grid electricity has failed to reach the kerosene based households. On the other hand, as we are aware, it's uneconomical to draw electrical cables and install several electric poles to meet a very tiny portion of the world energy consumption required for basic lighting purpose. If we are serious about providing energy to these disadvantaged households we should consider the solar energy option, which offers several advantages and generation of electricity at the point of use, which is clean and safe and best suits for low energy applications such as lighting.

THE ESSENCE OF LIGHT AND LIGHTING

Light is the integral part of life. There's no life without light. In fact, in a recent research, it has been found that DNA emits photons, the elementary particles of light. While day is signified with sunlight, the absence of sunlight on the globe is termed as night. But man always needed light except when he slept. Light is the essence of life. If we ignore its importance, we miss life. Light is essential for the overall development of man. We cannot even spell 'enlightenment' without the word 'light'!

While light from any source is same, all lighting sources are not. Light is pure but not the lighting sources. It's important that the lighting sources are pure; they should not produce pollutants. Kerosene lamps in the homes of un-electrified villages mark the light poverty in the world and they are best replaced by solar lamps.

The world of Disparity:



Fig. 1. Picture of the part of earth (showing Europe and Africa) taken by Astronaut Sunitha Williams.

Lighting has become the barometer of progress. If you watch those pictures of earth at night taken by Astronaut Sunitha Williams from space, it is evident that the magnitude of 'light' is directly proportional to the 'richness' of a country!

Those brightest spots on the Northern hemisphere mime the poverty in Southern hemisphere where darkness prevails. There's excessive light on one side and dismal amount of light on the other side. And, this difference is man-made.



Fig. 2. A house on MM Hills, in India without electricity and lack even basic roads to a nearby town

WHY LIGHTING SHOULD BE TAKEN ON PRIORITY?

It is an established fact, by now, that the global lighting energy is use very significant and, therefore, the lighting needs have to be addressed with far more seriousness than ever before. The following facts signify the urgency:

- The global lighting energy use is totaling approximately \$300 billion per year
- According to the World Bank, 24% of the urban population and 67% of the rural population in developing countries are without electricity today [World Bank 1996]
- In Cambodia, 90% of the homes are un-electrified. In India alone, over 100 million families lack electricity and they all depend on unsafe kerosene lamps. 90% of Africa still remains un-electrified as they still rely on fuel-based lighting.
- World annual consumption of kerosene for lighting is over 100 billion liters resulting in excess of 300 million tons of carbon dioxide (CO₂) being let out into the atmosphere; thus becoming one of the significant causes for global warming.
- The total lighting energy use equates to the output of approximately 1000 large electric power plants!

- Total lighting-related carbon dioxide is approximately 1775 million tons [Evan Mills 2002]

The above facts and figures signify the failure of modern world in diverting a small fraction of electricity for lighting needs of the developing world.

THE PROBLEMS AND PERILS OF KEROSENE-BASED LIGHTING

Kerosene-based lighting is far more expensive:

The poor people think that Kerosene is cheap. Even the educated people are unaware that kerosene is the costliest fuel. It's costly because of its inefficiency. In fact, the cost of kerosene is a greater burden to individual households and is far more expensive than electric lighting. The cost per useful lighting energy services (\$/lumen-hour of light) for kerosene lighting is 325 times higher than that for inefficient incandescent lighting and 1625 times higher than for compact fluorescent lamp (CFL). While households lit with flame kerosene-based lighting spend approximately the same amount of money each year on lighting, they receive far less than 1% as much lighting services as their counterparts in electrically-lit homes in affluent families.



Fig. 3.: Kerosene lamp from a household in Aleyuru (India) Village that leave more darkness than light!

Health risks:

It's not the cost factor alone that makes kerosene-based lighting an un-preferred option. The health risks associated with kerosene based lighting is manifold. The World Bank estimates that over 800 million women and children suffer from respiratory diseases on breathing particulate laden kerosene fumes. Inhaling such poisonous fumes is equivalent to smoking two packs of cigarettes a day. The result is that two thirds of the adult female lung cancer victims are non-smokers.

Fire risks:

Kerosene and candles cause countless fire catastrophes every year. In 1998, there were 282,000 deaths from fire related burns worldwide and 96% of the fatalities were in developing countries. In India alone, 2.5 million people (350,000 of them children), suffer severe burns each year, primarily due to overturned kerosene lamps. Each year, many thatched huts and even entire communities burn to the ground, causing death to the incumbents while they are in deep sleep not knowing when the lamp has toppled over.

Besides all the above Kerosene is a major contributor to the Green House Gases (GHGs)

SOLAR LIGHTING IS BOON TO THE RURAL HOUSEHOLDS

Improving the quality and quantity of light available to rural households in the developing world would yield dramatic social, health and other important non-energy benefits. Solar lamps based either on CFLs or white LEDs would light up the homes in the developing world to the same standards as those in industrialized countries, while



Fig. 4. Kerosene lamps from a household in Tolasikere (India) Village

reducing the cost burden and emissions released to the environment. At least in the case of lighting, attaining a higher standard of living does not require increased use of energy, to the stark contrast of people in cities to whom better standard of living comes only with higher energy use. In other words, it is far easier to satisfy the lighting energy needs of the poor than that of the rich. The solar lamps with low energy application fit the rural households perfectly well in all respects

Solar lamps with difference:

It is important to keep the cost factor in mind while developing the solar range of products. While the solar lamps have to be so cheap to have comparable cost economics of that of kerosene-based lamps, that the solar lamps have to add more values with negligible cost increase. It's our experience that the villagers are ready to pay for the higher services they get from the solar lamps. For example, the solar lamps with radio are very good attraction to the villagers. While there's increased value addition, the cost increase is not much owing to the negligible power consumption required for the operation of radio. Further, there are mobile telephone services that reach the totally un-electrified villages. But the villagers lack electricity to charge the mobile phones. Solar lamps with mobile phone charging facility would mean a great deal of value addition to the relatively well-to-do villagers.

There are three categories in the villages: those who can afford higher end solar products, those who are moderately placed, and those who cannot afford anything more than the cost of their annual kerosene expenditure. It is necessary that the solar lamps or the systems cater to the entire range of beneficiaries. Solar charging stations with the mechanism to provide 'light' (not lamp) on daily rental basis would go a long way in eliminating light poverty. These charging stations facilitate the poorest of the poor to stop buying kerosene and use the solar lamp while paying the



Fig. 5. Students studying using Kerosene lamps.

same amount as that of the kerosene on that day. This would mean that the households with extreme poverty do not get pinched by the burden of paying upfront cost for solar lamps.

The mechanisms for effective dissemination:

The most effective methodology to eliminate light poverty is to consider the LED based solar lamps with less than one watt, which emit light sufficiently more than the kerosene lamps. The LED lamps are very efficient and long-lasting. Importantly, these lamps fit the purse of the poor villagers.

Two other important aspects of successful dissemination of solar lamps are: reliability of the systems and the mechanism that ensures effective servicing facilities. However rugged the solar systems are, they are liable to fail over long and/or faulty usage. The failure to provide quick service back up would demoralize the villagers. It's a challenge to provide the uninterrupted service facility in economical way throughout the designed life span of the solar lighting systems.

There's much more to solar lamps:

Solar lamps bring true light and hence a new spirit in the lives of the rural poor. Their feeling of self worth mounts as they use the solar lamps, which has entered their life as a new and wonderfully magical modern gadget. The solar lamps enhance productivity of the people at every level in all activities: household chores, commuting to field, children's study and so on. Solar lamps truly light up the lives of the rural people.



Fig. 6. Students studying using solar lamps.

THE GLOBAL AWARENESS

There are several organizations and foundations that are aware of these grave situations and are working in providing safe and clean lighting solutions, such as solar lamps. But it is all happening in a sporadic way, which is not enough to really reach the last household in the world that lacks modern lighting. Few demonstration projects here and there

do not serve the purpose of eliminating light-poverty in the It requires enhanced awareness of such a momentous situation across the globe. Then, the question is that to whom the awareness has to be imparted? Those who are poor? No; awareness must be imparted to those from the affluent society (and local governments) who have the social responsibility to contribute to the bottom of the pyramid population. Going to a household that is in dark and trying to educate them that they are in utter darkness is as ridiculous as telling a hungry man that he is hungry! It is said that God must like common man because he created them in plenty. 'If society cannot save the many that are poor, it cannot save the few who are rich' thus said John F Kennedy. The world produces 785×10^{13} Kwh energy and it cannot divert the miniscule fraction of it (0.0000000008% or $8 \times 10^{-9}\%$) for the lighting purpose that brings remarkable improvements in the lives of the bottom of the pyramid population.

Who needs awareness?

The kerosene laden households are the places where the solar lamps are required most. And, these poor people need them most. They would find solar lamps most convincing than their city counterparts. So, what's important for the rural people is that the solar lamps are made available at their doorsteps so that they could acquire them. Then, it's up to the industrialized world to make the solar lamps reach the rural regions with certain networks and service facilities.

It is in the interest of society and environment the industrialized world has to take the lead. In order to take lead, they must be aware of the need for such action. It means that the global awareness about the elimination of light poverty is required to the affluent/industrialized world that has the potential and the ability to act upon.

Why the industrialized world is responsible?

- They produce the electricity that is un-equitably distributed and that with little lighting energy there will be enormous change in the lives of millions of people world over.
- The energy mix is best known to the suppliers of energy equipments or the energy producers.
- The phenomenon of global warming is the result of 'overdoing' by the industrialized world and hence he has to pay the price
- The national governments of the developing world should first understand that kerosene is the dangerous fuel that has nothing good and stop subsidizing such a 'killer fuel'
- The corporate companies should consider promoting solar lamps as part of their corporate social responsibility (CSR) directed by the Kyoto Protocol under UNFCCC's Clean Development Mechanism (CDM)

- NGOs and Foundations world over should treat the kerosene as the oil of 'social evil' and instead propagate the use of solar lamps in a widespread manner.
- The solar cell manufacturers should reserve their broken cells for manufacturing small solar modules, which employ only small pieces of solar cells. This should come as a great gesture of social commitment by the solar industry. The solar industry should consider this as a means to get tremendous market publicity among the rural regions, as solar lamps silently demonstrate the wonderful use of solar energy, which is not possible even by spending large amount of money for the power plants. The small solar lamps reaching every nook and corner of the world speak volumes about the solar technology and its advantages. And the students studying under solar lamps would appreciate the use of solar technology as they grow. The small solar lamps reaching every nook and corner of the world speak volumes about the solar technology and its advantages. And the students studying under solar lamps would appreciate the use of solar technology as they grow.

SUMMARY:

- The world's 2 billion users of kerosene-based lighting collectively consume significant amounts of energy and emit correspondingly large amounts of greenhouse gases, even compared households served with luxurious electric lighting.
- There's nothing good with kerosene lamps. Then why they should still be used in the 21st century at the times when we have excellent alternatives in solar lamps?
- The value addition by solar lamps is very significant, though they may not be detected from the space.
- It's the need and responsibility of the industrialized world to replace these dirty kerosene lamps with safe and clean solar lamps and pave way for eliminating light poverty. Low cost solar lamps (esp., LED based) are the best substitute for dirty, inefficient and dangerous kerosene lamps.
- The global awareness, about eliminating light poverty, among the world renewable energy - esp., solar energy promoters - policy makers is of paramount importance.

REFERENCES:

- [1] D.T. Barki, Small is Big Dissemination of Solar lamps to replace Kerosene lanterns, 2004.
- [2] Evan Mills, et al., \$230 billion Global Lighting Bill, 2002.