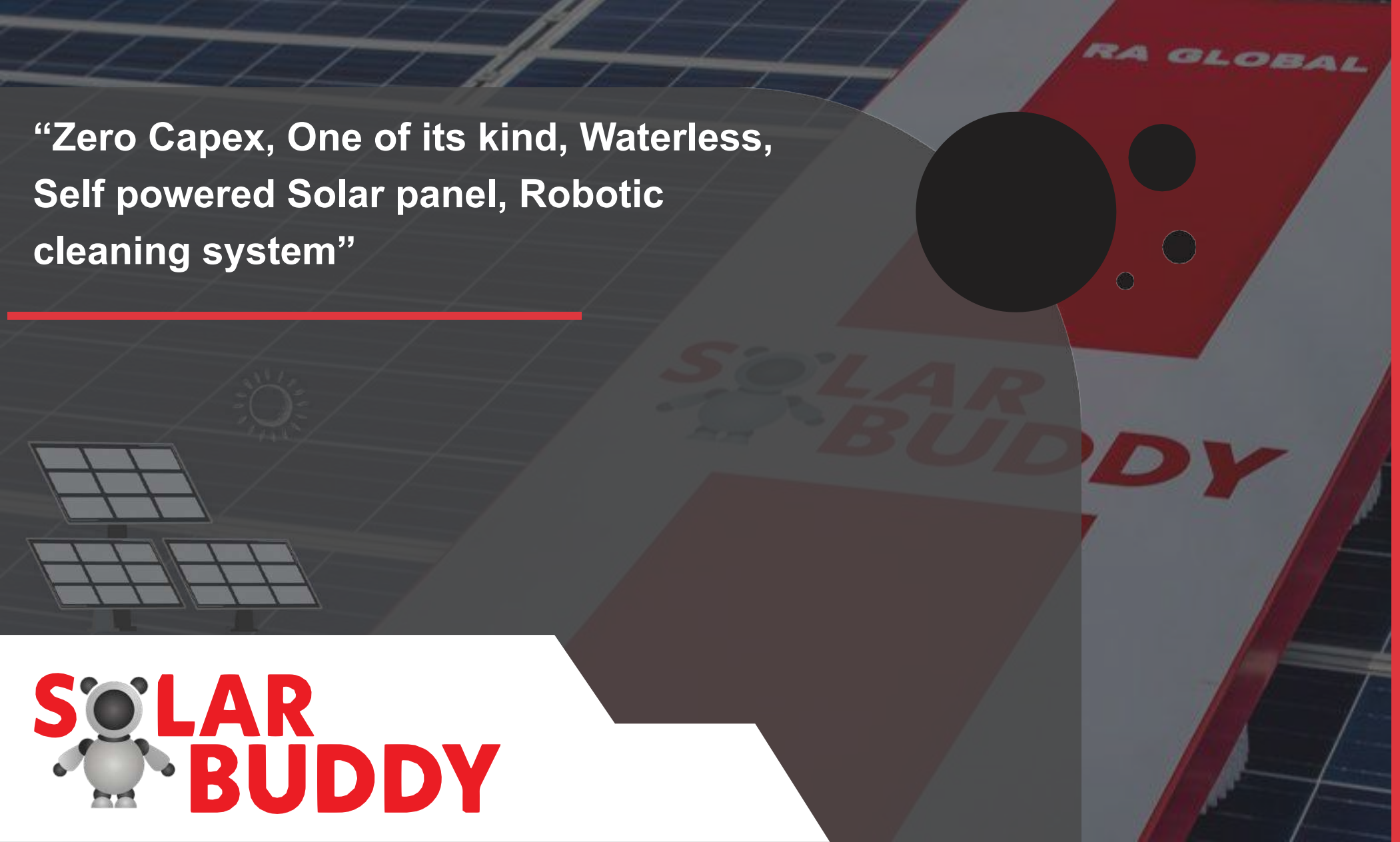


“Zero Capex, One of its kind, Waterless, Self powered Solar panel, Robotic cleaning system”

SOLAR BUDDY

The Problem

Loss of Power Due to Improper Cleaning..

Dust, debris, bird droppings or dead insects, all of these ultimately act as obstructions to sunlight and leads to loss of power, reduces panel efficiency and causes permanent damage by way of hot-spots to the investments

Annual losses caused due to soiling ranges from **1.5% to 6.2%** depending on the location of the solar site[1]

SOLAR BUDDY

1) https://www.sciencedirect.com/science/article/pii/S1364032116000745#:~:text=The%20conclusion%20was%20this%20study,location%20of%20the%20PV%20plant

Leading To Losses For Solar Sites

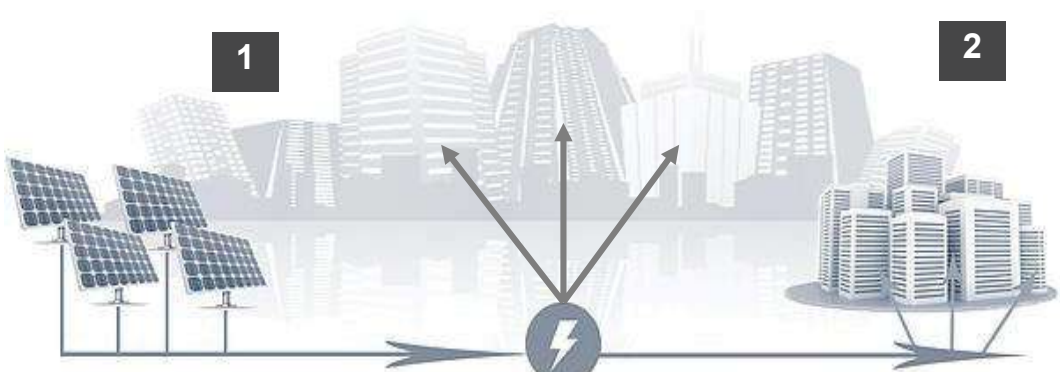
It is estimated that soiling reduced solar energy production by around 3-4% globally in 2018, causing revenue losses of ~INR 270 billion [2]

- 1 MW of solar plant produces around ~20,00,000 units of power, which is sold at ~INR2.5/unit[1].
- Soiling effect reduces power generation by 5% and leading to losses of ~INR 2,50,000 per annum per MW to solar parks

How do solar parks make money?

Sale of Power to state power generation or distribution companies or large central power entities like NTPC

Sale of Power to Private Companies



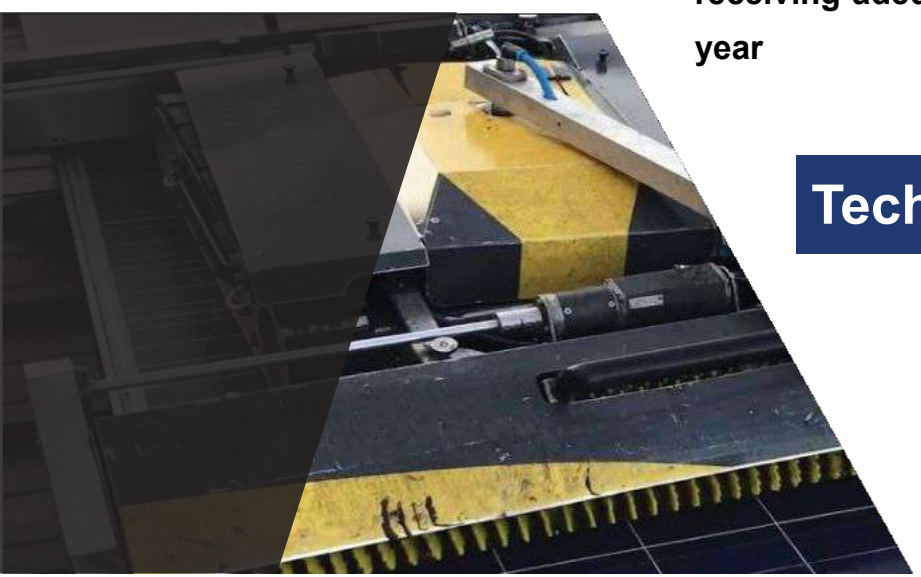
SOLAR BUDDY

(1) https://economictimes.indiatimes.com/industry/energy/power/solar-power-tariff-drops-to-historic-low-at-rs-2-44-per-unit/articleshow/58649942.cms?from=mdr

Current Cleaning Solutions

Traditional Method

- Manually by the solar park owners using scarce water resources
- Rainfall but this is only limited to areas receiving adequate rainfall throughout the year



Tech Enabled Cleaning

- Robotic Systems are gaining traction

SOLAR BUDDY

The Current Methods Are Not Efficient…

Lack of adequate rainfall
If the region is dry, cleaning by rain is not enough to remove all the dirt

Water Scarcity
India is suffering from the worst water crisis 600 million Indians face high to extreme water stress [1]

Human Intervention
Finding the labour or dealing with labour unions is a tedious task

Building Infrastructure
Water pumps, electricity lines and water pipes to be installed and maintained.

TRADITIONAL

ROBOTIC

Costly
The capex, operating and maintaining cost of robotic systems is prohibitively expensive

Inefficient
Per Robot cleaning capacity is quite low which ultimately surges the upfront investment

Failure to detect hotspots
Robots fail to detect hot spots caused due to surface fouling, mechanical damage like broken glass, etc

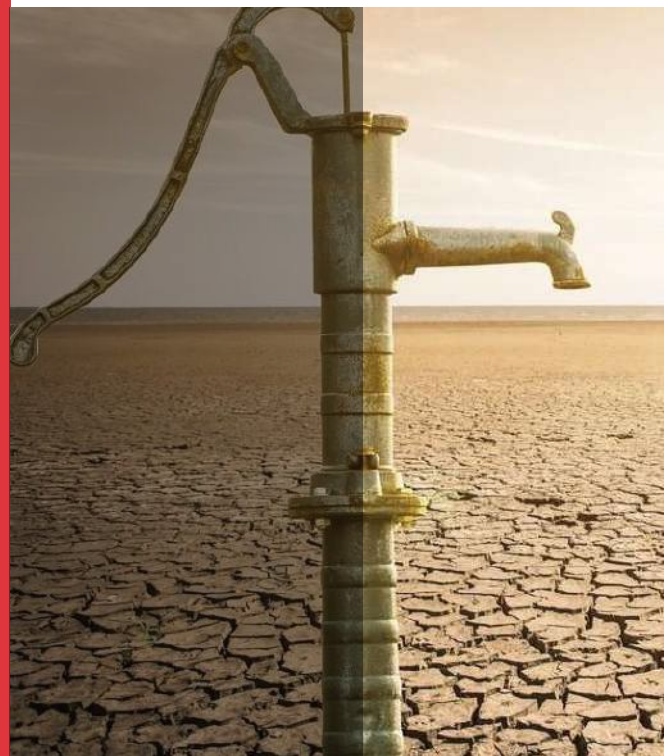
Power Requirement
Majority of the robots are not self powered and need energy backup to operate, thus additional power cost need to be incurred

SOLAR BUDDY

1) NITI Aayog Repo

…And Have Some Serious Implications On Our Society As Well

As per Niti Aayog , we are facing “the worst water crisis” in India’s history



2,00,000[1]

People die every year due to inadequate access to safe water

2X

The country’s water demand is projected to be twice the available supply by 2030

75%

Households do not have clean drinking water

40%[1]

Indian population will have no access to drinking water by 2030

Council on Energy, Environment & Water (CEEW) “
20,000 litres per MW per wash used, where panels are cleaned weekly”

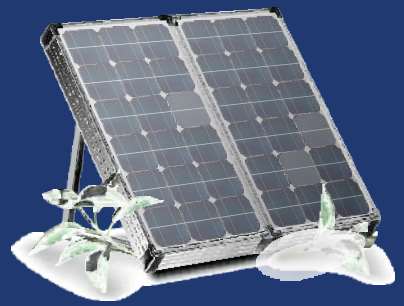
With a target to reach **500 GW by 2030** India will have additional water requirement of **171 Crore[2] litres of water per week,** which could pose a severe constraint to energy supplies and solar expansion in India

Introducing

SOLAR BUDDY

- RA Global's Solar Buddy is a self powered, optimized, automatic photovoltaic system cleaner that prevents micro scratches, detects hotspots and helps in reducing power loss due to soiling

- Solar Buddy uses spindle brush technology to ensure no harm is done to solar panels and to convert maximum sunlight into useful energy



Parent Company	RA Global Renewable Energy Pvt Ltd
Founded	2016
Headquarters	Bengaluru, India
Brand Name	Solar Buddy
Immediate Target Market	Solar Energy Industry
Website	www.solarbuddy.co.in
Patents	Under Process

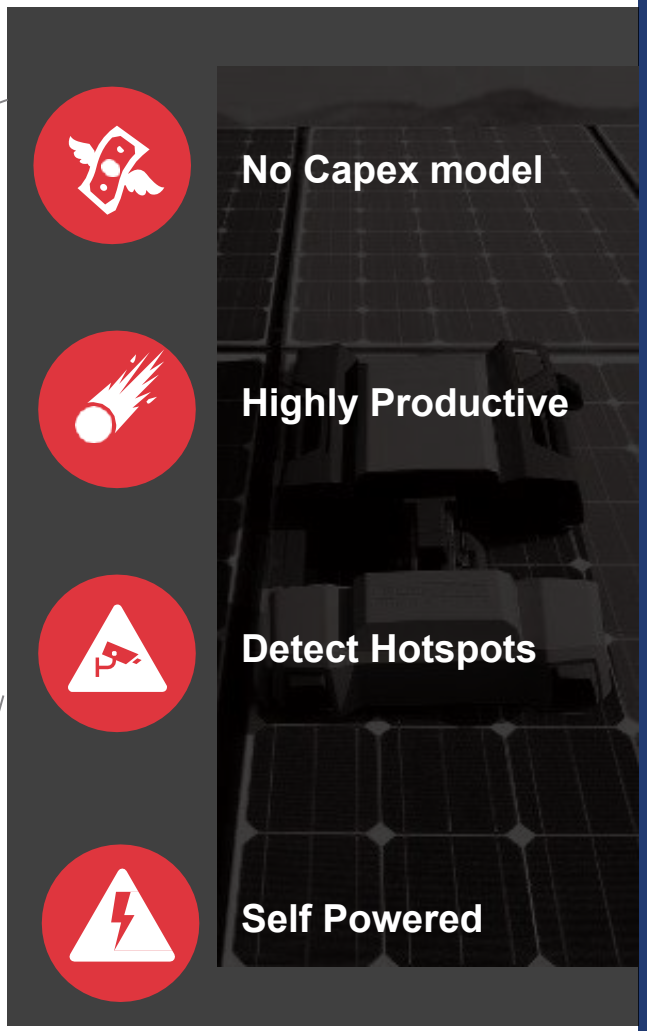
The Product

- Waterless Cleaning
- Zero Capital Investment
- Yearly Cleaning Contracts
- Patented & Copyright
- All Weather Cleaning
- Extends life of Solar Panels
- Automatic Track Changing
- Moisture & Rain Speed Detection
- Auto adjust in case of storm or structural defect
- Remotely operated through Application
- Artificially Intelligent

- Made in India
- In-house testing & training team
- Products Sourced Locally

How Are We Addressing The Gaps In Existing Robotic Solutions?

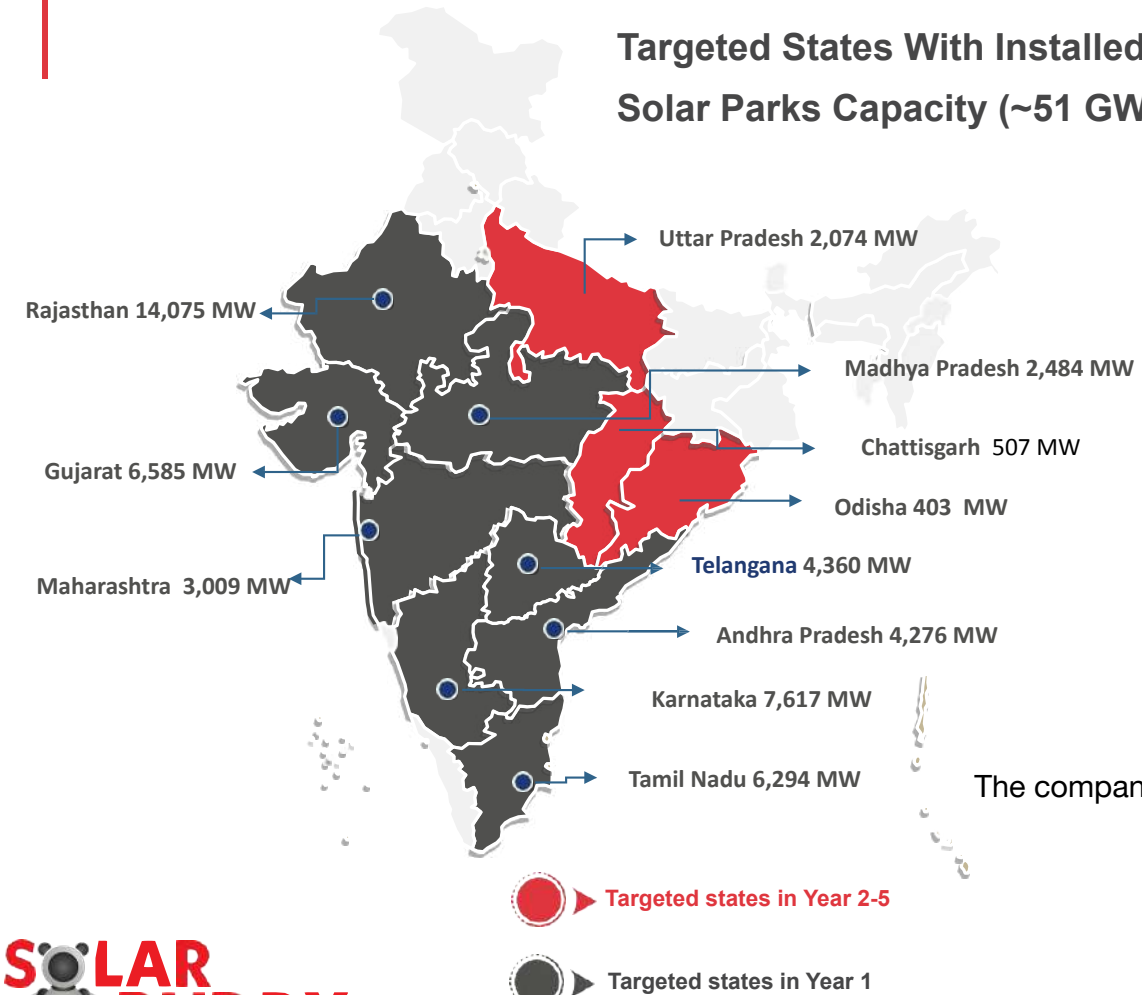
- No Upfront Capital Expenditure!. We charge cleaning cost per megawatt payable on a monthly basis over the life of the cleaning contract
- Our one single robot can clean upto 20 MW per day because of our unique track changer whereas for an equivalent site almost 100 such robots of any other competitor robotic systems
- Thermal imaging cameras helps in detecting any hotspots instantly
- Dedicated solar panels are attached to the track changer and thus do not require any additional power support



SOLAR BUDDY

Target Customers

Targeted States With Installed Solar Parks Capacity (~51 GW)



Year 1

Large Solar Parks

Year 2

Corporate Rooftop Installations

Residential Rooftop Installations

The company will also be targeting the countries having large Solar Park capacities such Japan, UAE, Germany, Italy, UK, and France

Source: https://mnre.gov.in/ in/(As of Mar')

SOLAR BUDDY

We Are Targeting Big Volumes & Industry Players

- As a proof of concept, Ecoppia which offers robotic cleaning solutions has deployed **~15 GW** capacity in India by 2019

- With increasing water scarcity India's **500 GW of installed capacity target by 2030,** one can understand the underlying humongous volumes and business potential

susten By Mahindra · ReNew POWER · एनटीपीसी NTPC · SB Energy SoftBank Group · Greenko

adani · TATA TATA POWER SOLAR · Azure Power · ACME · HINDUSTANPOWER · HERO FUTURE ENERGIES planet positive power

Revenue Model

- Yearly Cleaning Contracts
- Fixed fee per Megawatt basis
- The company will also charge a 3 month refundable security deposit

	SOLAR BUDDY	Current Robotic Systems
Capital Investment in Robots	✗	✓
Yearly Maintenance	✗	✓
Operating Costs	✗	✓
Opex Model	✗	✓
Maintaining minimum inventory of spares	✗	✓

No Maintenance Fee

No Electricity Cost

Zero Repairing & Labour Costs

No inventory of spares

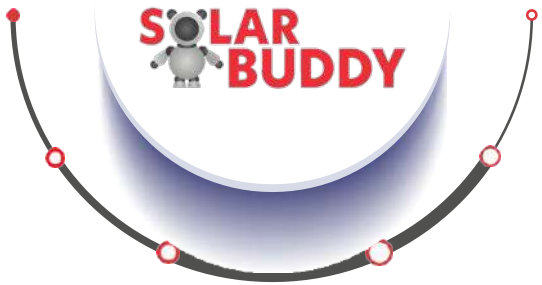
Major Players

	Ecoppia	Skilancer Solar	TAYPRO
Country	Israel	India	India
Founded	2013	2017	2018
No. of projects	>25 Globally	15+	N/A
MW Deployed/under deployment in India	~1,145MW	280 Robots Deployed	280 MW+
Funding	Yes ($53Mn) Applied for IPO	Yes ($0.6Mn)	No
Business Model	Selling of Robots + AMC	AMC	Selling of Robots + AMC
No. of Robots per MW	~3 Robots*	N/A	~2 Robots

- Recently Ecoppia installed 2,000 robots in Bhadla Solar Park for solar panel cleaning. **The Capex is around INR 40 Crores** excluding the annual maintenance cost charged by the company.
- **Solar Buddy can do a similar project in just INR 12 crores per annum**, leaving behind huge savings for solar parks owners apart from additional power generation which can be further sold to utilities or private companies

SOLAR BUDDY

USPs



Automatic Track Changer

Loads and transfers Solar Buddy from one row to another row

Flexibility & Convenience

Cleaning 365 days. In case of dust storms, we offer to clean twice a day ensuring zero power loss due to soiling

Plug & Play

Completely automated and works without any human intervention. The machine is capable of cleaning panels without water and without any external power resource

Spindle Brush Technology

Cleans 150 times better than any existing robotic cleaning system

Robust Backend Support

Due to a storm, loose solar panels or movement of any solar panels, millimetrically can be identified by our machine which sends auto alerts to control center for manual supervision

Roadmap

2023

- Completed field trials on 2_meter , 4 meter , 6 meter panel size sites
- Product is ready for launch

2024

- Setting up our own manufacturing unit
- _Setting up backend team
- Targeting Solar Parks in West & South zone of India

2025

- Developing a smaller size machine to cater to corporate roof top clients and residential customers
- Targeting Eastern & Northern Zone of India

2026

- Deeper penetration into the targeted markets
- Targeting International Markets

Completed

Planned

SOLAR BUDDY

Marketing Mix

Online Marketing

SEO: Search Engine Optimization to increase the visibility of the website

SMM: Social media marketing to generate publicity and increase the awareness of a product

PPC: Pay per click to direct traffic to the website

Direct Marketing /Distributorship

Conducting meetings, demo sessions with solar park owners or individual clients through an in house sales team or distributors

PR Marketing

Ads in Magazine and Media related to renewable energy or solar energyi

Influencer Marketing

Identifying the consultants that have influence over potential customers, and orienting marketing activities around these influencers

SOLAR BUDDY

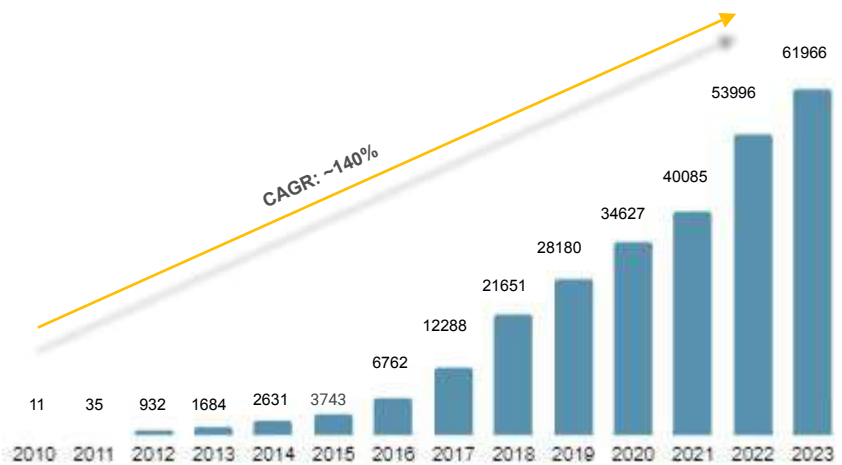
Market Overview

Due to its favorable location in the solar belt (400S to 400N), India is one of the best recipients of solar energy with relatively abundant availability

Global Cumulative Installed Solar Capacity (2022) (GW)

- Recently, India achieved 5th global position in solar power deployment by surpassing Italy

Year Wise Grid Connected Cumulative Capacity in India (MW)



- A total of 47 solarparks with over 61 GW of combined capacity were approved in India until March 2023

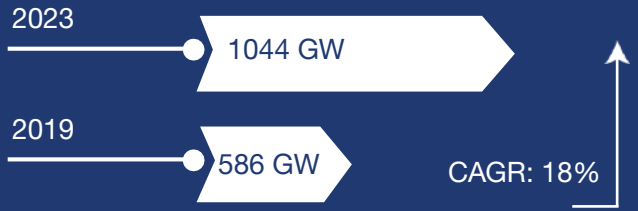
Source: ibef |

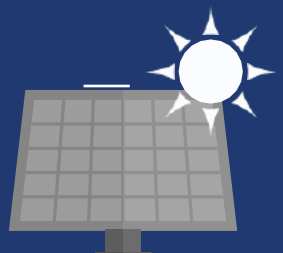
https://mnre.gov.in/solar/solar-ongrid

SOLAR BUDDY

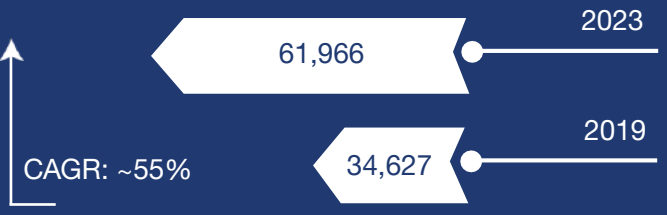
Solar Market Future is Bright

Estimated Global Cumulative Installed Solar Capacity (2019 - 2023)





Estimated Total Solar Capacity in India (2019 2023) (MW)



Market Size

Total Addressable Market (TAM)

Installed Solar Capacity by 2019 (Globally): 586,000 MW Price charged per MW per Year : INR 2,00,000

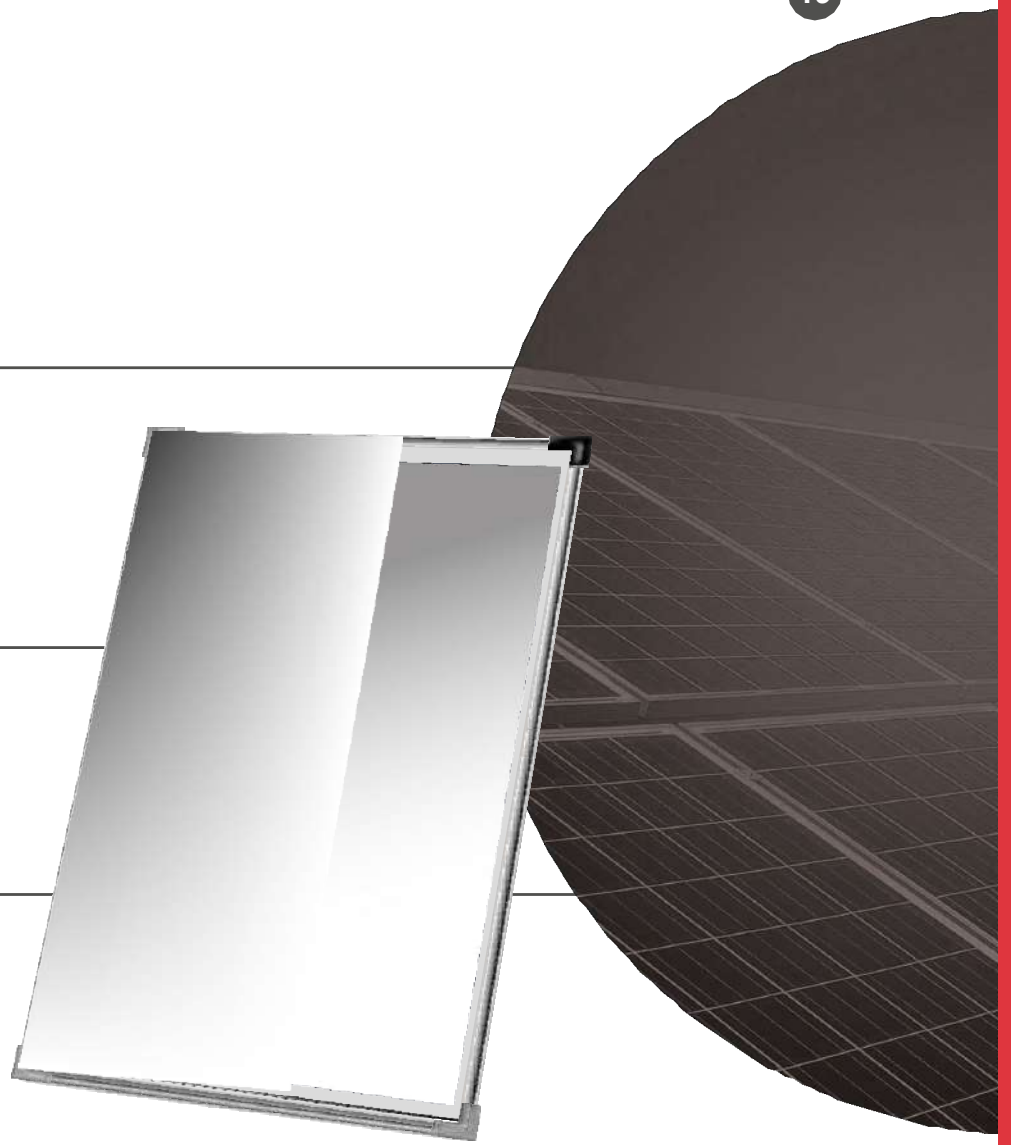
Serviceable Addressable Market (SAM)

Installed Capacity in India by 2022: 114,000 MW

Price charged per MW per year : INR 200,000

Serviceable Obtainable Market (SOM)

Assumed 10% of SAM



SOLAR BUDDY

Competitor's Analysis

	SOLAR BUDDY	Ecoppia	Sol-Bright	BOSON
Country				
Waterless Cleaning	✓	✓	✓	✓
Self Powered	✓	✓	✓	✓
Opex Model	✓	✗	✗	✗
Detect Hotspots	✓	✗	✗	✗
Automatic Track Changer	✓	✗	✗	✗
Remote Control	✓	✓	✓	✓

SOLAR BUDDY

Why Invest?

Huge Underlying Market Potential

Billion Dollar market! The solar energy industry is witnessing an unprecedented surge in its demand.

Robust Business Model

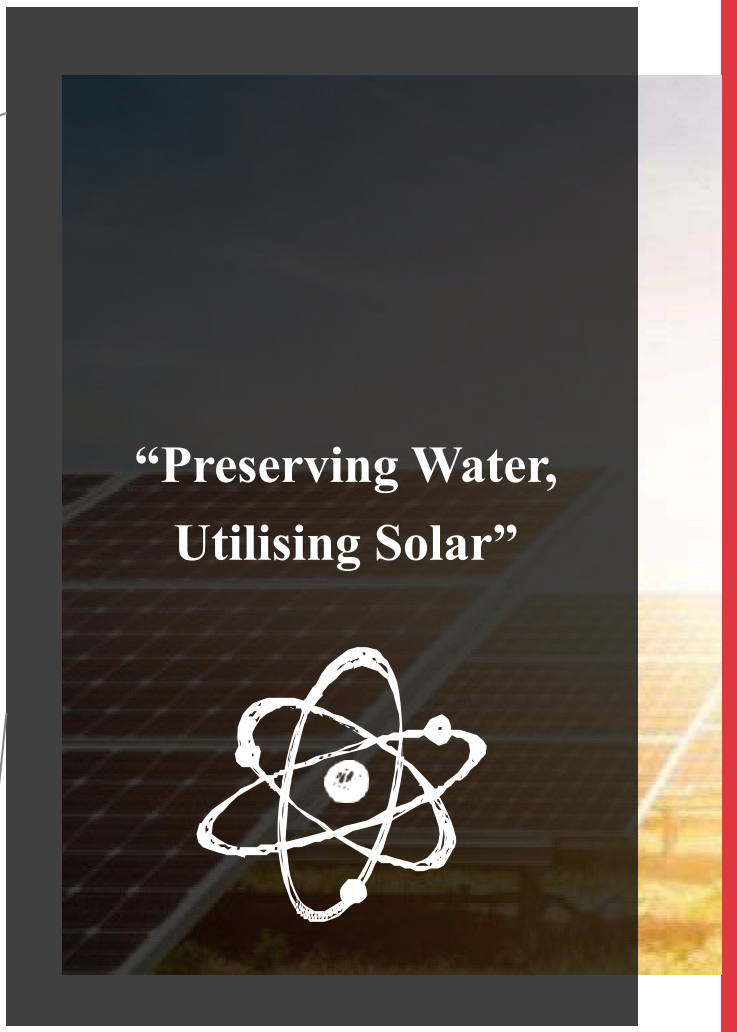
Opex Model! Unlike any other player in the market, we are offering the most economical solution which is tough to ignore

Made in India

Solar Buddy is our own nation's first fully automated, tried & tested panel cleaner, competing with international brands like Ecoppia , Boson, among others

Lucrative Returns

To be incorporated post Fin model



SOLAR BUDDY

Comparison

CURRENT PRACTICE

	SOLAR BUDDY	ANY OTHER ROBOTIC CLEANING	MANUAL CLEANING
Mode of Cleaning of Solar Panels	Without water.	With or without water.	By water supplied through tankers driven by tractors and by using water pumps.
Frequency of Cleaning Cycles	Unlimited. Daily cleaning. If required can clean more than once a day.	Daily cleaning or less as per cost agreed in contract as more cleaning cycles add to the operational cost.	1 - 4 times a month. Lesser cleaning cycles can cause loss of upto 40% of power generation potential of the solar panels.
Malpractices	Zero. It relays cleaning data live on any screen assigned, in any part of the globe.	Does not have that facility.	Over billing, tankers not filled optimally, inconvenience with water suppliers, cleaning not done as per contract, dealing with water mafia. In order to minimise the losses of the cleaning, Frequency is reduced which effects power generation.
Water Requirement	Zero. Waterless cleaning.	Depends on robots deployed.	Totally dependent on huge quantities of clean water. Also water supply around the year is a problem. Quality of water is detrimental to the panels. Water pipes and water reservoir to be maintained and maintenance of the above adds to the cost.
Electricity Requirement	Zero. Powered by own solar panels backed by 36 hours battery life.	Draws electricity from the grid adding additional cost to park owners. Zero battery back up. On cloudy days it cannot function. Electricity lines need to be installed.	Pumps and electricity lines to be installed.
Fuel Requirement	Zero.	Zero.	Fuel required to run the tractor and to pump the water
Manpower Requirement	Negligible. At our cost.	Dedicated manpower required. At plant owners cost.	Dedicated manpower required. At plant owners cost.
Safety of Solar Panels	Robot can run on rails or panels as client desires.	Option not available.	Unconventional method used. Cleaners walk on solar panels, water pressure uncontrolled, tractors at times hit the panels and structures, thereby damaging them. If water is not dried soiling effect is faster and use of wrong type of cloth or wiper can cause micro scratches on the solar panels which would affect its warranty. Water drying marks left on panel edges cause risk of hotspots and affect the life of Solar panels.

Comparison

EFFICIENCY FACTOR

	SOLAR BUDDY	ANY OTHER ROBOTIC CLEANING	MANUAL CLEANING
Number of Rows per 10 MW approx.	100	100	100
Number of Robots Required per 10 MW approx.	1	100	Multiple tractors with water tankers required
Reason for Cleaning solar panels	Due to higher frequency of cleaning cycles, the energy generation by panels increases to its optimum capacity.	Due to higher frequency of cleaning cycles, the energy generation by panels increases to its optimum capacity.	In the interim period between cleaning cycles dust accumulates on panels' surface thereby reducing the energy generation.
Live Display Information of Cleaning	Available. Relays cleaning process live on your screen.	Unavailable.	Unavailable.
Power Source	Powered by dedicated solar panels backed by 36 hours battery life.	Draws electricity from the grid adding additional cost to park owners. Does not have battery backup.	Not Applicable.
Battery Backup	Available. Sufficient battery backup for cloudy days.	Unavailable. Zero battery back up, cloudy days cannot function.	Not Applicable.
Variable Speed of Machine	Available. Variable brush speed and robotic linear speed.	Unavailable. Fixed speed- if panels are extremely dirty cleaning is not 100% effective.	Not Applicable.
Dry Dusting and Deep Cleaning	Available. Allows dry dusting and deep cleaning	Not Available. Does not have the option of dry dusting or deep cleaning	Not Applicable.
Electronic Features	Available. (optional) electronic features like hot spot detection/irradiance/dust level, due to cyclone/storm detects panel movement/misalignment etc…	Not Available. Zero electronic features.	Not Applicable.
Electronic Features	Available. Can operate at any angle upto 45 degrees.	Not Applicable.	Not Applicable.

Comparison

OPERATIONAL FACTOR

	SOLAR BUDDY	ANY OTHER ROBOTIC CLEANING	MANUAL CLEANING
Maintenance	Zero. Maintained by us, hence cost is zero to the solar park owner.	Maintenance to be borne by solar park owner.	Not Applicable.
Manpower Requirement	Zero. At our cost.	Dedicated manpower required. At plant owners cost.	Dedicated manpower required. At plant owners cost.
Spares	Zero. Solar park owner does not have to maintain spares inventory.	Solar park owner has to maintain spares inventory.	Not Applicable.
Breakdown	Downtime due to breakdown at our cost.	If robotic system gets damaged, client needs to invest in a new machine / use a repaired machine.	Not Applicable.
Options of Movement	Robot can run on rails or panels as client desires.	Does not have that facility that the robot can run on rails or panels as client desires.	Not Applicable.
Cleaning Flexibility	Can clean the system multiple times if required/day in case of untimely dust storms.	Do not have that facility to clean the system multiple times if required / day.	Not Applicable.
Robot Failure Control in Case of Error	Available. Inbuilt electronics to disengage/ deactivate operations and communicate error on screen.	Not Available. No such systems provided.	Not Applicable.

Comparison

COST FACTOR

	SOLAR BUDDY	ANY OTHER ROBOTIC CLEANING	MANUAL CLEANING
Capital Expenditure per 10 MW	Zero. Charge per MW of cleaning payable per month.	Only sell the robotic system. Minimum Rs. 3 Crores.	Not Applicable.
Maintenance Cost	Zero.	Estimated 10 rows per MW X 10 MW = 100 rows = 100 robots. Depreciation@ 20% is approx Rs. 40 Lacs per year for every 10 MW.	Dedicated manpower for the cleaning process and host of support staff to maintain accounts, records, feedback, admin and supervision, etc.
Repairs	Zero.	If robotic system gets damaged client needs to invest in a new machine or work with a repaired machine.	Not Applicable.
Installation Cost	Cost of rails to be incurred by the solar park owner.	Cost of rails to be incurred by the solar park owner.	Not Applicable.
Logistics Cost	Zero.	Transport, unloading and installation cost is incurred by solar park owner.	Not Applicable.
Spares	Zero. All spares of robotic system are purchased and stored at our cost.	Spares inventory of electrical, mechanical, electronic parts to be maintained at the cost of site owner. Spares to be purchased and stored by park owner. Damages, theft and quality control adds to the cost.	Not Applicable.
Manpower	Zero. All kinds of manpower on site including feedback collection is at our cost.	All kinds of manpower ranging from cleaning cycle supervisors to labour at the cost of solar park owner.	Not Applicable.
Water Cost	Zero.	Depends on the robotic system.	High
Electricity Cost	Zero.	As per grid supplier commercial rates.	Not Applicable.
Fuel Cost	Zero.	Zero.	High

The Team

Mr. SHANKAR JALAN

Chairman

Mr. Shankar Jalan pursued a Bachelor of Commerce from St. Xavier's College in Kolkata. He is a resourceful, self-made businessman, becoming the sole distributor of orient fans and NBC bearings, closely associated to the chairman of the Birla group.

He married into a family who is one of the prime exporters of steel to European countries.

Through his various years of experience complete and absolute knowledge of marketing, distribution, agents etc has cemented his position as the cream of the crop. He has been appointed as the Director of Jalan Engineering Pvt. Ltd, handling and controlling a business worth approximately 100 crores.

RASHMI JALAN

Director

Born into an affluent industrial family, Rashmi Jalan was quick to develop the suave communication skills that aided her journey to secure her niche in the social circles of Mumbai. She comes from the family responsible for Prakash Cotton Mills Ltd. and Filmistan Studios, thus, business and investments are terms that she is extremely comfortable and familiar with. Independently, she is closely associated with the well-known builders of Mumbai. Therefore, in terms of marketing, her networking will help the sales of Ra Global exponentially.

MONISH BHALLA

Director

Monish Bhalla has over 20 years of experience in the field of corporate affairs, business development and transactional services in India and several foreign countries.

The Team

RISHI JALAN

Director

An alumnus of University of Reading, Rishi Jalan pursued a Bachelor of Science degree in the field of Computer Science Engineering during the period of 2006 to 2009. He has since then worked with AGC Networks for one year in 2010/11.

AKUR RAMAN RAGHUNANDAN

Advisory Board

Akur Raman Raghunandan has acquired 35 years of experience in mid/senior management positions at medium/large corporations in India, Singapore and Dubai.

He is well travelled, developing a deep understanding of conduct of businesses in number of countries from his travels. Until recently, he was the CEO and Director of a trading entity in Singapore worth 1 Billion US Dollars. Additionally, he is a founding member and the Joint Secretary of the Institute of Directors - Chennai Chapter - where he is still an active member.

SOLAR BUDDY

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