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## Solar Panel Cleaning Services

**PlasmaBerry Solar** is now a firmly established organisation in various areas of operations & Maintenance (O&M) for Solar systems. If you own or maintain a commercial solar panel array, you will no doubt be interested in reaping the largest financial reward from your array and seeing your ROI as soon as possible. PlasmaBerry Solar will help you to do just that. Having dirty solar panels can severely dent your ROI time. Clean solar panels result in more light hitting the solar cells resulting in more generation which in turn translates to more money, sooner.

We offer a complete solution for Solar Panel Cleaning. Our guaranteed **24-hour response time** ensures that your solar panels instantly increase their output.

If you offer an O&M package to your clients, PlasmaBerry Solar can work under your umbrella contract and offer Panel Cleaning as an outsourced service to your customer.

We offer services to Residential, Commercial outfits as well as to large solar farms. PlasmaBerry Solar, provide an option for manual, automated and mechanized cleaning, on ground mounted solar farms and rooftop solar arrays.

We can clean solar panels up to 50ft away from where our cleaning operative is stood. In many instances, we use the cherry picker to reach the guttering level and clean the solar panels from there

### Salient features of our services

- Pan India delivery of services
- Trained Manpower
- A Fully Insured service
- Manual / Semiautomatic / Automatic cleaning technique
- Visual inspection of panels included
- Consultancy advice on frequency of cleaning
- Cleaning for Bungalows, Factories rooftops and ground mounted solar parks and farms

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## Methodology of cleaning

We use various options for solar panel cleaning, right from manual to Semi-automatic to robotic systems depending upon the site, array outlay and environmental conditions. However, all of these systems come at an expensive premium, so the best tried and tested method is regular manual solar panel cleaning. Our various cleaning methods are

1. **Manual** – We have tools to clean panel 10 meter farther using telescopic mop adjoined with purified water spray.
2. **Semi-Automatic** – We use semiautomatic buffing machines with water spray arrangement where physical reach would not be possible
3. **Automatic** – For the large panel arrays like solar farm we use robots to clean series of panel strings.
4. **Cleaning Solution** – We use soap concentrate which is specifically formulated for use in water systems and ensure that correct amount of soap is applied to the panels. Our soap concentrate is designed to clean solar panels without any damage to the solar panels, frames, or roofing materials. The concentrate formula is biodegradable.

## Why customer prefer us as their Solar Panel Cleaning partner

1. We are extremely conscious of the fragility of solar panels. Hence we avoid walking over the solar panel any point in time.
2. We work with customer suitable time. Often commercial houses need to be serviced on the weekends or at night to avoid disrupting their day to day activities.
3. A clean solar panel is more productive. Our solar panel cleaning technology will leave the solar panels clean for up to ten times longer than the methods used by other companies.
4. We have adopted all types of cleaning techniques right from manual to semi-automatic to Robotic.
5. Our cleaning methods for commercial systems are different from our residential methods. As each system has it's own set of challenges our cleaning methods are adapted to meet those needs

## Basic Services

	Type of Service	Purpose
1	Deep Cleaning Service (DC)	This is done once in the beginning followed by series of Soft cleaning services
2	Water Splash Service (WS)	This service is done as a follow-up service to Anti Dust Shield ( ADS) serviced solar panels. This service is not delivered independently.
3	Soft Cleaning Service(SC)	This service is done either as a follow-up service to deep cleaning or in isolation provided the location is not in industrial zone.
4	Anti- Dust Shielding (ADS) Service	This service is done so that cleaning frequency is drastically reduced. Ideally it is followed by water cleaning service.

While above services are mentioned as basic service, for your kind information, it is suggested not to be performed them in isolation ( one time ). To get desired results, it is suggested to selected annual service Plans . Annual service Plans is the configuration ( combination ) of suitable services as per your need to keep your solar generation optimum. Please find few most demanded service Plans for your kind information.

### Annual Service Plans - Residential

Service Plans	Service Configuration	Suggested Environment
Basic	1-DC+3-SC	Within City
Silver	1-ADS+1-WS	Near Dusty main road
Gold	1-ADS+3-WS	Near Industrial Zone
Platinum	1-ADS+1-HC+3-WS	deep dusty panel in Industrial Zone

### Annual Service Plans – Factory & corporate houses

Service Plans	Service Configuration	Suggested Environment
Basic	1-DC+5-SC	Within City Locality
Silver	1-DC+11-SC	Dry Dusty farm road
Gold	1-ADS+11-WS	Industrial Zone
Platinum	1-ADS+1-DC+11-WS	Chemical Industrial Zone

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## Panel Cleaning Services based customer requirements.

### A. Residential Solar Panel Cleaning

Solar panels are becoming ever more popular in all metro cities of India. Rarely you are told that Solar plant requires regular solar panel cleaning services, but here you are 6 months down the line only producing 75% of what you were generating when the panels were first installed.

Most of the cities in India are dust prone due to various development work that goes on. The dust could be due to air particles, Bird shit, rain drops etc. This dust gets accumulated on the solar panel and reduces the output. If this dust is not cleaned at regular frequency, the same gets pasted strongly creating thicker layer, further reducing the panel output. The solution to this problem is a good cleaning. There 2 questions that comes to owner's mind....

#### 1. Who should do the cleaning?

Normally owners get on a ladder and hose the panels down but this is not good for a number of reasons. The panels normally need a good scrubbing, this could damage the panels. Further, it could also leave mineral deposits on the panels. This white layer reflects the Sun's rays back thus drastically lowering the panel output.

#### 2. How should it be cleaned?

We clean solar panels with special cleaning material with soft bristle brushes that does not scratch the surface glass, followed by splash of soft water. We can clean solar panels on bungalows and houses with our latest solar panel cleaning equipment. With poles that reach up to 60ft, we can reach solar panels that even have obstructions such as ground floor extensions.

### B. Solar Panel Cleaning for Commercial houses

Commercial houses like factory roof tops are prone to different kind of dust that gets created out of air namely, effluents from chimneys of chemical / rubber/textile industries. More often the environment has high level of Carbon and Ammonia which along with water particles creates the sticky paste which engulfs the solar panel. This pulls down the solar plant power generation dramatically.

We have top of the range solar panel cleaning solutions that deals with chemical dust to clean solar panels on a professional basis. We have also mastered technique of working on factory high roofs safely and without the need to walk around on your roof. We use organic & biodegradable solutions to clean the solar Panels.

Our capabilities of working on off hours helps customer losing their production time during Solar Panel cleaning session.

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## C. Solar Farm Maintenance

The techniques used for cleaning solar panels in Solar Farms or Utility scale are far different from Commercial houses, due scale of arrays and type of the challenges that exist.

We offer solution various challenges by deploying special category cleaning machines like water splashing vans, waterless robotic cleaner, telescopic mops supported by trained manpower.

### **Water based , Automated Solar Panel Cleaning**

- Extremely fast; 5 seconds per meter
- Super efficient against all kinds of dirt and dust.
- Light weighted for mobile purposes.
- Most importantly - more affordable than any cleaning solution in the global market.

Customer need to invest in one Robot and an operator, to handle an entire solar field, no matter the size. Simply move the light weighted, portable robot from one panel row to the next. The more robots customer owns, the faster it will complete cleaning cycles. It can be operated either with several water infrastructure spots, or with a mobile water tank. These robots can be custom made, to fit customer PV panels dimensions.

#### **Technical Features**

- Water consumption is between 0.6-1.0 litter per square meter.
- The robot is supplied with integrated battery.
- Warranty time is 500 working hours or 12 months.
- Free Training to operating team

### **Waterless, Automated Solar Panel Cleaning**

The Solar frames where the ambience is dry and faces least monsoon with scarcity of waterfront like deserts, waterless robots can be used

#### **Features**

- Portable
- Length of Array can handle upto 300 m
- Cleaning Speed 0.25 m/s
- Solar Charged ( No electric supply required)
- Dry Cleaning method of cleaning
- Adaptable to type of solar frames

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#### **D. Anti Dust Shielding ( ADS) Treatment**

Anti Dust Shielding ( ADS) treatment is a proactive technique to keep solar panels clean even in the dusty environment. Under ADS, clean solar panel is applied layer of solution which does not allow environmental dust (even chemical particles, bird shitting, debris) to stick on the panel. Any type of dust can be cleaned even with or without using water. The ADS treatment is best suited for environmental conditions where Carbon or Ammonia components are high, like chemical / rubber/ textile industries. Following are the salient features of ADS:

1. ADS treated panels resist buildup of dust, dirt due to bird shit, sand abrasion & Carbon particles
2. Easy to clean as water rolls off the surface
3. UV-Stable, resistant to abrasion, stable at various temperatures
4. Simple application technique, cures at atmospheric temperature
5. Biologically safe and ecologically beneficial
6. Very effective in salt and Ammonia prone environment
7. Reduces panel cleaning cycles
8. Improved power output
9. 1 to 2 Years guarantee depending upon environmental conditions

#### **Third Party Outsourcing**

We offer outsourced solar panel cleaning services to Operations & Maintenance ( O&M) partners to for their customers. We work under the supervisory of O&M contractor and deliver committed services as per Service Level Agreement (SLA).

## FREQUENTLY ASKED QUESTIONS

### A. WHY CLEAN THE SOLAR PANELS?

Airborne dust particles, sticky tree and plant sap, lichen, soot and bird droppings are just a few of the things that can contribute to a build-up of dirt on your panels. Accumulation creates shading and therefore will prevent sunlight reaching the cells. This results in poor system performance, loss of efficiency and a loss of financial return for the owner and investor of solar energy.

#### Dirty Solar Panels

- Lose efficiency and lifespan
- Reduce overall system performance
- Will leave permanent staining on the panels
- See a loss of return (R.O.I)
- Affect your limited warranty

### B. HOW MUCH ELECTRICITY DO DIRTY SOLAR PANELS LOSE?

Pollution, traffic dust, leaves and even bird droppings contribute to preventing sunlight from reaching the solar cells in your solar panels. From various analysis it is observed dirty solar panels don't produce as much power as clean panels. The loss may range as high as 20-50% in highly affected environments. Loss off energy production can mean a higher bill from your DISCOM if your panels can't produce enough electricity to keep up with your usage

### C. HOW OFTEN SHOULD THE PANEL BE CLEANED?

Every solar array is unique and depending upon different environmental factors, the recommended frequency of each clean will vary. Special attention should be given to panels situated in dustier areas. The possible cleaning frequency could be as follows

	Environmental Conditions	Frequency of solar panel cleaning
1	Near Main Road or Farmland	Once in a month
2	Residential place	Once in a six month
3	Factories in Chemical/Rubber/Textile Industry	Once in a month
4	Solar Farms in Agricultural area	Once in month
5	ADS treated Solar Panels	Cleaning frequency is halved

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#### *White paper on PlasmaBerry Panel Cleaning Services (Confidential)*

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***White paper on PlasmaBerry Panel Cleaning Services (Confidential)***

PlasmaBerry Solar Pvt Ltd 301-B, Royale Arcade, Ramakrishna Mandir Road, Kondivita, Andheri (E), Mumbai-59.

Ph No. 7718800749 [www.PlasmaBerry.com](http://www.PlasmaBerry.com). CIN No – U74999MH2017PTC298922