sunpossible
A Brand of Flow Technics

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Power where it is Needed: Promise of Photovoltaics

The need for energy in today's world can be nothing but increasing. As M K Gandhi said "Nature can feed a man's need, but not his greed", the energy sources are limited. One source of unlimited energy however, which we call the mother of all energy sources, is the Sun. It is this sun that in many cultures is worshipped, considered God. This divinity is what lights up the world during the day. Technology when added to the divinity can light up the darkness of the night. This is where photovoltaics can play a big role. I am talking about the 1.6 billion (Source: World Bank) people in this world who live in darkness from sunset to sunrise. There might be people who have neither seen nor heard of the magic of electricity. This is where the true application of photovoltaics lies. As Dr Harish Hande (MD and Founder of SELCO, Bangalore) said once, "Photovoltaics is expensive for the rich but cheap for the poor". The environmental benefits of photovoltaics are well known to all and I don't intend to write about them. Photovoltaics has its share of applications for the whole world in general, electrified or un-electrified.

Electricity as described in Harry Potter series is "what muggles use instead of magic". Indeed electricity is synonymous to magic. I believe that photovoltaics is the magic of semi-conductors. The energy radiated by the sun is absorbed and converted to electricity without any emission or any rotation/movement. Through this article I want to bring to you this magic called photovoltaics and its promises.

There are two distinct types of installation of PV power systems, Stand Alone and Grid Connected. Both are feasible in their own sweet way. Initially I would like to write about Stand Alone PV systems and then Grid Connected.

Stand Alone Systems:

As the name suggests, it is an isolated power system. It's not connected to any kind of grid. It directly connects to the electric load. These are most feasible for the rural regions. High costs and Photovoltaics are often considered synonymous to each other. However, they are not. Poor people living in rural regions can afford it. To understand this irony, one has to look at the lives of the poor rural people. I can summarize their lives in following points:

1. **No Electricity:** This is mostly because extension of grid to these regions is very expensive for the government and even if it is extended the production of electricity is not sufficient. A problem faced throughout the developing world.
2. **What they PAY for using Energy:** Without electricity, the rural people depend mostly upon kerosene for lighting lamps and wood for cooking. They also use batteries for radios which again has a cost. Not only do they have to pay for procuring the kerosene, they also pay in terms of their time that goes into walking long distances to get it and for wood collection. Last but not the least they pay in terms of their health and eye-sight deterioration due to the fumes from burning of kerosene and wood.

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3. **Education:** The children, in-spite of going to school have to study in the low light of the kerosene lamp after dark. They have no access to TV which is a good connection with the world outside. Worst affected are girl students who have to complete house work as well as study.

The solution to these problems of the poor is the use of photovoltaics power systems (For fire wood problems its smokeless *chullas,* out of scope of this article). Financial Balance is brought about by the following:

1. Partially subsidizing the PV systems by the government against the cost it would have incurred in establishing a grid connection and Increasing power production
2. Provision of Micro Finance to end users (It has been a major success in Bangladesh and Sri Lanka as well as a few projects in India)
3. Monthly instalment of loan should be almost similar to the original expense on kerosene which the installation of PV will be offsetting.

Any product that makes life better and is affordable will have customers. Even the poor person in rural regions is a customer. He will also want it. However, due the nascent stage in which the technology is in, there are many matters than need attention for the above process to go on smoothly. They are:

1. **Needs Assessment:** The end user should be asked his needs as an individual or as a general village. The suitability of PV to the needs has to be determined. The end users should know the advantages and limitations before they make their decision.
2. **Capacity Building:** The end users, government authority, installation and maintenance people need to be educated well in their own capacities.
3. **Proper Planning, Implementation and Maintenance:** Any project implementation should be with best planning at all stages for its best performance. PV project is no different. Failure of any PV project is not the failure of technology but the failure of planning. Unfortunately in a few parts of the world PV electricity has been deemed as second grade electricity due to planning failures and low quality equipment.

The complete implementation of PV projects is not same as any other power projects in a developing nation. PV projects need a different approach and execution and maintenance as well as a complex financial mechanism for the profitability of the whole supply chain. IEA-PVP Task 9 completely deals with the implementation of PV in developing nations.

Apart from PV for powering up homes, it can be used for running small rural business, lights and computers in schools and for water pumping. Solar water pumping which is now a mature technology is a divine solution to pumping and irrigation problems especially for a vast agrarian country like India.

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Grid Connected Photovoltaics:

This is the latest trend in the market. Grid connected photovoltaics is being adopted by the developed world in a big way. Europe is pioneering the use of PV for grid connected power systems followed by the United States of America. With the concerns of global warming and climate change being taken seriously, such projects has been given a lot of importance and people are encouraged to use PV at their homes. This is done by offering partial subsidies, tax benefits as well as buying of electricity by power utilities. The major benefit of this system is the peak load shaving which is during the day time when all the offices are working.

One very interesting trend in Grid Connected projects is Building Integrated Photovoltaics (BiPV). Specially designed PV panels can be used as the roof or shading elements or the front facade of buildings. Hence, the conventional elements like glass are being replaced by BiPV Panels. This brings down the effective investment on PV as it is only additional cost one pays over the conventional material. BiPV in coordination with energy efficient building design or green buildings is a growing market today.

It is very clear that whether it's the developed, developing or the underdeveloped countries there is a major role that PV can play in the future. There is a need of more number of people to work in this industry which is one of the fastest growing in the world if the numbers of the previous few years are considered. There is need for the premier educational Institutes to educate the students in this field of PV, not only in terms of technology but also in terms of practical application.

There need of the hour is:

1. To develop more efficient and cheap solar cells by research
2. Learn and improve the practical aspects of the application of the technology in rural as well as urban environment

The engineering behind designing, planning and Implementation of PV projects as well as the techniques to make these projects sustainable and self sufficient financially is what one must improve. This is what we at Sunpossible strive to do. We want to perform the magic of semiconductors in the best possible way for our customers and realise the promise of Photovoltaics – Power where it is needed.

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