

TURNKEY SOLUTION : On Grid/Off Grid/Hybrid Solar Plant.

As an EPC company and system integrator, the services we provide are:

- Consultation
- Site Assessment and Solar Analysis
- System design
- Supply, Installation, Testing and Commissioning (SITC) of system components
- Integration Services
- Erection and Laying of Transmission Lines
- Operation and Maintenance

We are supported by a highly talented team and few of the most reputed global organizations in solar industry. The solar feasibility study along with training and design is supported by Global Sustainability Energy Solutions, Australia (GSES).

We work in a vertically integrated end to end engineering process which results in plant layouts with their possible yield / investment ratio. We believe in procurement of the most efficient components from different vendor companies to provide our customers with most advanced and reliable systems.

Our technological alliances allow us to guarantee a comprehensive performance ratio to secure your investment and your cash-flow. As a turnkey provider, we are the right partners to handle whatever is necessary for the efficient erection and operation of solar power PV plants.

In a solar plant, the efficiency and the profitability relies on both performance of its single parts but also proper matching and compatibility between the components. We will ensure that the plant is properly designed and commissioned for maximum efficiency and profits.

The procurement is broadly divided into 4 stages:

- Procurement of SPV Modules
- Procurement of Inverters, Mounting structures and Balance of System (BOS)
- Procurement of power transmission and accessories and electrical panels
- Procurement of other project components

The scope of work usually includes:

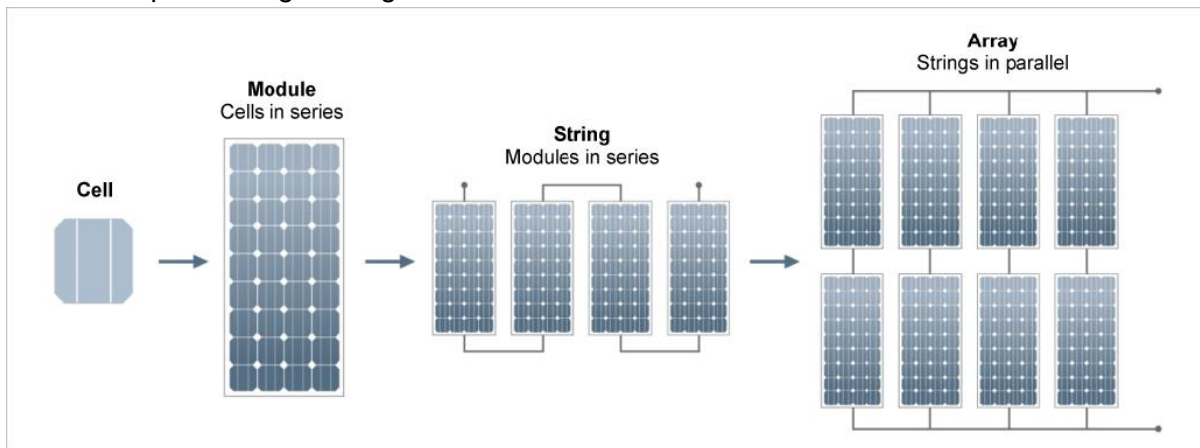
1. Designing of SPV plant and submission of drawings for client's approval.
2. Supply, installation & commissioning of all equipment's, including their transit insurance, packaging and freight. Taxes, if any, shall be extra.
3. Civil works including site leveling, foundation & grouting of structure, mounting of solar modules & machinery, trenching works for cables, cable trays etc.
4. Erection and installation of inverters, panels, distribution boards, energy meters etc associated with SPV plant.
5. Associated cabling and electrical works of solar plant.
6. Commissioning and trial run-out of solar plant.

SOLAR PV PLANT LEAD COMPONENTS

PV Modules

Each solar PV plant array capacity should not be less than the capacity of the same SPV Plant capacity. SPV array should comprise of solar polycrystalline modules. The Photovoltaic modules must be tested & approved by one of the IEC authorized test centers ,Test Certificates can be from any of the NABL / BIS accredited testing / calibration laborites the module type must be qualified as per IEC 61215(Second Edition). In addition PV modules must qualify to IEC 61730 Part I to II for safety qualification testing. The maker of PV modules should be registered channel partner with MNRE.The modules should be using polycrystalline silicon solar cells, anodized aluminum frame, high transmissivity tempered glass with output voltage of 24 Volts.

The module should have 90% performance warranty for 10 years and 80% performance warranty for 25 years. SPV module shall contain mono/poly crystalline high power silicon solar cells. The solar cell shall have surface anti-reflective coating to help to absorb more light in all weather conditions. The module should have glass to glass technology (front as well as back of module is with glass only) and have a transparent or color PVB filter and protection against moisture & provide high voltage electrical insulation.



Module Mounting Structure

Modules shall be mounted on a non-corrosive support structure suitable for site conditions (extreme site conditions are taken into account). Support structure design and foundation or fixation mounting arrangements shall withstand minimum horizontal wind speed relevant to site conditions.

- The array structure shall be hot dip galvanized mild steel. All nuts & bolts shall be of very good quality.
- The structures are tilted as per the tilt angle calculated after site assessment and shall be designed to allow easy replacement of any module.

- The structures are designed for simple mechanical and electrical installation. It shall support SPV modules at a given orientation, absorb and transfer the mechanical loads to the ground properly. There shall be no requirement of welding or complex machinery at site.
- **The array structures are so designed that it will occupy minimum space without sacrificing the output from SPV panels at the same time it will withstand wind speed up to maximum 150km/h.**
- The drawings along with detailed design shall be submitted for approval before starting the execution work. The work will be carried out as per design approved.





Solar Inverter

Solar string inverter designed for high efficiency and flexibility for any photovoltaic system installation shall be used with peak efficiencies of more than 98%. Flexibility of solar inverter allows the inverter to be configured with varied combinations of voltage and power outputs. In addition, the solar inverters are designed to allow for DC inputs and contain the latest grid management features to meet global utility scale requirements.

Full grid management features of solar inverters include voltage/frequency high and low ride through, reactive current support, VAR control, and frequency based active power control. A photovoltaic power plant system can be designed using a power conversion substation or with central inverters.

Using the optimized versions of the PV Box, customers can benefit from a reduction of the balance of systems cost, an increase of the reliability, and an improvement of construction lead times.



Cabling

DC Cable

Sizes of cables between modules to inverter shall be so selected to keep the voltage drop (power loss) of the entire power plant to the minimum.

The bright annealed 99.97% pure bare copper conductors that offer low conductor resistance are used in the power plant. They result in lower heating of the cable thereby increase in life of the cable and also reduction in Power Losses in the system. These cables are insulated with a

special grade PVC compound formulated for outdoor use. The skin coloration offers high insulation resistance and long life.

Solar Cables from Module to Inverter: 1C X 4Sq. mm XLPE Insulated Cu cables is flexible and are used with annealed electrolytic grade copper conductors. They are suitable for outdoor and for 1100VDC application.

ACCable

All AC cables from inverter to ACDB panels are PVC insulated copper cable and cables from ACDB panel to feeding point is PVC/XLPE insulated Al armored cable.

Cables from Inverter to ACDB: 3.5 C X 35 Sq. mm XLPE insulated Cu, armored cable.

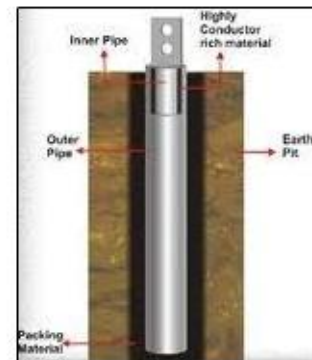
Cables from ACDB to Feeding Point (Existing Internal bus-bar): 3.5 C X 120/150 Sq. mm XLPE insulated Al armored cable.

Metering & Grid Connection

Inverter output is combined at ACDB panel The AC distribution boxes are dust and waterproof and made of Thermo plastic/GI. Distribution box shall have all protections as required with suitable arrangement for its connecting. The distribution box shall also have metering devices to calculate the total energy generation from the plant. The distribution boxes also have to provide for arrangement for disconnection it form main LT panel of building at 415V @50Hz. All protection used are of standard make with well known companies.

Earthing System

The first line of defense is to have an excellent grounding system with respect to all electrical outlets. Earthing is of utmost importance for safety of Human Life as well as animal life and also plant, equipment, property. All possible measures for protecting the system components will be incorporated.



Lightning Protection

SPV power plant is provided with lightning and over voltage protection connected to earth pits. The main aim of over voltage protection is to reduce the overvoltage to a tolerable level before it reaches the PV or other sub components. The



source of overvoltage can be lightning or other atmospheric disturbance. Lightning conductors used are earthed through flats and connected to earth pits as per applicable Indian standards. Each lightning conductor is fitted with individual earth pit as required.

SPV plant is protected with copper lightning arrester which protects the SPV plant from direct lightning strikes. Lightning arrester is installed in such a manner that whole module area is within the protection region of lightning arrester. Lightning arrester is properly earthed by Cu/Al Earthing, as per the standard IS3043.

WARRANTY

All equipment supplied by us shall carry original equipment warranty terms. Any warranty shall not be valid for any mishandling, abused wear and tear, sabotage/force majeure conditions.

- Solar PV Modules: Linear performance of 90% power output warranty for 10 years and 80% power output warranty for 25 years.
- Solar Inverters: 5 years, extendable at an extra cost, as actual.

ACCELERATED DEPRECIATION

Accelerated Depreciation (AD) refers to any one of several methods by which a company, for 'financial accounting' or tax purposes, depreciates a fixed asset in such a way that the amount of depreciation taken each year is higher during the earlier years of an asset's life.

The benefit of AD in solar power industry is used to incentivize the entrepreneurs to enter into the solar power generation. Section 32 of IT Act provides Accelerated Depreciation of 40% of the invested capital to professional companies with tax liability. Investors can thus, set off their tax liability on the taxable income to the tune of 40% in the first year of commissioning of Solar PV Plant, and subsequently balance of 60% in following year(s).

Any company involved in solar power generation can claim either AD or Generation Based Incentive (GBI) and not both of them together.

In simple words, if a company was paying Rs 33 as tax on a profit of Rs 100 earlier, the by installing a solar plant of Rs 100, it can claim a depreciation expense of Rs 40 (40%) in the first year, thus, reducing its profits for tax purposes to Rs 60.

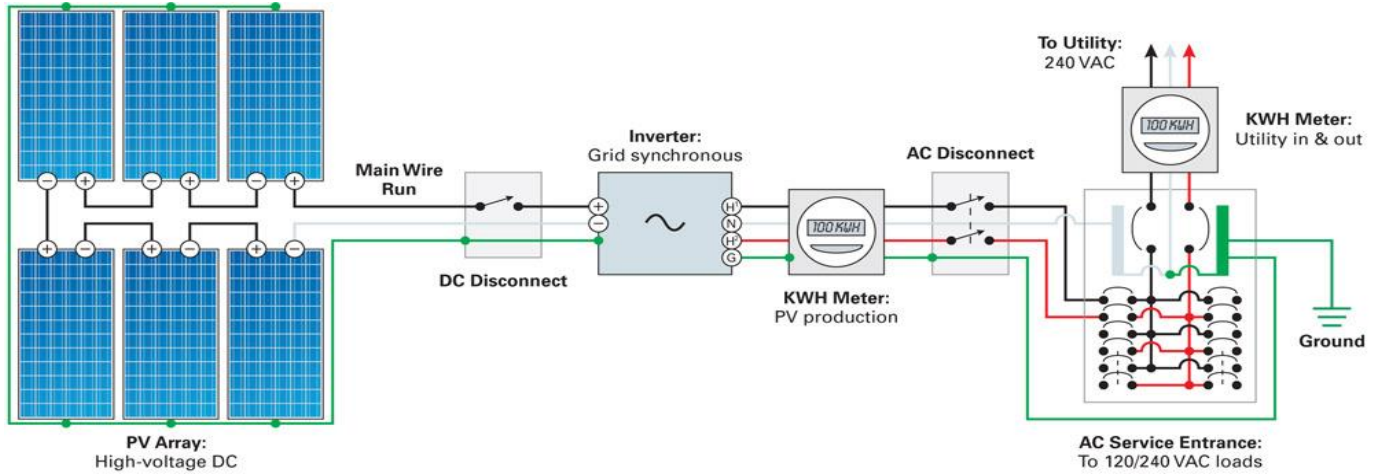
ELECTRICITY GENERATION : Example for 200Kwp rooftop plant

Capacity of SPV Plant	:	200kwp
Approximate yearly generation in 1 st year	:	1400 units/kWp

The generation can vary according to:

1. Season
 2. Operations and Maintenance
 3. Quality of equipment
 4. Plant Location (ideal location is South facing, no shades)
 5. Temperature
 6. Shade on panels
 7. Front surface soiling
 8. Central or scattered panels
 9. Distance between panels and feeder boxes
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Grid Interactive Solar PV System:



Single Line Diagram for Solar Plant

Roof Top Grid Interactive Solar Photovoltaic Power Plant of 200kWp capacity: