

# Way forward for solar energy players in india



Market Analysis Opportunities India had an installed solar power capacity of 1700 MW in 2007 which amounted to roughly 1% of its total power generation of 130, 000 MW. India is currently ranked 7th in the world in Solar PV cell production. But considering India's geographic location and climatic conditions, this is a huge market waiting to be tapped. India receives bright sunlight almost throughout the year especially in West and Central parts of the country. Due to global warming and rising CO2 levels, average temperature in India is set to increase by 4 degrees by 2050. Given Government's recent policy announcement which gives thrust to green and renewable energy, there is a commercial opportunity which can be exploited. Some of the incentives given by the government are: - Subsidy of Rs 12/unit on medium scale operations (1-5 MW capacity) - 100% depreciation of equipments used in 1st year itself - Other tax benefits like zero excise duty These measures though very limited as compared to other countries like USA or Germany, the world leaders in solar energy, but still it is a step in the right direction. So it is no surprise that many big companies have announced sizeable investments in this field. At present the main players are - Tata BP Solar - Moser Baer - Central Electronics Ltd. - SELCO - BHEL Many more are expected to join like DuPont, Dow Chemicals and surprisingly even Google. Improvement in PV technology, which is touching efficiencies of 30%, and development of newer technologies especially STEG (solar thermal electricity generation) are driving the energy costs down. Till now, use of solar energy in India is limited to rural areas for lighting purposes. But innovation can play a major role in expanding the scope of applications. Issues Involved Cost of setting up a PV solar cell panel Rs 16-20 cr. per MW Cost of setting up a coal fired plant Rs 4 cr. per MW Cost of setting up a hydro plant Rs 6 cr. per MW

Almost 70% of cost associated with solar cell panel is wafer silicon which is polluting. So though solar power is pollution free during its use, it creates lot of toxic pollution during manufacture of PV cells. This makes cost/unit of solar energy very high at Rs. 15-25/unit as compared to Rs. 2-6/unit for other sources. This is where government subsidy helps in bringing costs down. Another issue is the requirement of lot of open space to set up the solar cell panel. There should be no shade because efficiency of panel reduces significantly even if one cell is in shade. As of now, the energy produced is not suitable for energy intensive applications thus ruling it out for industrial applications (36% of total consumption). Also agricultural applications are ruled out because of its very high costs (22% of total consumption). This limits use of solar energy for small to medium scale applications (1-5 MW) as of now. As technology is improving and costs are coming down it can be used for large scale applications (> 30 MW) viably by 2020. Demand Analysis India faces a power shortage of almost 70, 000 MW. Energy demand is increasing at 12% p. a. but the supply simply hasn't kept pace. But to expect solar energy to step in will be too much. Right now, its usage is limited to developing innovative applications for individuals or medium scale operations (1-5 MW). The growth in this area depends upon improvement in technology and economies of scale. But it can't happen unless someone takes initiative. So it's a kind of catch 22 situation. Growth, thus, depends upon private player initiative with government playing the role of a facilitator. In rural areas, which are not yet connected by electric grid, the demand for solar energy is immense. Demand is also coming from environmentally conscious people who have the capacity and are willing to pay the premium for green sources of energy. This segment can be

expanded by spreading awareness and making it an issue of pride. Some institutions or government warehouses located in remote locations can also be tapped. Competition At present the major players are Tata BP Solar, Moser Baer, BHEL, Central Electronics Ltd. etc. Also realizing the growth opportunities in this field, many existing players have unveiled massive expansion plans and new players are also showing interest in this market. - Tata BP Solar announced \$100 mn investment in solar cells and modules - Moser Baer raised \$150 mn from foreign convertible bonds for solar energy - Giants like DuPont, Google are considering entering this field - Signet Solar announced \$2 bn investment to develop 3 plants in India So competition is hotting up in this field. Most of these companies are planning to use PV technology except Google which is planning to use newer STEG technology which is expected to reduce setup costs by almost 50%. Business Model Considering the issues involved with PV technology at present, it makes sense to go for small to medium scale operation at present (<5 MW). Newer STEG (Solar Thermal Energy Generation) technology, when available, can reduce setup costs by almost 50% and doesn't cause pollution associated with wafer silicon production. This technology is expected to come up approximately 10 years. But an area where PV technology scores over STEG is miniaturization. So it is logical to limit the present operations to small and medium scale operations only. As we have seen, despite government subsidies, solar energy still costs about 2-4 times that of conventional sources. So we have to target those buyers where conventional sources are either uneconomical or where buyers themselves are willing to pay a premium for clean source of energy. Three such segments are identified: 1. Environment conscious people in high income category (earning more than

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Rs. 10 lac p. a.): These people, either out of sense of duty or pride, are willing to pay a premium to reduce their carbon footprint. With proper awareness, this segment has the potential to become very big. We will call it segment A. 2. Demand from remote locations: It can be in the form of government cold storage plants, educational institutions or defense forces. In these areas, grid electricity is either not present or is economically unattractive due to high transmission and distribution losses (almost 50%). We will call it segment B. 3. Street vendors or workers working at night: Innovative applications like solar lantern and headlamps can improve their productivity. By doing live demos and introducing pay per use payment method, this segment can be targeted. We will call it segment C. Selection of SPV suppliers Since Dow is considering entering into Indian market under a 'renaming' model, it is essential to have a reliable supplier of photovoltaic equipment so as to ensure quality of its final product. It is also important to look for one or two big suppliers so as to benefit from economies of scale and reduce costs. Contracts of 1 year can be given to these suppliers with automatic extension of contracts if no default occurs. Government companies like BHEL or Rajasthan Electronics and Instruments Ltd. operate at large scale and thus ensure low cost of the PV equipments. Now we will discuss the strategy to be adopted to target each of these segments.

Segment A These are environment conscious people and fall in high income bracket (upwards of Rs. 10 lac p. a.). They are willing to pay a premium for green sources of energy. A tie up with real estate developers like Unitech or Sahara, involved in construction of luxury housing societies can be done. Solar cell panel of capacity 1-3 MW depending upon requirement can be setup on rooftops. This power is sufficient to meet most of the demand. Still

batteries or electric grid backup can be used in case solar energy is not sufficient like on cloudy days. These projects can be endorsed by green organizations like TERI. These societies in any case have diesel generators otherwise. Having solar power can reduce this dependence. Real estate developers can share 50% cost of construction of solar cell panel as they will also benefit by attracting this segment and by enhancing their brand image. TV campaigns to promote green source of energy as a matter of pride should be undertaken. A 10-15% premium for these luxury apartments can then be charged and this segment won't mind paying a little extra. Another way to tap this segment is by collaborating with green hotels like Orchid Hotel or any other hotel chain willing to promote ecotourism. This will help in attracting eco tourists, mostly foreigners, and they are willing to pay a premium for it. In US, such hotels command up to 30% premium in room rents. Let us consider 2 MW solar cell panel can power one such society of 100 homes. Considering government gives subsidy to the tune of 25%, it works out to selling a typical home of Rs 50 lacs at a premium of 10%. By highlighting the benefits of living in such a society like no pollution or noise of generator, customers can be wooed to pay this premium. Responsibility of maintenance and replacement of equipments can lie with the society with Dow providing necessary technical support. This segment can contribute almost 60% of total revenues. Segment B Many places in India are yet to be connected by electric grid. Either the costs associated to construct such grids or T&D losses (transmission and distribution losses) make it unattractive. This is where solar energy can step in. Some of the opportunities lie in - Government Institutions located in remote areas - Defense forces base - Government warehouses especially for cold storage

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Presentations can be made to the government officials showing the advantages of such projects. 500 kW to 1 MW projects can provide sufficient energy to such places. Also space is not a problem in these areas. Various research organizations like IISc and NGO's can help in highlighting specific problems and designing solutions for them. But there is the problem of high setup costs. Power Purchase Agreements can help in these cases. In this, Dow bears the cost of building the solar power plant which comes out to be around Rs. 6-12 cr after government subsidy. These segments pay only 30% of total cost upfront and agree to buy the energy at market rates for a minimum period of 20 yrs. It is expected that in around 10 yrs, solar energy cost can match or even better energy from other sources. Though this requires long gestation period, but it has the potential for profits. As we can see from financial assessment, this segment doesn't look too attractive in terms of IRR. But it has many intangible benefits like - Understanding local markets - Getting into good books of the government - Increase lobbying power for solar energy This segment can contribute 20% of total revenues.

Segment C This is a segment which can't be ignored for its sheer vastness. According to some estimates, India has almost 10 million street vendors and there are many workers like street cleaners, who work at night. These people normally live on less than Rs. 150/day. So their buying power is less, but still their sheer numbers make it a viable segment. Having a solar lantern or headlamp can improve their productivity immensely and it is this value proposition that should be promoted to them. Besides, it does away with the need for harmful diesel fuel lamps which cause pollution. Innovation can play a big role in properly tapping this market. There are many not for profit organizations like GSBF (Grameen Surya Bijlee Foundation) which are

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currently doing this work. These organizations can be roped in to scale up their operations and utilize their distribution network. Pay per use mechanism can bring the costs down to Rs. 10/day and make it viable for this segment. Contrary to what one may think, this segment has among the lowest default rates (Grameen Bank Experience). What is needed is awareness which can be spread through live demos of its products. Also as we can see from the financial assessment, it also has the highest ROI or IRR among all the segments. It can contribute almost 20% of total revenues.

**Financial Assessment** The following excel shows the financial assessment of the proposed model. **Future Outlook** Solar energy industry is growing at 12-15% per annum. By properly targeting the right segments, Dow can achieve almost 25% CAGR for the next 5 yrs. Then, the future growth depends upon the PV technology developed by it and the status of STEG technology.

Realistically, it can aim to achieve \$100 mn mark in revenues by 2015. The following steps can be taken to further Dow's cause in India: 1. Offering internships to research/engineering students in PV labs to develop innovative products for mainstream customers, which are not only easy to use but also low in cost. 2. Competition/Seminars in B-Schools to spread awareness about advantages of green sources of energy. These students would be major decision makers of tomorrow be it in home or in office, so they are Dow's future customers. 3. To scale up operations and move to large scale power generation (> 30 MW), R&D efforts should shift to new STEG technology: a. It will reduce setup cost by 50% b. It will not involve toxic silicon manufacturing c. It can be used for energy intensive applications 4. Carbon credits can be earned under Kyoto Protocol's Clean Development Mechanism (CDM) and be sold in the secondary markets to earn additional revenues. 5.

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It should try to lobby for additional incentives in solar energy sector to enable it to meet India's burgeoning energy demand. References 1. www.mnes.nic.in 2. www.ecoworld.com/features/2003/11/17/solar-energy-heats-up-in-india 3. http://www.solarbuzz.com/Consumer/Solarthermal.htm 4. http://www.ingentaconnect.com/content/iabse/sei/1994/00000004/00000002/art00004 5. http://techon.nikkeibp.co.jp/article/HONSHI/20080428/151154/ 6. www.domain-b.com 7. www.howstuffworks.com 8. www.indiasolar.com 9. www.ises.org/india