

A SOLAR ROAD FOR RURAL INDIA

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Government is promoting solar energy like never before. Under National Solar Mission, it has set an ambitious target to generate 100 GW solar energy by 2022 (both grid connected and off-grid). Rural India is going to play an important role in this because of the easy availability of open space and land to install solar panels. Yet challenges remain. Lack of trained manpower is one. Skill India will have to play a major role here in training the rural youth.

The sun is setting, sky is changing fast from red to dusky, cattle are returning from grazing land and birds settling in trees for night are making considerable noise.... That is a remote hamlet perched somewhere in rural hinterland of India.

Few moments pass and now village turns quite and calm, engulfed in darkness of night. Jackals have started howling.... But Rashmi is busy. She has a solar lantern and a workbook before her. Homework is still incomplete but bright white light from solar lantern feels much better than the pale light of kerosene lamp.



Solar lantern has made her life and study really easy. Other than good visibility, it is easy to maintain and clean. Old kerosene lamp was a nightmare for Rashmi whenever she had to clean its glass from inside. She would often break it while washing and would be scolded by mother..... sometimes broken glass would injure her tiny hands. Earlier at night, she could never study on open roof as wind would often blow out the kerosene lamp. And then there was always danger of her cloths (or loose hair) catching fire if she ever dozed while studying near that pale lamp.

Solar energy is no less than a boon for the likes of Rashmi, who live in faraway villages with erratic power supply or no supply at all. Solar energy has

helped the villages in multiple ways. Rashmi's mother is no less a gainer- she has replaced her earthen heath with a solar cooker.

Most of Indian villages use biomass *chulhas* where cow dung, wood and agricultural residue is used as a fuel. These *chulhas* are a big source of indoor pollution and women cooking on them are the worst affected. Many respiratory diseases and eye related ailments are attributed to the smoke and soot emanating from these *chulhas*. WHO data shows that these traditional *chulhas* are responsible for 13 per cent of total mortality in India, they cause about 40 per cent of all pulmonary disorders, about 30 per cent of cataract incidences and more than 20 per cent each of heart disease, lung cancer and lower respiratory infections.

India being a tropical country, with abundant sunlight most of the year, **solar cooker** can be an easy and convenient replacement for these soot & smoke *chulhas*, bringing immense benefits to health, environment and economy as a whole. Community solar cookers like PRINCE-40, can be used for cooking large number of meals e.g. mid day meals in schools.

Solar heater is another device which can be used to warm water, especially in winters and cold areas saving considerable amount of wood.



With development of country, living standards are also improving in villages. This new emerging rural lifestyle, which borrows from urban ways of living, is more energy intensive. Lights, coolers, fans, TV and submersible pumps require much more energy than traditional way of living in rural India. Due to this increased demand, load on feeder lines is increasing and hence the failure of transformers in villages is very common, especially in summers. This leads to total shutdown of power supply, making life and irrigation of crops both difficult.

Here solar energy can play a very important role as summers also provide the greatest amount of insolation which can be effectively harnessed. Open space, which is main requirement to install solar panels, and difficult to find in urban landscape, is abundantly available in rural area. Other than wasteland and rooftops, farmlands are also being used to install solar panels. Because some crops which can grow in shade, can still be cultivated in the farm under the panels. Further waste water from washing of the panels will be used for irrigation in the same field, thus doubly benefiting the farmers. These solar farms will be a good supplement to grid based supply and may even make **villages Self dependent in energy**.

Even after seven decades of independence, Indian agriculture remains vulnerable to the gods of rain. Last two successive weak monsoons have left our farmers in difficult situation. Boosting irrigation facilities is the solution but erratic and unreliable power supply again becomes a constraint here.

Solar water pump offer the solution. Due to division of land after every generation, 80 per cent of the farmers are small land holders nowadays. Getting new power connection for tube wells is really hard for them. Those who have tube wells, often face the threat of their power supply being disconnected by power distributing company for not being able to pay electricity bills on time. Solar water pump may be best suited to their needs. This combined with modern techniques of irrigation such as drip irrigation, may really prove to be a boon for both – the farmer and fast receding ground water table. NABARD is providing subsidy for solar water pumps.



When we think of a farmer, the first image that emerges in our mind is that of a lean man with two bullocks. Though this image remains etched in the popular imagination, it is no longer true as tractors have vastly replaced bullocks. Farm mechanization has taken place at a rapid pace during last three decades. But these equipments cost a lot and mainly big farmers are only able to afford them. Their operation costs are higher as tractors use petroleum fuel which keeps getting expensive every year, thus increasing the input costs of the agriculture. **Tractors equipped with solar panel** may be the solution to this problem. It is not only environment friendly but would also reduce diesel use and thus, our import bills.

Due to small land holdings, expensive diesel and eight months of good sunlight, India is most suited place for these tractors. Small farmers will benefit immensely from this.

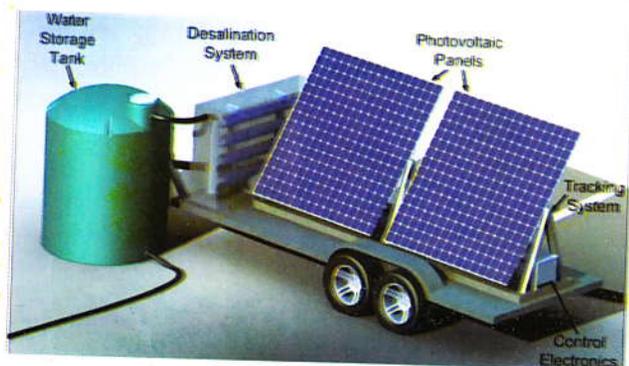


Other than this, solar energy can be used in ancillary activities like food processing and dairy. **Solar dryer** is one such application which can be used for drying perishable, semi-perishable and wet processed food material (such as potato chips, leafy vegetables) without contamination. Solar milking machines may help dairy sector.



Man-animal conflicts are often reported from all parts of the country. We often hear the herds of wild elephants straying into farmlands. They cause damage to crops and in return earn the wrath of the land owner, leading to conflict. Innumerable human and animal lives are lost in these conflicts. Though root cause of this problem lies in loss of habitat for wild animals and fragmentation of forest lands but **Solar electric fencing** of fields may solve this problem to a considerable extent, thus reducing the direct conflict.

Pure water is matter of fortune, nowadays. Rapid industrialization and mindless exploitation of ground water has made this problem even more complicated. Several villages complain of ailments related to consumption of contaminated water. Purifying the water using modern techniques such as solar RO seems to be the only solution. Similarly India's 7600 km long coastal boundary



line is facing the problem of saline water. Coastal villages are getting adversely affected. By using **solar desalination water plants**, drinking water crises may be overcome effectively.

E-Rickshaws can play vital role in rural connectivity. Thanks to *Pradhanmantri Gram Sadak Yojana*, by now most of the villages are connected by road. And in densely populated regions, average distances from one village to another is 2-3 km. E-rickshaw may be modern *Ikka-Tanga* (Horse Carriage) to ferry passenger towards nearest bus stops or local railway station. At night, all streets and roads can be made safe for women and common man by installing solar lights.

At last, we understand that a vast solar market in rural India will require skilled and semi-skilled pool of manpower to install, maintain and repair solar panels and related electrical equipments. Majority of these job opportunities would be available to rural youth by way of their proximity to the rural solar market. This would also give rise to new entrepreneurs in rural India who would take lead in these projects.

Challenges ahead

Government is promoting solar energy like never before. Under National Solar Mission, it has set an ambitious target to generate 100 GW solar energy by 2022 (both grid connected and off-grid). Rural India is going to play an important role in this because of the easy availability of open space and land to install solar panels. Yet challenges remain. Lack of trained manpower is one. Skill India will have to play a major role here in training the rural youth.

Second challenge is seasonal and daily variations in availability of sunlight. During rains or fog, sunlight is far less, drastically reducing the solar power generation. This variation in power production is also the main hurdle in connecting the solar energy to grid. We will need a huge storage capacity to ensure reliable supply of solar power. Off-grid installations may be more successful but they also need back up power supply in cases of clouds or fog.

Apart from these natural limitations, there is the issue of availability of appropriate technology.

Though India is producing solar PV cells and modules of its own but world class standards are yet to be achieved. Recently announced International Solar Alliance may help in this regard as one of the objectives of this Alliance is to develop new technologies through collaborative efforts. Further private sector must also be engaged in this process. Companies operating in India should design affordable technologies that meet the local demand.

Further cost of solar energy equipments is also a concern. Initial cost of solar installation is relatively high. We know agriculture input costs are already high in farming sector, in such scenario, high prices of solar based appliances may add burden and it may neutralize the mood of farmers towards solar based appliances. Government is trying to solve this issue by providing various types of subsidies but still new cheaper technologies would have to be evolved through R&D to make solar energy attractive and sustainable.

Also, with the expanse of solar sector would arise the problem of managing huge amount of e-waste. We will have to think about this beforehand and include strategies of proper

e-waste management in the installation phase itself. Generating public awareness would also be crucial for this.

Renewable energy is the future, not only for India but also for whole world. A lot many initiatives have been taken up at international and national level to promote green energy. At 37,000 MW, renewable energy accounts for close to 15 per cent of the total installed power capacity in the country. It sounds impressive till it is compared to the humongous target India has committed for the Paris climate change agreement - 40 per cent of the installed renewable energy capacity by 2030. Country is aiming to add 175,000 MW of capacity from clean energy sources by 2022, 60 per cent of which would come from solar energy, 30 per cent from wind and the balance from biomass and small hydro. Rural India is integral to the success of these schemes. Also these renewable energy programmes would be able to justify themselves, only when they benefit the last Indian living in the remote hinterland such as – Rashmi.

(Authors have run campaigns on popularising solar appliances among farmers. Email: rsambawat@gmail.com)

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