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Adani Green Energy Limited

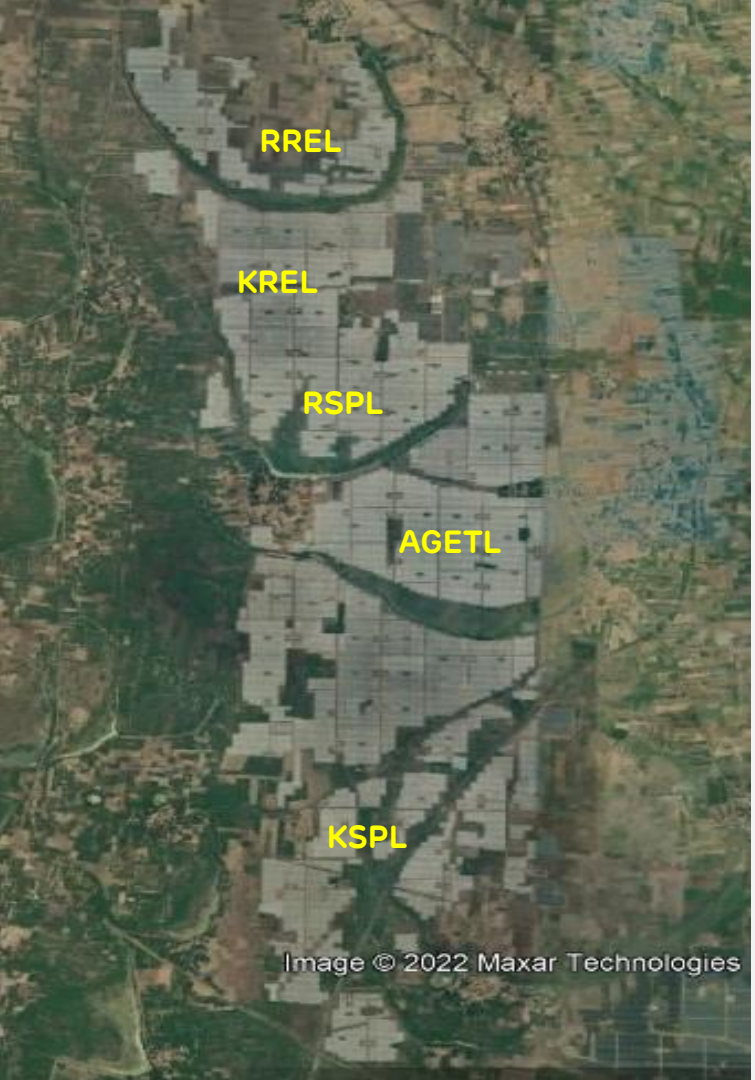
Analyst Visit to Solar Plant
Kamuthi – Tamil Nadu

15 April'22

Plant Location – 648 MW Solar Power Plant at Kamuthi, Tamilnadu

Project at a Glance:

Site Location	Sengapaddai, Pudukottai, & O'Karisalkulam villages, Kamuthi Taluka, District – Ramanthpuram
Total Land area in Acres	2500 Acres
Nearest Airport	Madurai (approx. 90km from Site)
Nearest Road	Porthbanur – Kamuthi – Arruppukottai Road (Adjoining Site)
Nearest Port	Tuticorin Port, approx. 110km
Nearest Railway Station	Tiruchuli, Tamil Nadu (Approx. 25km from site)



One of the World's Largest single location solar power project of capacity 648MW was commissioned in FY 2016 by the Adani Group at Kamuthi, in Tamil Nadu, with an investment of around INR 45.5 billion.

It spans a vast area of 2,500 acres, equivalent to about 950 Olympic-sized football fields. The entire facility was completed within a record eight months by nearly 8,500 dedicated personnel who worked day and night to set up this 648 MW clean energy plant.

The Kamuthi plant is now fully operational and connected with the 400 kV substation of TRANSCO, powering 265,000 homes in a suitable manner.

Development Phase

Phases	Companies	Capacity	Cumulative	COD	Achievement
1	Ramnad Solar Power Limited (RSPL)	72 MW	**72 MW**	8th Feb 2016	Tamil Nadu's largest 08th Feb 2016
2	Adani Green Energy TN Limited (AGETL)	216 MW	**288 MW**	11th Mar 2016	India's Largest
3	Ramnad Renewable Energy Limited (RREL)	72 MW	**360 MW**	31st Mar 2016	Asia's Largest
4	Kamuthi Solar Power Limited (KSPL)	216 MW	**576 MW**	18th Sep 2016	World's Largest
5	Kamuthi Renewable Energy Limited (KREL)	72 MW	**648 MW**	18th Sep 2016	**World's Largest**

PLANT INAUGURATED BY HON'BLE CHIEF MINISTER OF TAMIL NADU AND DEDICTAED TO NATION ON 21.09.2016

PPA execution in presence of Honourable Chief Minister of Tamil Nadu on 04th July, 2015

Site photographs: as it was in the beginning

Site Infrastructure: Temporary Stores

Precast Boundary Wall and Road

Site Infrastructure: Temporary Office & Dining Area

Material Storage Yard – Module & MMS

Foundation for MMS

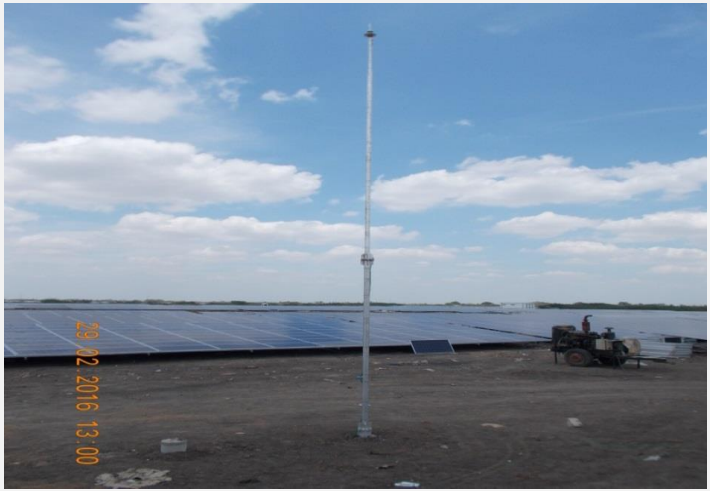
MMS Erection Works

Module Erection Works

Inverter Room and Distribution Transformer Erection

HT Switchgear, Power Transformer & Switchyard

Lightning Arrestor

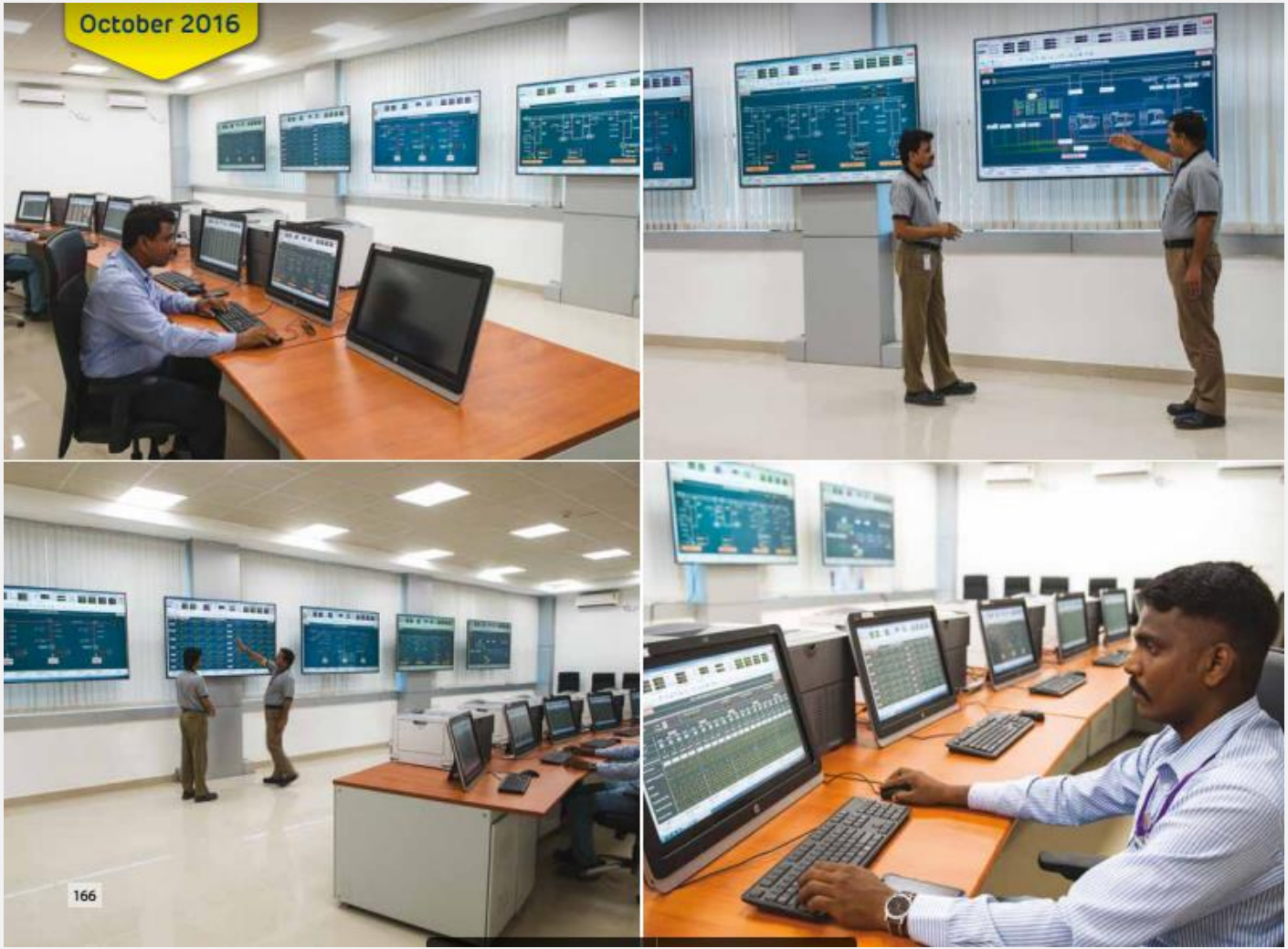


DC Cable Laying & Termination

Main Gate view:

Stores

Water Treatment Plant


October 2016
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Drone Monitoring

Thermal Imaging

Dust detection

Solar Power Generation flow Block diagram:

SUN
Natural Energy Source

SOLAR PANEL
Solar Energy, being converted to DC electricity

SCB
DC electricity is being collected

INVERTER ROOM
DC converted to AC electricity

INVERTER DUTY TRANSFORMER

SWITCHGEAR PANEL

POWER TRANSFORMER

SWITCHYARD

TRNASMISSION LINE

Mammoth Volume of Works:

S No	Particular	Nos
1	Total Project Land Area in Acres	2500
2	Foundations (Nos)	3,80,000
3	Module Mounting Structure (MT)	27,000
4	Solar Modules (Nos)	25,00,000
5	String Combiner Boxes (Nos)	5,500
6	Inverters (Nos)	576
7	Transformers (Nos)	154
8	Switchyards (Nos)	5
9	Perimeter Wall / Fencing (KM)	62
10	Length of Internal Roads (KM)	58
11	Length of Cables (KM)	7,700
12	Cement Consumption (MT)	30,000

Kamuthi	AGETL	KSPL	RSPL	KREL	RREL	Total
DC Cap	**260MW**	**260MW**	**86MW**	**86MW**	**86MW**	**778MW**
AC Cap	**216MW**	**216MW**	**72MW**	**72MW**	**72MW**	**648MW**
No of Blocks / IDT	44 nos	54 nos	16 nos	15 nos	15 nos	**144**
ABB INVs	16 nos	216 nos	12 nos	12 nos	32 nos	**288**
Hitachi INVS	160 nos	0	48 nos	48 nos	32 nos	**288**
Power Transformer & Capacity	2 nos	2 nos	2 nos	2 nos	2 nos	**10 nos**
	240MVA 33kV/230kV	240MVA 33kV/230kV	90MVA 33kV/110kV	90MVA 33kV/110kV	90MVA 33kV/110kV	**750MVA**
Transmission Towers	2 nos	24 nos	2 nos	2 nos	2 nos	**32 nos**

Kamuthi	AGETL	KSPL	RSPL	KREL	RREL	Total
DC Cap	**260MW**	**260MW**	**86MW**	**86MW**	**86MW**	**778MW**
AC Cap	**216MW**	**216MW**	**72MW**	**72MW**	**72MW**	**648MW**
Solar PV Modules	8,29,440	8,28,480	2,78,440	2,76,444	3,26,048	**25,38,852**
	Fixed Type	Fixed Type	Fixed Type	Fixed + Bifacial	Fixed + Tracker + Thin Film + Season Tilt	
Make	SunTech Canadian Trina GCL Hanwa	SunTech Canadian Trina Hanwa	Adani SunTech Trina Hanwa	SunTech Canadian Hanwa Mega Cell	SunTech Hanwa Solar Frontier CGL First Solar	

Absorption of Technology:

- Modules are sourced from Tier-1 Suppliers only
- Adopted Robotic Module Cleaning technology initiative to promote new technology and for operational feedback for the future plants in order to reduce water consumption

Ecoppia

Absorption of Technology:

New Technology adopted for pilot purpose for about 25 MW.

Bifacial module technology - 1.25 MW

Absorption of Technology:

Thin film technology - 10 MW (First Solar, Solar Frontier),

Absorption of Technology:

Seasonal Tilt technology - 5 MW.

Absorption of Technology:

Single Axis Tracking technology – 8.75 MW (Smart Track, Scorpious, Archtech, Twincity, Runsol, Insolar, Solpower of 1.25 MW each)

Absorption of Technology:

- One of the LARGEST MMS table of 8x20 landscape module (2mx1m) configuration has been considered which resulted in the optimized footprint area.

- First ever design, engineering and implementation of GROUP Control feature enabling auto adjustment output of individual inverters by single point set point by control room operator.

- For area/road lighting, Solar streetlights have been used to reduce energy consumption.

- Illumination of complete plant has been done with LED lights only to reduce energy consumption

Major Suppliers:

Sr No	Items	Supplier
1	**Modules**	Suntech, CSI, Trina Solar, GCL & Hanwah - China Solar Frontier – Japan, First Solar - USA, Megacell – Italy & Adani Mundra.
2	**Module Mounting Structure**	Zhongxingbo (Arctech) & Jiangsu Weir - China Ganges International & Satec Envir Engineering - India
3	**Inverters**	Hitachi & ABB
4	**Transformers**	ABB / Transformers & Rectifiers / Schneider Electric - IDT
5	**Switchyard / SCADA System**	ABB
6	**HT Switchgear / RMU**	Siemens
7	**Cables**	Sterlite Industries, KEI Cables, Polycab, Apar Industries
8	**DC Combiner Boxes**	Jakson Engineers / Statcon Power
9	**Cable Connectors**	Bizlink, Taiwan

Generation:

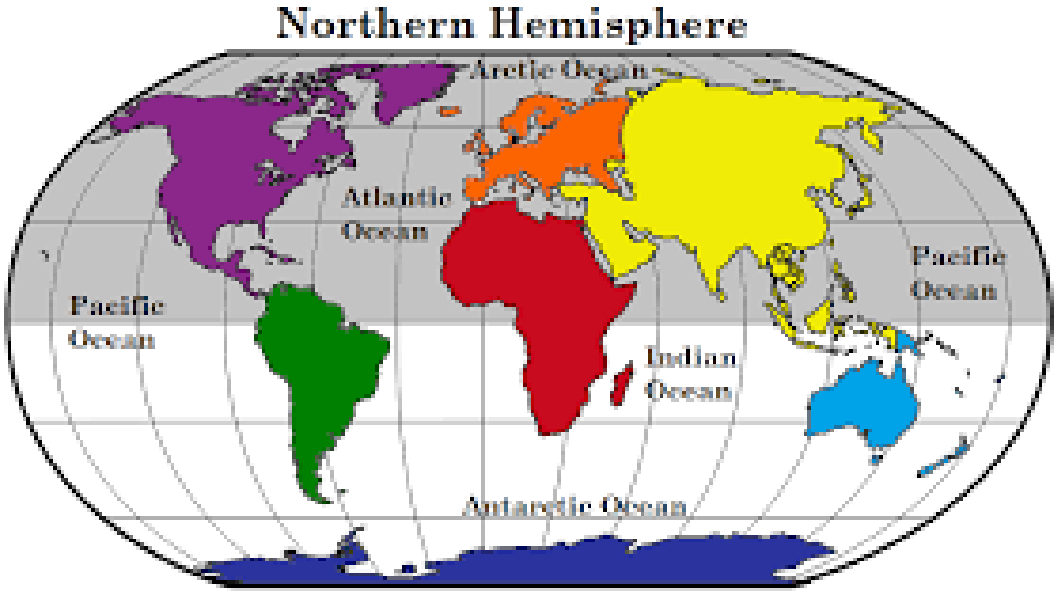
Output varies depending on:

- Module temperature
- Sun's radiation (which depends on):
  - Season
  - Weather
  - Time of the day

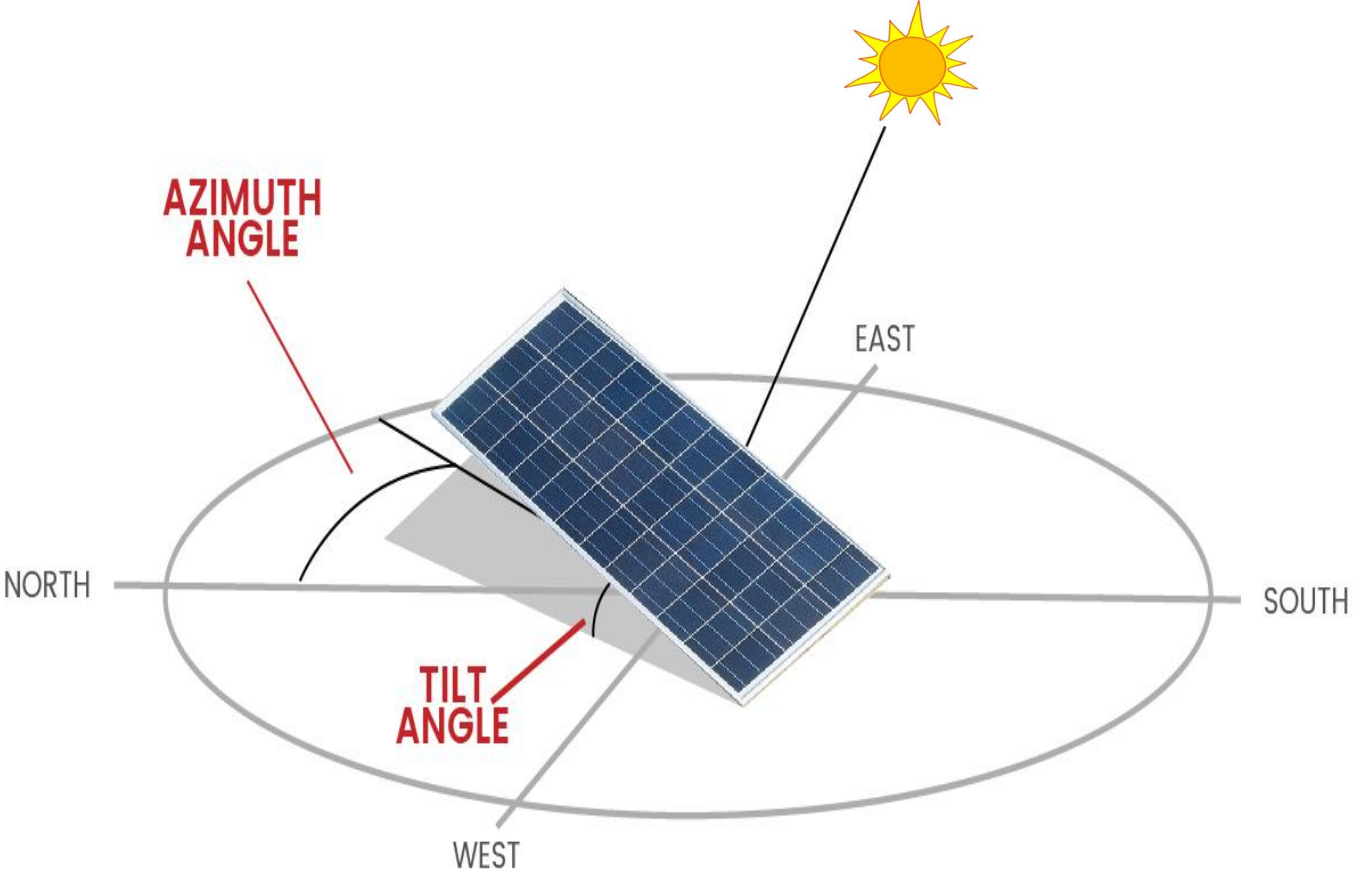
- Majorly renewable electricity generating plants have a **Must-Run status** meaning the electricity generated here is given a preference over the electricity generated in nonrenewable electricity generating plants (thermal or nuclear plants)
- **Kamuthi is one such plant enjoying a Must-Run status**
- The only factor that could limit the supply of electricity here would be due to grid security reasons and curtailments

Modules:

- The modules selected at this plant are Crystalline Silicon modules
- Tamil Nadu is in the Northern Hemisphere and thus, the modules are placed South facing for capturing maximum solar energy



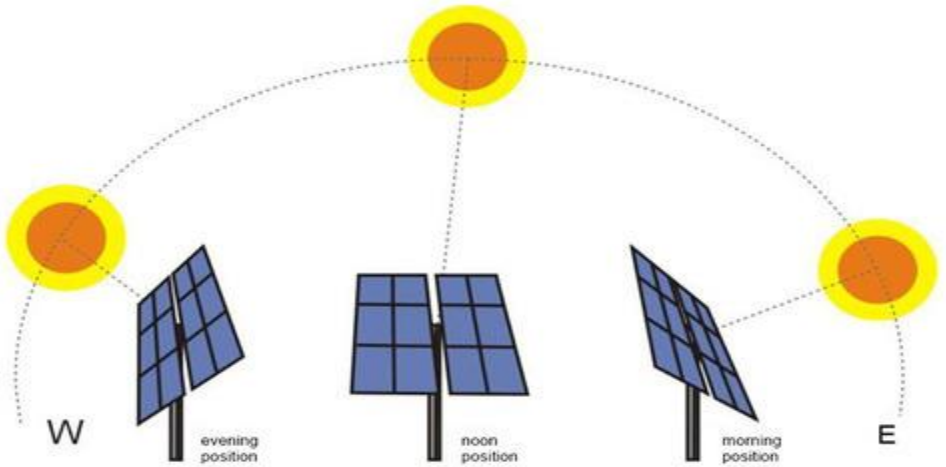

Slope of site along North to Southeast
106 ft
730 ft -0.4%
Image © 2022 Maxar Technologies
1985
Imagery Date: 5/28/2021 9°22'10.07" N 78°22'53.94" E
Graph: Min, Avg, Max Elevation: 74, 95, 111 ft
Range Totals: Distance: 4.83 mi Elev Gain/Loss: 229 ft, -257 ft Max Slope: 10.6%, -5.7% Avg Slope: 1.1%, -1.1%
106 ft
-0.4%
730 ft
0.5 mi
1 mi
1.5 mi
2 mi
2.5 mi
3 mi
3.5 mi
4 mi



- The angle of fixed tilt structures is 8 degrees

- Single Axis Tracker rotates according to the sun's movement from -45 degrees to +45 degrees

- Depending upon the season, the modules start backtracking (coming back to 0 degrees, which is parallel to the ground).



- The Programmable Logic Controller (PLC) is used to control the tracker based on the Sun's movement

- The PLC is programmed such that if the wind speeds increase above the set limit, the tracker will come back to 0 degrees for avoiding breakage of modules

Water Neutrality

Water is a precious natural resource, and its judicious use is responsibility of every company.

- AGEL has taken many initiatives to reduce its water consumption and monitors its water. The company has also declared a long-term solar panel cleaning water target of 0.7 lit/module/wash from a baseline of 1.3 lit/module/wash.

DNV

Water Accounting Data of FY 2020-21 as Estimated/ Measured by AGEL**

AGEL site	Water Debit*	Water Credit*	Water Balance Index (Water Balance / Water Debit)	Water Balance status
	Estimated Freshwater Consumption$	Increased Potential Created (additional rainwater storage by pond rejuvenation) **	E=B/A	
	A	B		
Kamuthi	35,670	52,982	1.48	Positive

Ecoppia

Fully autonomous solutions

Water-free

Ecoppia robots remove over 99% of soiling on a nightly basis using a completely water-free cleaning technology that is both eco-friendly and cost effective

Energy independent

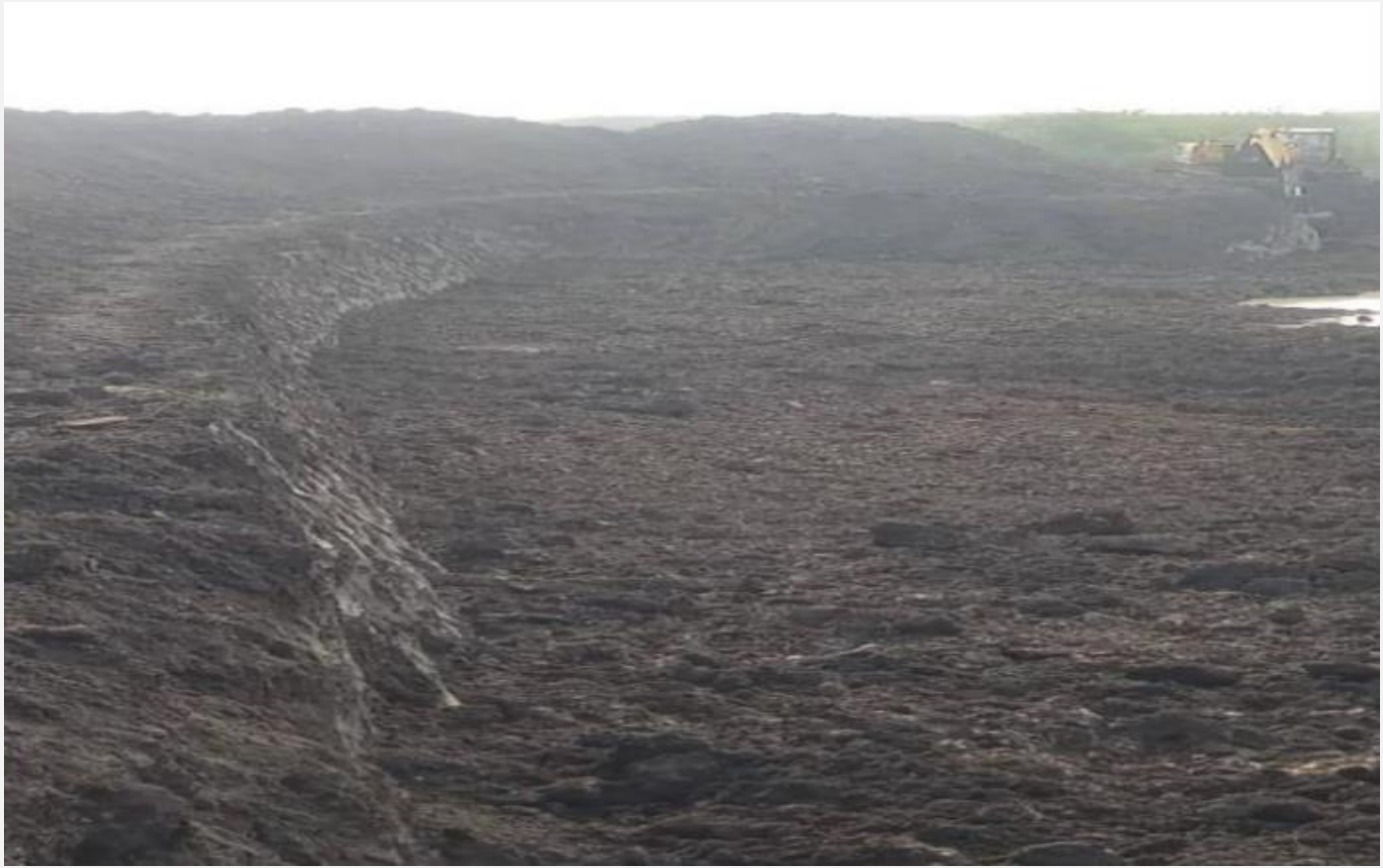
Ecoppia robots have their own on-board dedicated solar module, allowing batteries to quickly charge in between operations

Self-cleaning

Fully autonomous, Ecoppia robots self-clean their on-board solar panel and the cleaning microfiber elements

Deepening and Strengthening of water bodies at Sengapaddai Village

Deepening and Strengthening of water bodies at Dadakulam Village



Deepening and Strengthening of water bodies at Pudukottai Village

Benefits of the ponds deepening:

- The water will be held in limited deepened area, reducing evaporation losses (compared to same water in the available ponds area).

- Water level in the deepened area will be relatively better, delaying this getting shallow and muddy (which may be unusable even for drinking by cattle)

- Villagers have already requested the ponds deepening under CSR and we can meet their expectations to improve our social relations with nearby community

Semi Automatic Machine (SAM) based solar panel cleaning has shown the following benefits, compared with our conventional cleaning process:

1. Consumes less water (1.8 lit/module to 0.7 lit/ module)
2. Increases cleaning capacity per day
3. Reduces cost of O&M (MW/year)


FARMKING
FARMKING
FARMKING

Single Use Plastic Free

Single-use plastic is not only harmful to the health of the people, but it is also a major reason for the deterioration of the health of the land. My country is going to ban single-use plastic in the coming years.

-Shri. Narendra Modi, PM

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Do's and Don't to Avoid Single Usage of Plastic
#DitchTheDisposable

Do's	Don'ts
• Bring your own carry bag whenever go for shopping	• Allow vendor to provide any items in less than 50-micron plastic bag
• Replace plastic water bottles, cups and cutting boards with ceramic and stainless-steel products	• Use plastic container with recycling number 3, 6 and 7. Which can be found on bottom of the container
• Use aluminum foil to wrap food rather than plastic cling	• Use plastic straw , fork, plates , non-woven bags
	

SUP Items – Before - After

BEFORE – Use of polyethene bag to carry grocery items

AFTER – Replaced by Cotton/Jute bag

BEFORE – Use of plastic bottles for drinking water

AFTER – Use of metal bottle

Replacement of Flex banners with Cotton/Metal board

Innovative Site visuals from Waste Modules

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Certificate to AGEL O&M Team

CII-ITC Centre of Excellence for Sustainable Development

Confederation of Indian Industry

Certificate

Single-use Plastic Free

Adani Green Energy Limited

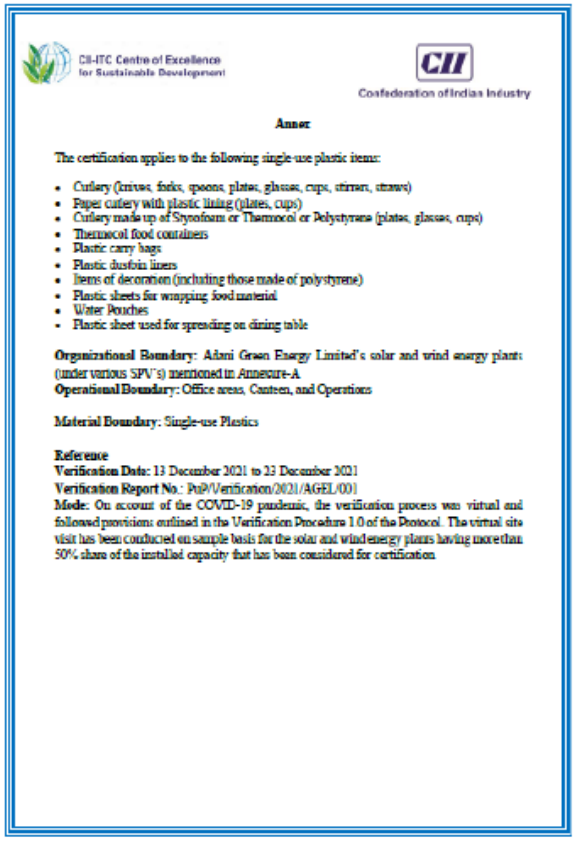
This is to certify that Adani Green Energy Limited, is Single-use Plastic Free at the solar and wind energy plants mentioned in the Annex as verified by the Confederation of Indian Industry, under the provisions of the Plastics-use Protocol: **Verification and Certification (1.0)**.

This Certificate is valid from 27 December 2021 to 26 December 2022.

Ms Seema Arora
Deputy Director General
Confederation of Indian Industry (CII)
Centre of Excellence for Sustainable Development (CESD)

Certificate Date: 27 December 2021 **Certificate No.: CII/PuP/2021/024**

This certificate has been awarded after the company fulfilled the requirements for phasing-out single-use plastics and provided evidence for it. Responsibility for the data provided to CII rests solely with the company. The conditions of certification, and terms are detailed in the Annex



CII-ITC Centre of Excellence for Sustainable Development

Confederation of Indian Industry

Annex

The certification applies to the following single-use plastic items:

- Cutlery (knives, forks, spoons, plates, glasses, cups, stirrers, straws)
- Paper cutlery with plastic lining (plates, cups)
- Cutlery made up of Styrofoam or Thermocol or Polystyrene (plates, glasses, cups)
- Thermocol food containers
- Plastic carry bags
- Plastic dustbin liners
- Items of decoration (including those made of polystyrene)
- Plastic sheets for wrapping food material
- Water Pouches
- Plastic sheet used for spreading on dining table

Organizational Boundary: Adani Green Energy Limited's solar and wind energy plants (under various SPV's) mentioned in Annexure-A
Operational Boundary: Office areas, Canteen, and Operations

Material Boundary: Single-use Plastics

Reference
Verification Date: 13 December 2021 to 23 December 2021
Verification Report No.: PuP/Verification/2021/AGEL/001
Mode: On account of the COVID-19 pandemic, the verification process was virtual and followed provisions outlined in the Verification Procedure 1.0 of the Protocol. The virtual site visit has been conducted on sample basis for the solar and wind energy plants having more than 50% share of the installed capacity that has been considered for certification.

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CSR ACTIVITIES TAKEN UP BY ADANI GROUP IN NEARBY

We Share.....We Learn..... (Industrial Visit)

Transformation.....

Kamuthi O&M Team

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Thank You