



Executive Summary

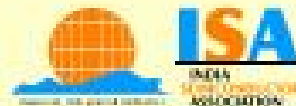
Solar PV Industry: Global and Indian Scenario

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India Semiconductor Association

UNI Building, Millers Tank Bund Road
Bangalore 560 022. www.isaonline.org



The Renewable Energy (RE) sector around the world, including India, is developing rapidly. Within RE, solar is one of the major growth segments globally with almost 30% of all investments in the sector going into solar. The Indian solar industry, which is in the nascent stage, holds huge potential. But the pace at which it is growing does not compare to global standards. One of the main reasons for this is the lack of adequate investment in solar PV manufacturing and R&D in India. There is an urgent need to facilitate and enhance investment in solar PV manufacturing in India. This would enable the domestic solar PV industry to provide cost-effective and sustainable solutions to the domestic market and compete with the rest of the world. This study has been carried out with the intent to provide the requisite background for investment in this sector.

The study provides a broad overview of the solar PV market globally and in India. It provides the current status and future trends in solar PV manufacturing, technology, R&D, market dynamics, commercial and financial aspects, and government policies and market drivers in leading countries in this space, namely, Germany, Japan and the USA. The study also identifies key market segments where solar PV can be implemented and evaluates the market viability and the size of these market segments. Based on these analyses, a set of recommendations has been made to enhance the growth and competitiveness of the Indian solar PV industry.

Technology

Crystalline silicon (c-Si) solar cells have a larger surface area and have relatively high conversion efficiency. However, c-Si cells require high inputs during manufacturing (i.e. energy and labour) and are heavily dependent on pure solar grade silicon which has had a limited supply base. In contrast, thin film technology has the advantage over c-Si technology in terms of better cost economics for electricity generation. Lower material (silicon) usage and lower energy requirements contribute to reduced generation cost. However, the land requirement for this technology is higher than in c-Si technology.

To reduce cost and improve efficiencies in the future, a major thrust on R&D is needed on two key aspects: a) reduction of system cost, and b) improvement of system efficiency. Signs of innovations and improvements in these areas are already visible. Today, silicon usage is down to 10 g/Wp, which till a few years ago was typically 13 g/Wp. There is significant potential for improvement in manufacturing processes in the near future. The European Union (EU) is targeting polysilicon consumption below 5, 3, 2 g/Wp in the short, medium and long term, respectively.

The main areas where cost reduction is expected are in the development of new, lower cost and less energy-intensive techniques for polysilicon production and a reduction in material usage. According to available market research, crystalline silicon modules (c-Si) may touch US\$ 1.3-1.7/Wp in EU by 2012.

Module efficiency of c-Si has gone up from 10% in 1990 to typically > 13 % today, with the best performers averaging around 17%. Cell efficiency has also been on the rise and poly-crystalline cells now have an efficiency of 18% and mono-crystalline almost 23%. Also, with increasing standardization of manufacturing equipment and improving efficiencies of modules, it is expected that there will be a reduction in production costs in the medium term.

Besides the c-Si and thin film technology, emphasis is being given on R&D for new technologies that can improve system efficiency and maintain low cost production. Researchers are now targeting conversion efficiencies between 30% and 60%, while retaining low cost materials and manufacturing techniques.

With the cost of solar PV falling, it has become a workable alternative for power generation. Solar PV can become a sustainable source of energy considering the current energy security aspects and environmental concerns.