

RENEWABLE ENERGY REFRESHER

BERGEN GROUP NEWSLETTER



CONSTRICTED SUPPLY OF EQUIPMENT FOR PV MANUFACTURING IN INDIA

In view of the announcement of PLI scheme by MNRE and consequent invitation by IREDA for submission of projects under this scheme, many investors have started planning for such projects. Major objectives of the PLI scheme are to encourage investors:

- To integrate maximum stages of PV production starting from polysilicon to Ingot/wafering to solar cells to solar panels with minimum qualifying limit of integration of two stages.
- To maximise the capacity of the manufacturing plants to 4 GW+ with minimum qualifying limit of 1GW.
- To employ high efficiency technologies with minimum qualifying limit of 20% efficient panels for crystalline silicon solar cells and 19.5% for thin film solar cells

to be continued...

Total outlay for the incentive is, as of now, Rs.4500 Crore which is expected to be enhanced in future. Taking these facts into account It is expected that there could be proposals for establishing manufacturing facilities across the PV value chain for more than 10GW capacities in coming 1.5- 3 years.

If hopefully this scenario arises of which chances are very high specifically in view of the Atmanirbhar Bharat philosophy of Government of India (GOI), there could be supply constraints of equipment for such capacities looking at the current suppliers of cell and module manufacturing specifically. Currently there are only two main suppliers of PERC cell lines in India, namely SCN from China and Centrotherm + from Europe. There is, therefore, strong need to cultivate more quality group of suppliers for PERC cell lines e.g. Semco+ from Europe and H2Gemini+ from Europe& China. Similarly in module manufacturing major supplier in India has been Jincheng China, recently Confirmware, China has got entry into the Indian market. So here as well there is scope for few good players e.g., H2Gemini Europe. For HJT cell line there are only two suppliers from China namely Jincheng and Maxwell. So here also few European suppliers should be evaluated e.g., Von Ardenne and H2Gemini from Germany.

In case of Polysilicon and Ingot/wafer plants, situation is worse. Only few Chinese suppliers are ruling the complete world market. European suppliers are very few and unaffordable. So Korean and Japanese suppliers should be looked into.

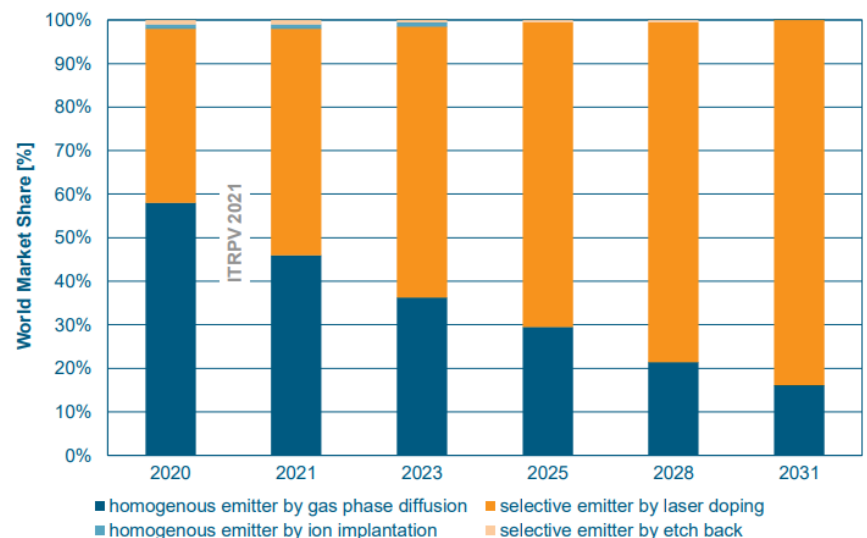
Idea here is to flag the issue for the investors in India in PV sector and evolve their strategies accordingly.

LASER-DOPED SELECTIVE EMITTER

Today Passivated Emitter and Rear Cell (PERC) technology has become the industry standard for mono-crystalline silicon solar cells. As the name suggest these mono cells are passivated on both emitter and rear (back) sides compared to earlier mono cells which used to be passivated only on emitter side. Emitter side is passivated by silicon nitride and rear side is passivated by aluminium oxide and silicon nitride stack. Passivation of open silicon surfaces or metal contacted surfaces is required to reduce the recombination of carriers. This increases the efficiency of cells. Once the passivation technology for the rear was perfected and implemented, emitter side passivation was not found adequate hence the need to improve performance on emitter side arose and a previously tried selective emitter technology was brought in. This technology creates two types of resistive areas on the emitter side in place of uniform resistive emitter, a low resistive area where metal contacts are made (silver fingers), other a high resistive area which absorbs the radiation and is not covered by metal. Earlier when rear passivation was not perfected, selective emitter technology could not bring in required benefits vis-à-vis the processes cost and complexity.

Later this technology has been perfected with laser doping on the emitter side on selected areas to create the emitter and contact areas separately. First a high resistive area is diffused and then on selected areas, doping is modified by laser. In state-of-the-art PERC technology laser-doped selective emitter has, therefore, become an integral part.

Different phosphorous emitter technologies for p-type cells



SOURCE: ITRPV

Dr. D.N. Singh

CEO

Bergen Solar Power & Energy Ltd.

NEWS UPDATE

Applications open for Indian solar manufacturing incentive scheme

The Indian Renewable Energy Development Agency has invited applications for incentives from solar manufacturers prepared to set up high-efficiency module factories under an INR4500 crore (\$618 million) production-linked incentive scheme. Manufacturers setting up any solar technology-based production facilities will be eligible for assistance, provided they commit to develop facilities which manufacture at least solar cells and modules; meet a minimum level of production capacity; and adhere to minimum standards for solar module performance. The latter requirement sets standards for module efficiency and level of temperature coefficient of Pmax - which concerns the amount of power generation lost for every degree Celsius a panel is above 25 degrees Celsius.

Say Goodbye To 2020's Low Solar Bids, As Price Hikes Continue In Modules, Cells

The record low prices last seen in GUVNL's 500 MW auction, when NTPC won with a bid of Rs 1.99/ unit, may be a distant memory as solar equipment prices continue their upward march in 2021.

Those low prices in the last big auction of 2020, blamed on NTPC flexing muscle and projections of a continuous drop in costs, are already looking much more risky than even the most skeptical analysts projected.

Depending on who you speak to, the landed cost of cells and modules from China is already 18-22 percent higher in 2021, for deliveries in October and beyond this year. With no sign of abatement, thanks to a series of incidents as well as spike in demand from across the world. Especially China itself.

- India achieved the highest score of 62.7 for solar in the latest edition of Ernst & Young's renewables attractiveness index. It ranked third for overall renewable energy investment.

- Uncertainty Surrounds the Fate of Solar Safeguard Duty After July 2021

The crucial duty of protecting domestic solar cell and module manufacturers in India against imports from China PR, Thailand, and Vietnam is set to end on July 29, 2021. Until the basic customs duty starts from April 1, 2022, a nine-month no-duty period has the manufacturers concerned. The project developers are keen on utilizing this rare duty-free period to ramp up their module procurement.

- Goldi Solar supplies 24+ MW modules to a textile client

The Surat-based solar manufacturer has completed the supply of an aggregate 71,690 quantity of 335Wp polycrystalline solar panels to a textile company LS Mills.

NEWS UPDATE

PLI Scheme for Battery Storage Will Lower Cost of EVs in India: SMEV

The Society of Manufacturers of Electric Vehicles (SMEV) has said that the production linked incentive (PLI) scheme for promoting battery storage will lead to the reduction of cost on purchase of electric vehicles (EVs) thereby accelerating accessibility and adoption of greener vehicles in the country. Welcoming the government's approval of the PLI scheme for promoting battery storage at an estimated outlay of Rs 18,100 crore, SMEV also said it will attract huge investments in the EV industry in the next 1-2 years.

Uttar Pradesh tenders 106 MW of solar under KUSUM program

UPNEDA has invited bids for the selection of solar power generators to set up decentralized, ground-mounted grid-connected solar power plants aggregating to a 106 MW capacity under Pradhan Mantri Kisan Urja Suraksha evam Utthan Mahabhiyan (PM KUSUM) Scheme.

The plants—in sizes of 0.5 MW, 1 MW, 1.5 MW, and 2 MW (AC)—are to be set up on a 'build-own-operate basis in the Indian state of Uttar Pradesh. These shall come upon farmers' barren or agricultural lands, pasturelands, and marshlands falling within a 5 km radius from the identified 24 numbers of 33/11kV substations of the four state Discoms.

Bids Invited for 5 MW of Rooftop Solar Projects on Government Buildings in Punjab

• String Inverters for Optimizing Commercial Rooftop Solar Installations

With cutting-edge innovations driving the solar space, technologically advanced string inverters are fast gaining popularity among solar developers. Although inverters account for 5% of the total project cost, they become key contributors while factoring in project performance, stability, and the levelized cost of energy. So, quality and technology play a substantial role. In the past two years, string inverters have been steadily catching up with the conventional central inverters, which have until now been the go-to solution for solar projects. Even though string inverters are slowly making their way in India, the trend in recent years shows that they are being received well by stakeholders. String inverters are fast capturing the solar installations market – in both utility-scale and rooftop – making up 49% of the inverter market in India in 2020.

• Stable, Conducive Policies and Low-Cost Finance Critical to Scale Rooftop Solar

Panelists ask the government to frame a three-year policy instead of a yearly policy to help the business grow

NEWS UPDATE

Panasonic combines hydrogen fuel cell generators with PV and storage

Japanese electronics manufacturer Panasonic is building a pilot hydrogen plant combined with photovoltaics and storage at its fuel cell factory in Kusatsu, Shiga Prefecture, in central Japan. The plant is described as an “in-house” system relying on hydrogen fuel cell generators with a combined capacity of 500 kW, a 570 kW solar array, and lithium-ion batteries with an aggregate storage capacity of approximately 1.1 MWh. “The power generated with this system supplies the entire power used in manufacturing departments of the fuel cell factory located within the Kusatsu site

Solar-plus-storage to produce hydrogen from seawater.

The plant will produce hydrogen from seawater and will be powered by a 30 MW solar plant and a 20 MWh storage system with an autonomy of 4 hours.

The facility will be based on double-reverse osmosis treatment with energy recovery followed by electrolysis of deionized water through proton exchange membrane (PEM). Furthermore, secondary electrolysis of concentrated brine will be implemented by cell membrane electrolysis.

The main electrolyzer at the facility will have an installed capacity of 20 MW and an estimated production of 1,000 tons per year. The produced fuel will be then stored in trucks for pressurized gas at 400 bar pressure.

• Court Tells Government to Consider Including Hydrogen Fuel Cells Under FAME-II Program

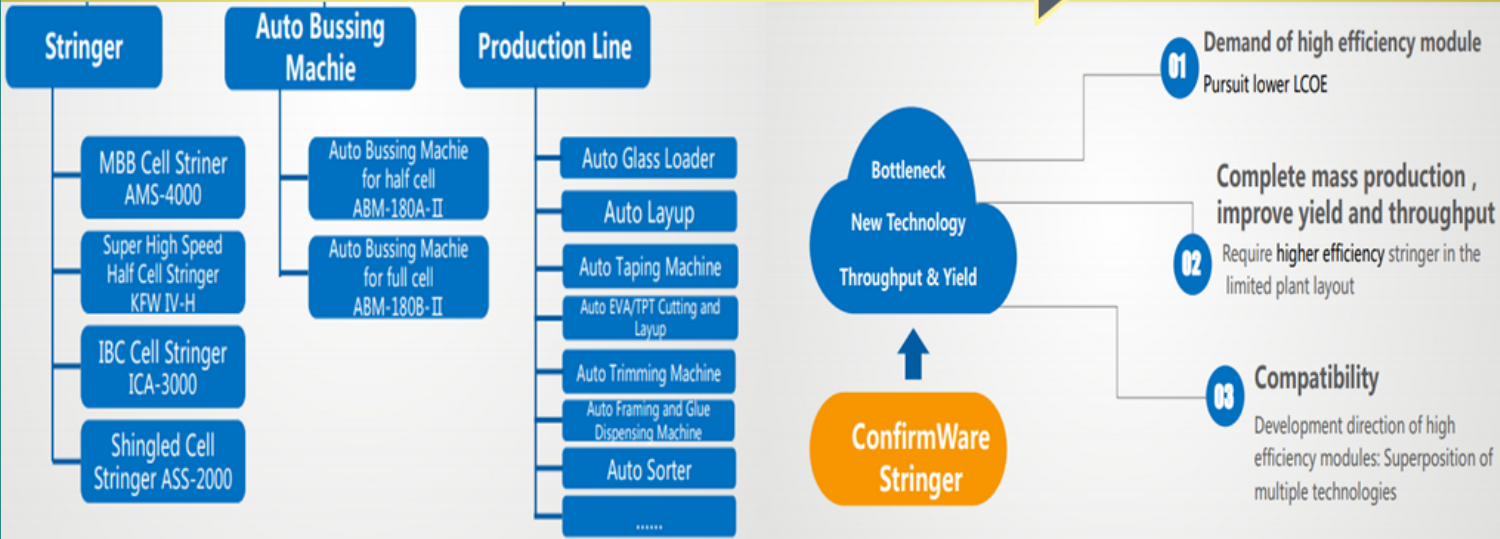
The Delhi High Court has directed the Government of India to consider including hydrogen fuel cell-based electric vehicles (EVs) and hydrogen refueling stations under the ambit of the Faster Adoption and Manufacturing of Electric Vehicles (FAME-II) program. The FAME II program aims to encourage domestic manufacturing and create a market for EVs in the country and reduce the dependence on internal combustion engine vehicles and foster alternative fuels' growth.

The government launched the FAME program to push for early adoption and market creation for both hybrids and EVs. Later, the central government approved a subsidy of ₹55 billion (~\$756.3 million) to be disbursed under the FAME program's second phase. In March 2019, the Union Cabinet approved the proposal to implement the second phase of the program to promote electric mobility in the country.

• First Solar & Nel Hydrogen to develop integrated PV-hydrogen power plants.

First Solar and Nel Hydrogen Electrolyser AS have announced they will collaborate to develop power plant control and other supervisory systems as part of a broader plan to build integrated photovoltaic-hydrogen power plants.

Module Line Technology Update



AUTO LAYUP MACHINE

UPDATE

Module Technology



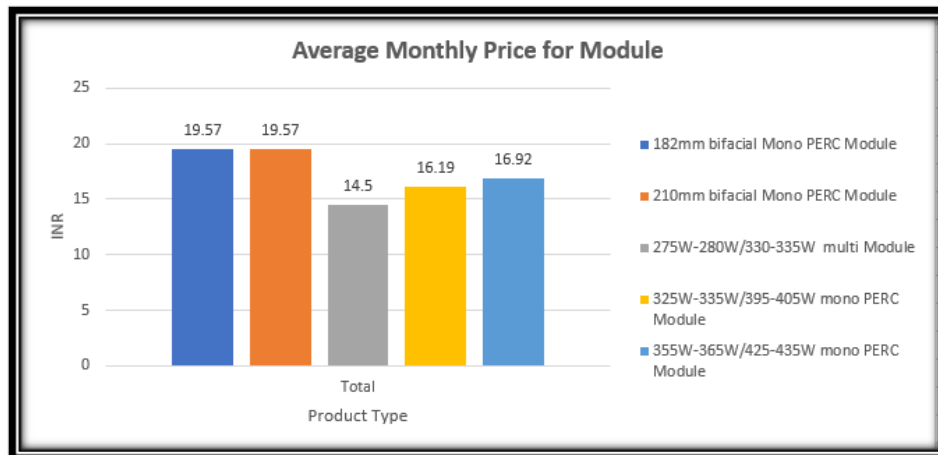
1. Cycle : $\leq 10s/string$
2. Optical positioning, Positioning accuracy $\leq \pm 0.3mm$
3. Applicable module :
Full cell : 10cells*6strings/12cells*6strings,13cells*6strings ;
Half cell : 10cells*12strings/12cells*12strings , 13cells*12strings
4. Yield $\geq 99.8\%$
5. Sucker is made from imported polyurethane material, trace free for cell strings.
6. The suction jig is equipped with vacuum detection to avoid dropping during grabbing cells.
7. Easily lay up different size of cell strings by changing sucker rod and setting on the program
8. Integrated with equipments of any other brands

Note: BERGEN SOLAR POWER & ENERGY LIMITED IS THE SOLE REPRESENTER OF CONFIRMWARE FOR INDIA.

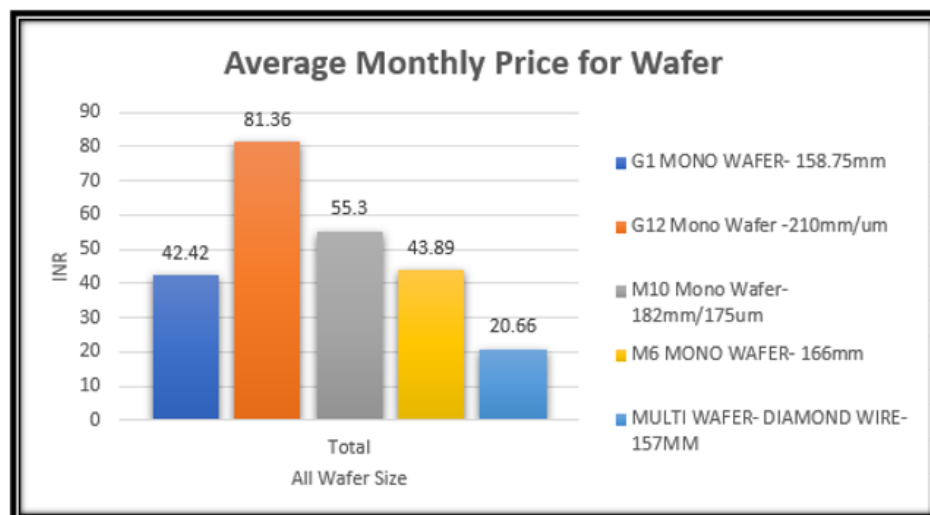
MARKET ANALYSIS

PRICE UPDATE

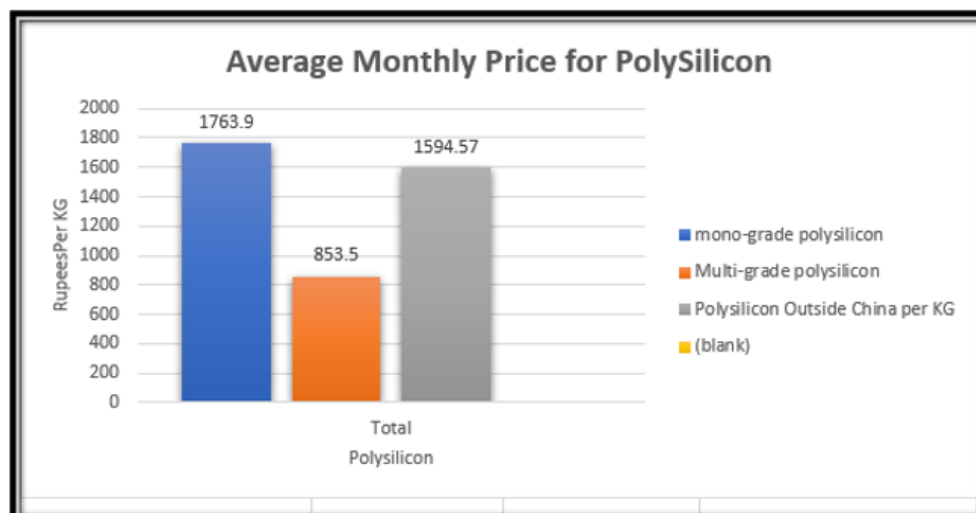
- **Module Spot Price Update- Multi/Mono**



- **Wafer Spot Market Price Update- Multi SI/MonoG1M6**



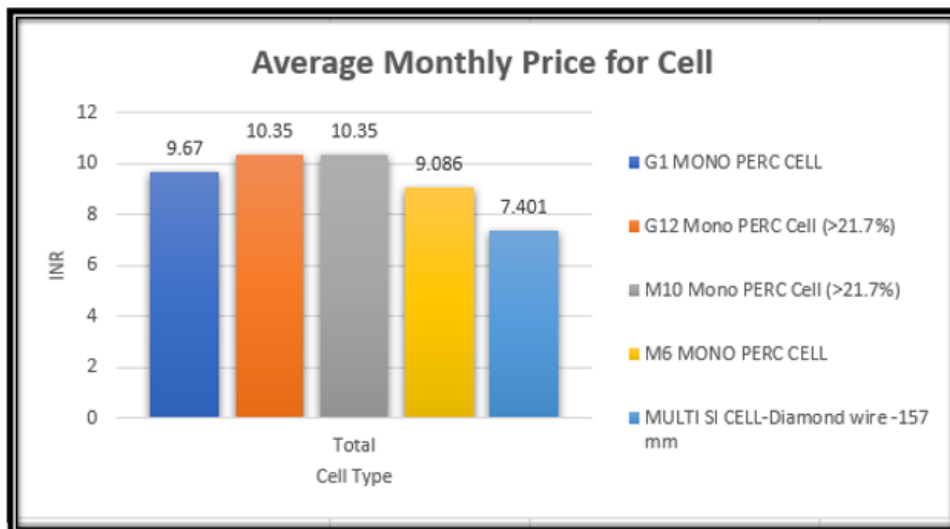
- **Polysilicon Spot Price Update-Virgin poly (spot, contract)/Granular**



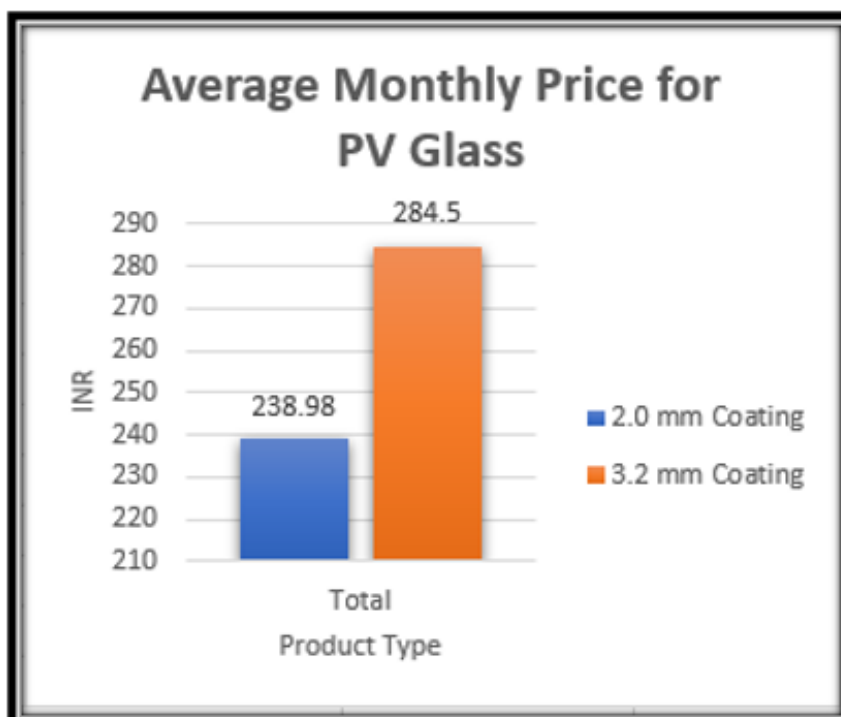
MARKET ANALYSIS

PRICE UPDATE

- Average Monthly price for CELL



- Average Monthly price for PV Glass



EDITORIAL TEAM



Rajinder Kumar Kaura
CMD

With nearly 43 years of contributions in conventional and non conventional power & electronics field, he is pioneer and pathfinder in developing solar & electronic industry in India. His contributions in bridging the gap in standards of living between rural and urban population through generation of solar power and skill development has earned him tremendous respect and recognition by countries like Norway, Japan, Germany, etc besides State and Central organizations.



Dr. D.N. Singh
CEO

Dr. D.N. Singh is a one of the most prominent leaders in solar PV and Semiconductor technology and widely known professional in India and abroad. He has a total of 46 years of experience in Industries, research and academia. He has published over 40 research papers in international and national journals. He has been invited speaker at PV Cell Tech and PV Module tech international conferences. Dr. Singh is Vice-President of Microelectronic Society of India, member IEEE and member of National Nano-Technology working group.



Dronveer Kaura
Director

After completion of academics from The OHIO State University, US, he returned to India to share the knowledge gained in his academic and serve the nation. He founded and engaged himself and his team in Industrial Automation Projects to follow industry 4.0 standard and keep India intact and way forward in the state of art technology of Automation. Under his guidance and knowledge sharing, we could develop a efficient solution for Robot Automation in the field of automobile to boost per day production. He is currently pursuing Phd in Hydrogen Fuels & Technology.



S.K. Kaul
Vice President

Having more than 20 years of experience in the field of Manufacturing, Operation, Material Management & Factory Administration. and looking after complete solutions & supply of Capital Equipment, Technology for the manufacturing of Printed Circuit Boards, Electronic assemblies, Photovoltaic Cell & Photovoltaic Modules and undertaking the turnkey installation of the solar based power projects.