

# SOLAR TEA GARDEN

## GANAPATI PRODUCTS

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# INTRODUCTION



**Promoting Climate Change Awareness Through Public Art**

**Tea processing is energy intensive and requires both electrical and thermal energy, which account for upto 20% of the tea processing cost.**

**Imperative for tea industries to cut costs in order to stay ahead in the market, especially for exports where there is stiff Competition from other countries**

Fortunately, the message of energy conservation has gone down well in the tea sector and owners are convinced of the benefits.

# INTRODUCTION



Tea factories need large amounts of electricity during season and only 50% of that off – season.

Frequent power cuts leading to halt in the chain of production process

The major hindrance for the tea factories to go in for the HT connection service is the seasonal production of tea

We can say that the era of implementation has started in tea factories and primary focus is on electricity reduction. Some of the interventions that have already made ripples include the usage of EE motors, VFD controlled combustion, flat belts, illumination optimization, dispense with vapor lamps, usage of aptly sized motors, etc.

On the thermal side, the ball started rolling by way of briquette usage, adoption of combustion controllers, heat content related fuel cost reduction, etc. We can anticipate that 25 - 30% of reduction in both thermal and electrical energy costs of tea processing can be achieved, by adopting and implementing roughly 15 recommendations.

# SOLAR POWER SWOT - STRENGTHS



- Solar energy is environment friendly. When in use, it does not release CO<sub>2</sub> and other gases which pollute the air. Hence it is very suitable for India, India being one of the most polluted countries of the world.
- The geographical locations of the whole India is a most appropriate place for getting solar energy in abundant and there are also vast areas in rural India can be utilized for installing solar panels.
- Ministry of New and Renewable Energy announced 30% Capital Subsidy for all Solar Power Plant Projects in India through Jawaharlal Nehru Mission Scheme. These subsidies and motivations to public reduce the cost of implementation and increases interest in going through solar.
- In our India, it would be suitable for small entrepreneurs to commence solar energy business as only few large corporate are playing role in developing and distributing solar energy.
- Solar energy can give uninterrupted supply of power to households and commercial places.

# SOLAR POWER SWOT - WEAKNESS



- Solar energy is limited for a geographical point of view - solar panels are not popular in regions where there's snow like Jammu & Kashmir.
- The cost of installation is expensive for a common man. So only rich people chooses solar energy.
- The cost of production range is Rs 15 to Rs 20 per unit for the solar energy, which is very high when compared to, Rs 2 to Rs 5 per unit for other conventional sources in India.
- There is no awareness among people about solar energy and its benefits. It restrains the turnovers and only literate people choose solar energy.
- We cannot depend on solar energy in rainy and cloudy days.
- Maintenance of solar panel is required at frequent intervals with additional costs.
- Lack of technical support for the remote locations.

# SOLAR POWER SWOT - OPPORTUNITIES



- India is depending on the gulf nations for oil and we are running out of oil at some times. The cost of oil soars high for most of the months in a year and it will force our government to depend on solar resource available in our country for generating electricity. It also may force people to purchase electronic cars or vehicles with solar panel on roof.
- People are concerned about the environment blocking to install nuclear and coal power plants in their villages will force the government to substantially depend on solar energy. e.g., Kudankulam Nuclear Power Plant is facing protests from the local fishermen community in Tamil Nadu.
- As more companies are entering into the production of solar panel may lead to reduction in cost.
- Awareness programs about solar energy and subsidies announced by the government of India will make the people feel easy about solar energy.
- Our Indian government announced investment over US \$20 billion for 30 years in solar energy will give more opportunities to the people in attaining solar energy and would boost the economy

# SOLAR POWER SWOT - THREATS



- Only large investors can get higher operating profit from solar energy distribution since it requires huge investment to install, maintain and distribution.
- India may face competition from Chinese firms due to cost difference as they are going to solar energy intensively.
- The traditional energy production sector is not likely to diminish in the near future and it bars the people to change.

# ADVANTAGES & DISADVANTAGES



- Advantage:
  - Provides shade and required to allow 20% sunlight to tea bushes
- Disadvantages:
  - At the later stage the leaves fall and thus allows upto 80% sunlight
  - Cutting down the old trees create problem due to Indian Forest Act
  - Foliage have to be cleaned regularly
  - Storms often cause the branches to fall on the bushes and destroy the harvestable portion of the tea bushes



# SPECIAL ADVANTAGES OF BIPV IN TEA ESTATE:



- BIPV module based powerplant can replace the shade trees
- The plant can bring in more profit to the plant by reducing the power consumption from Grid and exporting additional power to grid
- The long life of the modules may enable better management of resources

# CASE STUDY – 1

Tea Garden, Xishuangbanna, Yunnan Province. 51MW



This 51MW project is installed in Tea Garden, Xishuangbanna, Yunnan Province.

It deploys transparent dual glass modules erected on the tea trees, which does not affect the growth of these trees but does enable the efficient stereoscopic use of the space, thus significantly improving the utilization of land and solar energy and fostering the symbiosis between agriculture and solar PV.

This photovoltaic tea garden is the first among many agriculture-photovoltaic power generation projects in China.

# CASE STUDY – 1

Tea Garden, Xishuangbanna, Yunnan Province. 51MW



Photovoltaic agriculture is a new, comprehensive approach to land utilization and the result of closely-combined traditional agriculture and clean energy.



Using 197,800 dual glass modules this project, connected to the grid in 2015, will enable a yearly CO2 emissions reduction of 80,000 tonnes. The expected annual generation capacity is 80,000 kWh.



By not altering the nature of the land, this project is not only good for the protection of the environment but also able to produce clean power, increase the proportion of renewable energy and provide mutual benefits for all stakeholders.

# CASE STUDY – 2

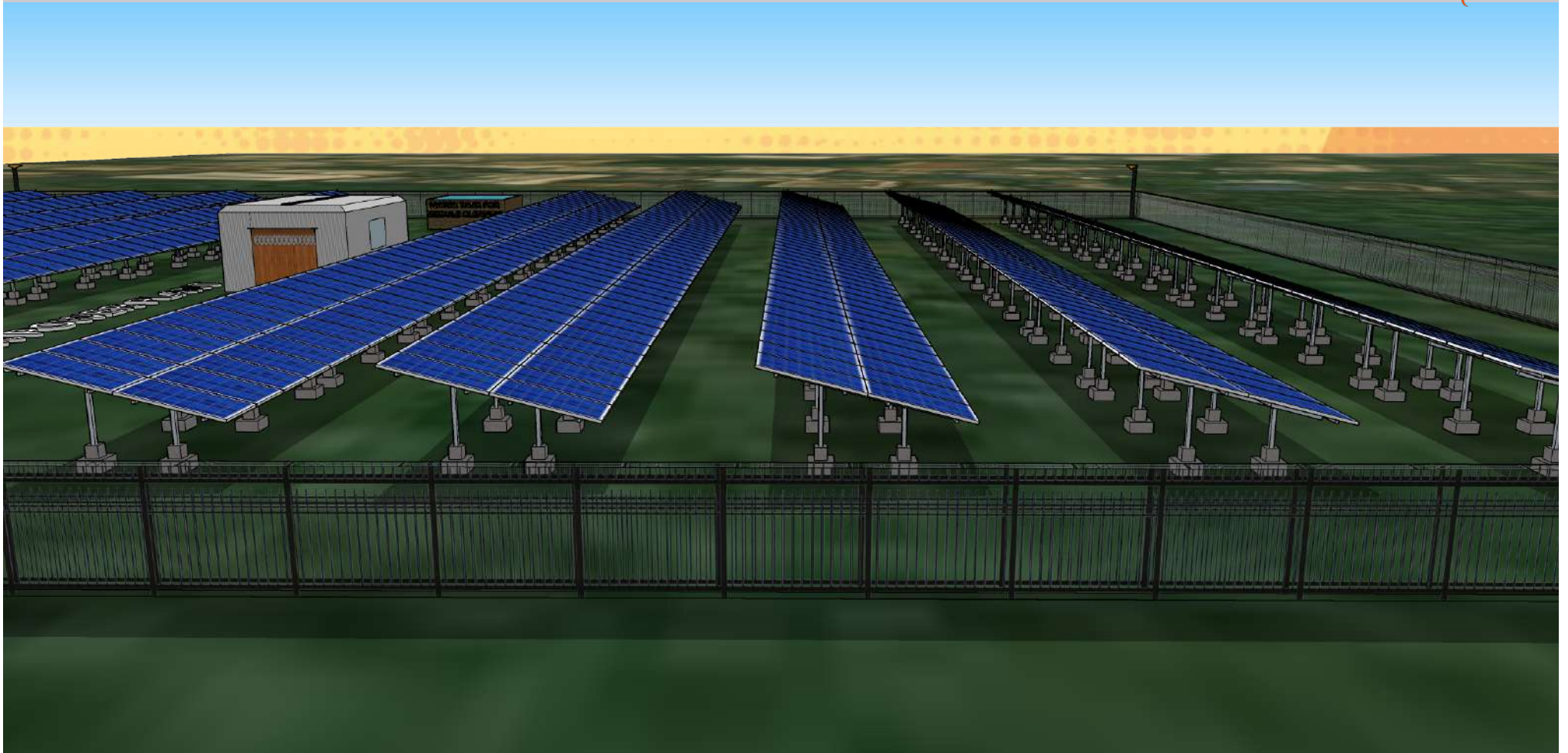
CTC TEA MANUFACTURING IN A GARDEN LOCATED IN THE JORHAT IN DISTRICT OF

ASSAM



Input = Raw Tea Leaves		23960 Kg			Ratio		22.79%		Output = Processed Tea		
		5461 Kg									
Stage	Process	Category	Machine Type	Nos	Rated Output (HP)	Rated Output (KW)	Efficiency	Duration (Hrs)	Energy Consumed (kWh)	Per Capita Energy Consumed (kWh / Kg)	
Stage 1	Withering		Trough Motor	30	3	2.2	79.00%	12	1002.54	0.18	
Stage 1	Withering		Hot Air Blower Motor	1	7.5	55	84.00%	0	0.00	0.00	
Stage 1	Withering		Hot Air Fan Motor	1	20	15	87.00%	0	0.00	0.00	
Stage 2	CTC	Tea Master	Rotorvane	1	20	15	87.00%	12.08	208.28	0.04	
Stage 2	CTC	Tea Master	Stage 1	1	25	18.5	88.00%	12.08	253.96	0.05	
Stage 2	CTC	Tea Master	Stage 2	1	20	15	87.00%	12.08	208.28	0.04	
Stage 2	CTC	Tea Master	Stage 3	1	20	15	87.00%	12.08	208.28	0.04	
Stage 2	CTC	Steelsworth	Rotorvane	1	15	11	86.00%	10.75	137.50	0.03	
Stage 2	CTC	Steelsworth	Stage 1	1	20	15	87.00%	10.75	185.35	0.03	
Stage 2	CTC	Steelsworth	Stage 2	1	20	15	87.00%	10.75	185.35	0.03	
Stage 2	CTC	Steelsworth	Stage 3	1	15	11	85.50%	10.75	138.31	0.03	
Stage 3	Fermentation	Humidification Plant	Pump Motor	1	3	2.2	79.00%	16.33	45.48	0.01	
Stage 3	Fermentation	Humidification Plant	Fan Motor	1	15	11	87.00%	16.33	206.48	0.04	
Stage 4	Drying	Quality Dryer	Hot Air Fan Motor	1	30	22	88.50%	18.6	462.38	0.08	
Stage 4	Drying	Quality Dryer	Spreader Motor	1	2	1.5	79.00%	18.6	35.32	0.01	
Stage 4	Drying	Quality Dryer	Output Motor	1	5	3.7	82.50%	18.6	83.42	0.02	
Stage 4	Drying	Quality Dryer	Heater of TD Oil	1		10	100.00%	18.6	186.00	0.03	
Stage 4	Drying	ECP Dryer	Blower Motor	1	2	1.5	79.00%	0	0.00	0.00	
Stage 4	Drying	ECP Dryer	Hot Air Fan Motor	1	20	15	87.60%	0	0.00	0.00	
Stage 5	Sorting & Grading		Vibro Motor	6	2	1.5	79.00%	22	250.64	0.05	
Stage 5	Sorting & Grading		Vibro Conveyor Motor	1	1.5	1.1	77.50%	22	31.23	0.01	
Stage 5	Sorting & Grading		Vibro Conveyor Motor	1	0.75	0.55	62.00%	22	19.52	0.00	
					<b>266.75</b>	<b>257.75</b>	<b>83.89%</b>		<b>3848.32</b>	<b>0.70</b>	

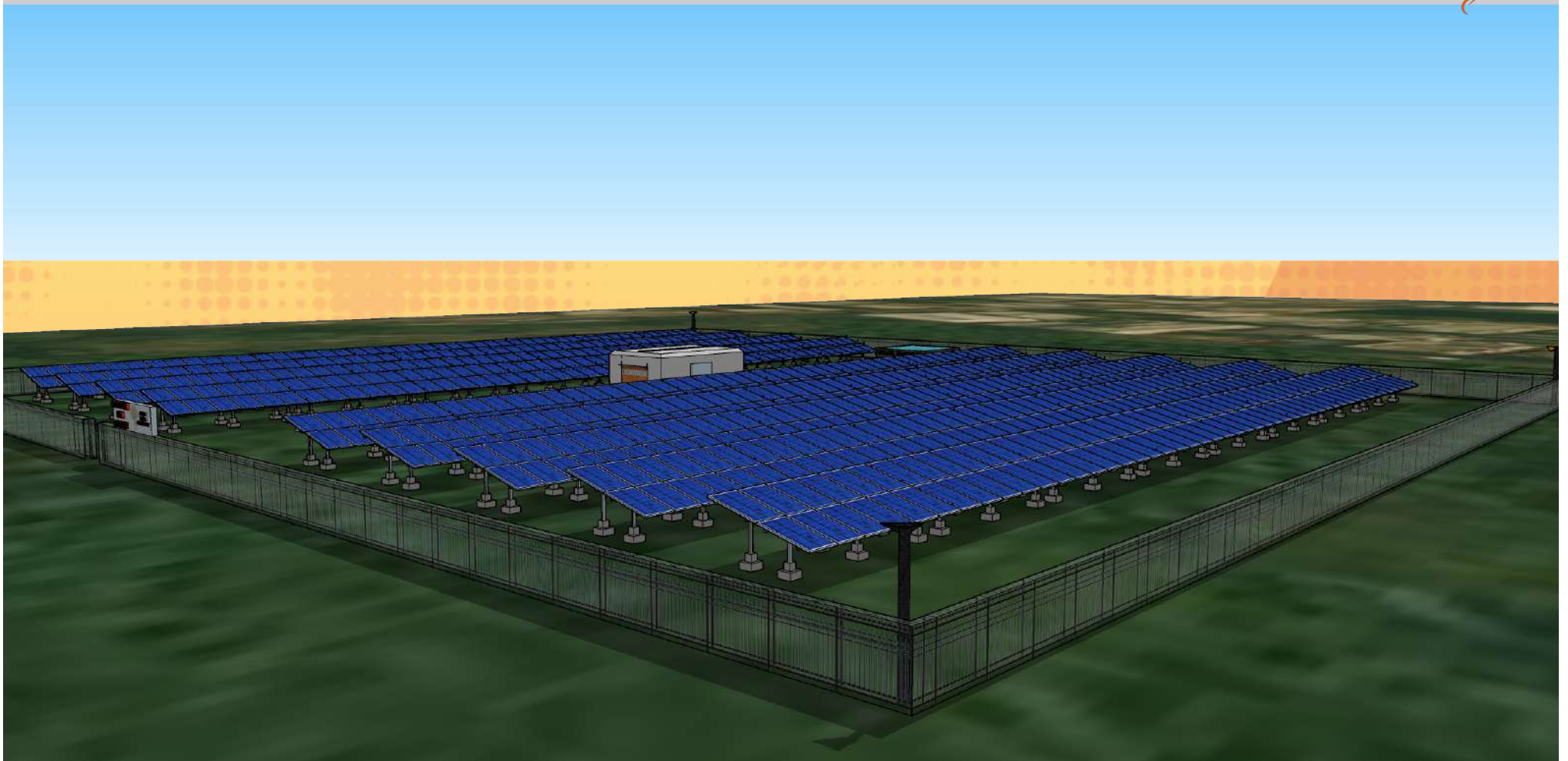
# DESIGN ARCHITECTURE



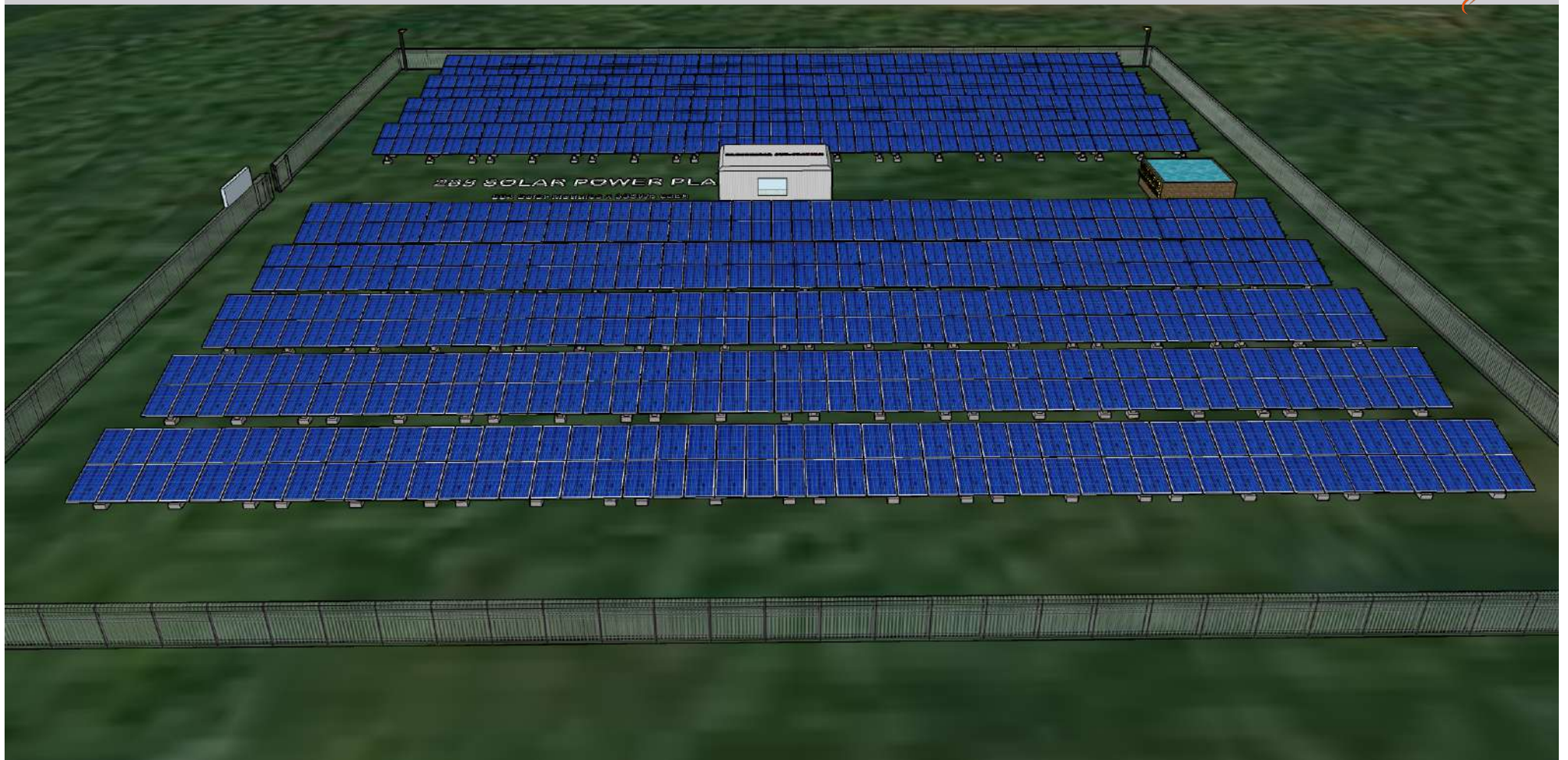
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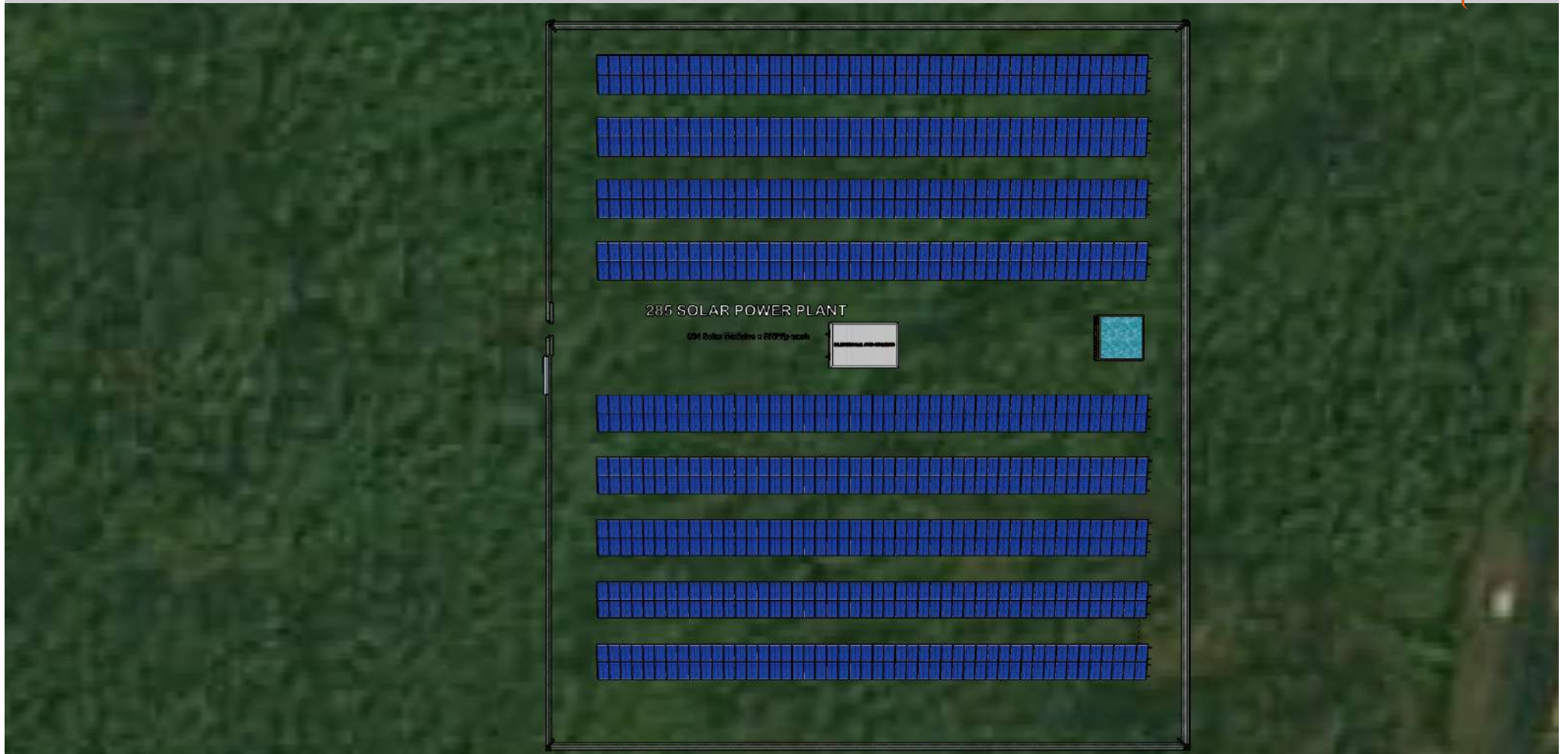
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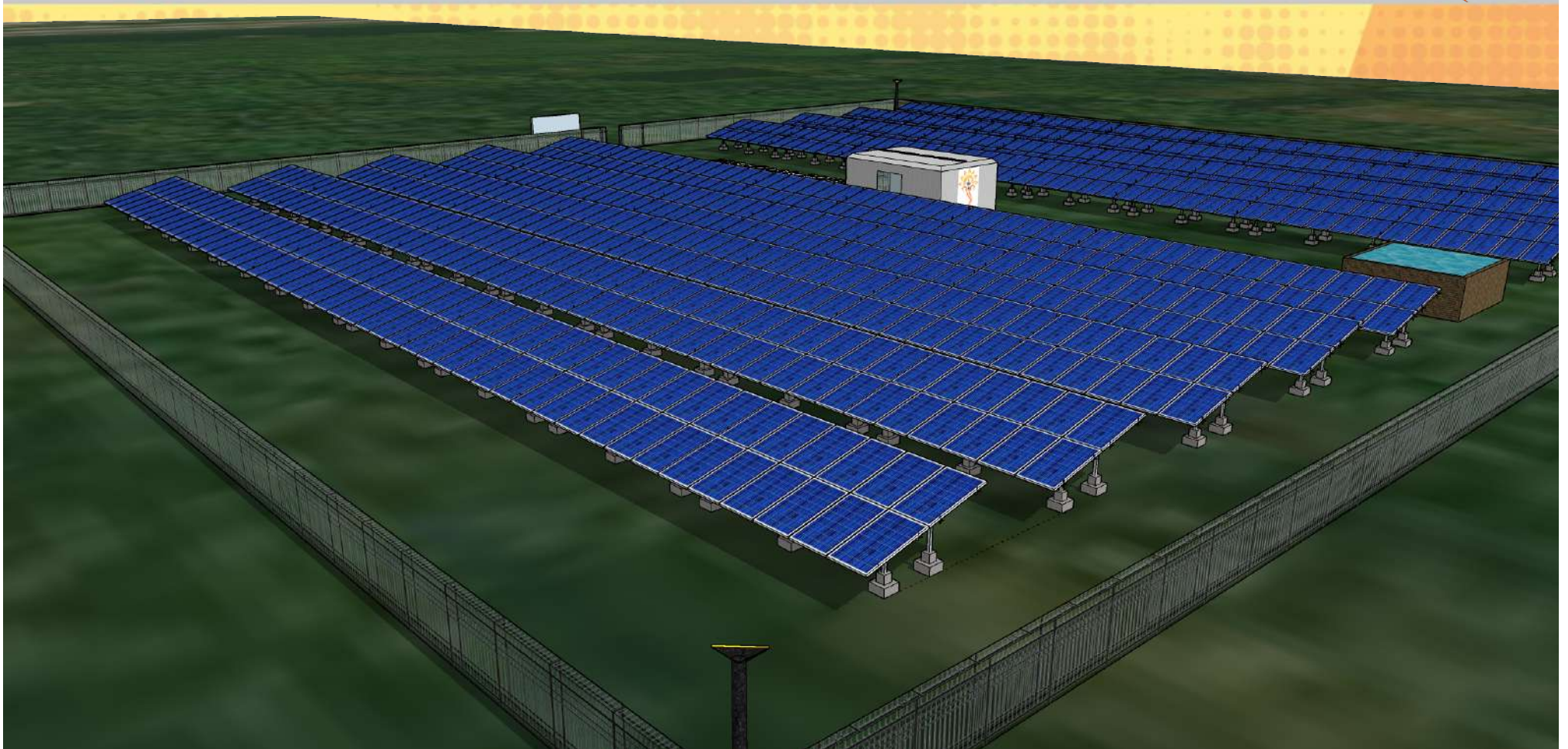
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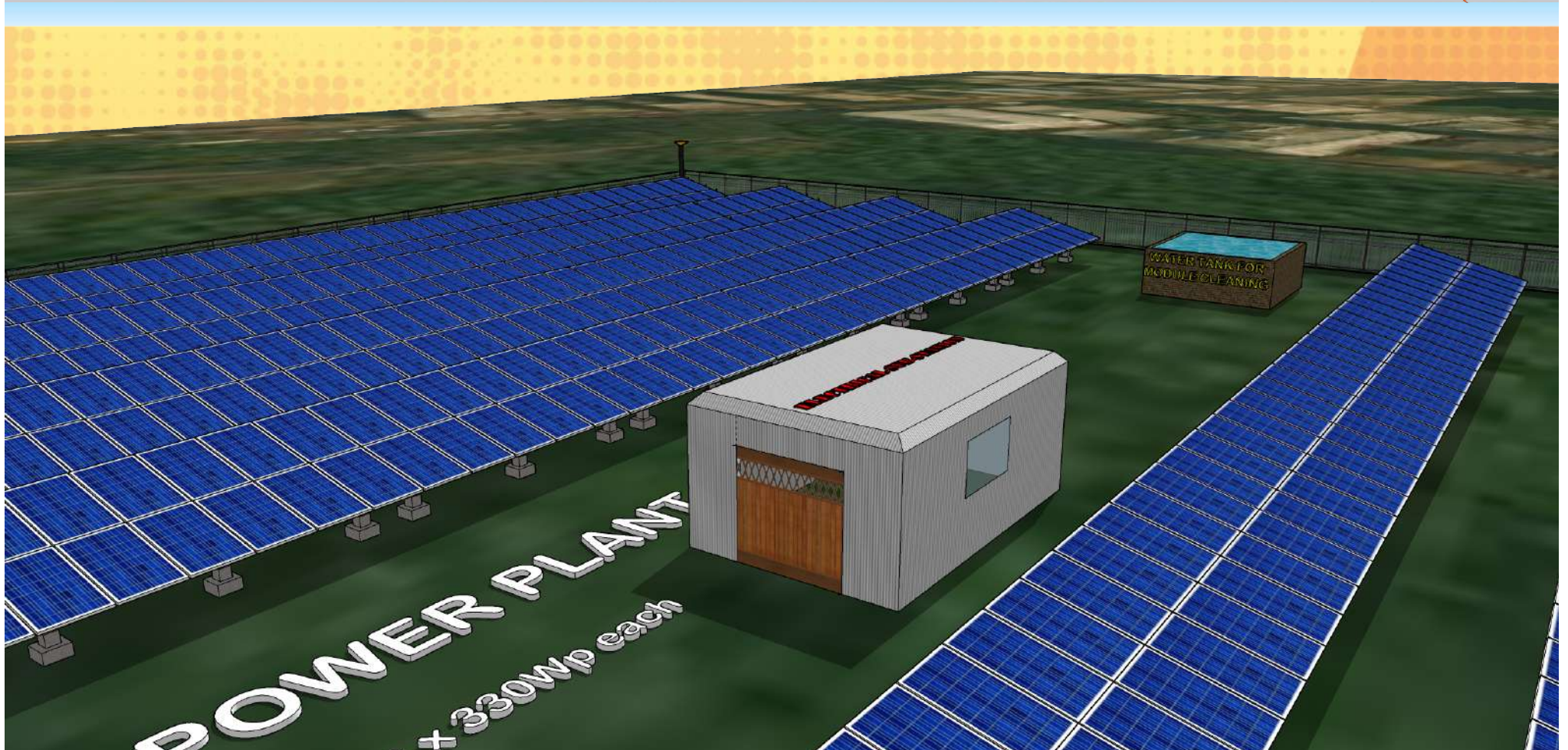
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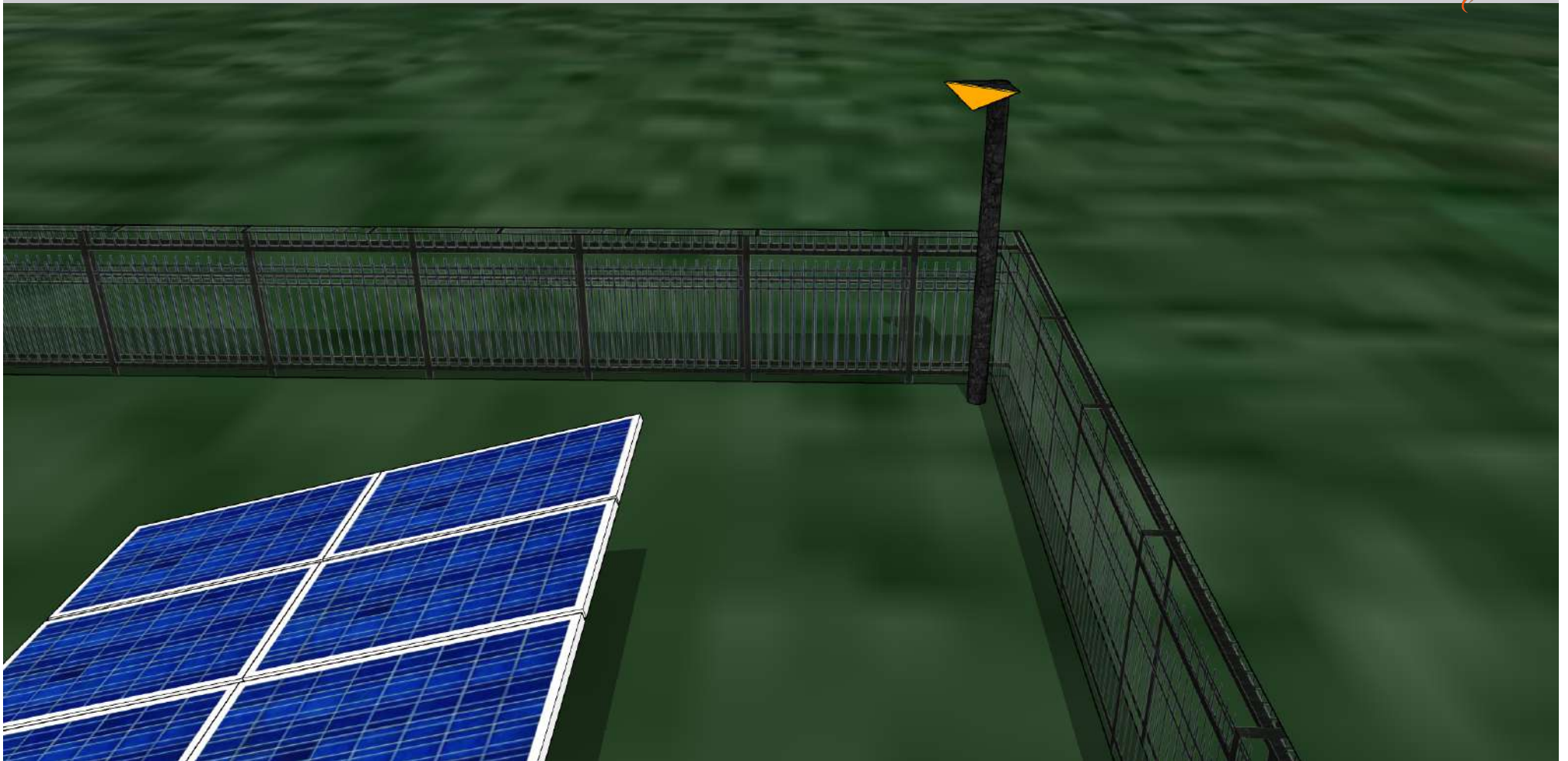
# DESIGN ARCHITECTURE



# DESIGN ARCHITECTURE



# DESIGN ARCHITECTURE





# SYSTEM ARCHITECTURE - SOLAR



GROUP	ITEMS	SPEC	UOM	Qty
SOLAR	Polycrystalline Modules	330	Wp	306
SOLAR	MMS	HDGI 80micros	KWp	101
SOLAR	Battery LMXT	1000Ah 2V LMXT	Pcs	240
SOLAR	Hybrid PCU	100KVA / 240VDC / 3PH	Pcs	1
SOLAR	WMS	Weather Monitoring System	Pcs	1
SOLAR	REALTIME SCADA	Online Monitoring System	Pcs	1
SOLAR	DC Cables	Cu 1C XLPO 4sqmm DC	Mtr	2000
SOLAR	Earthing Kit	Maintenance Free	Pcs	6
SOLAR	Lightning Arrestor	ESE Type	Pcs	1
SOLAR	GI Strip	40x6 mm	Mtr	350
SOLAR	MC4 Connectors	IP67	Pair	50
SOLAR	Consumables	Ferrules, Lugs, Cable Fasteners, Sleeves	LS	1
SOLAR	Cable Trays	GI 125x50x1.6mm	Mtr	100
SOLAR	Cable Trays	GI 50x40x1.6mm	Mtr	300
SOLAR	HDPE	40mm Dia	Mtr	100
SOLAR	SMU	String Monitoring Unit	Pcs	2
SOLAR	AC Cable	4C XLPE AL 240sqmm	Mtr	100
SOLAR	ACDB	LT Panels & Switchgears	Pcs	1

# SYSTEM ARCHITECTURE – DESIGN & CIVIL



GROUP	ITEMS	SPEC	UOM	Qty
DESIGN	Site Survey	On site survey with load analysis	LS	1
DESIGN	DWG Drafting	SPV layout, Structural Analysis Inverter & Battery Room	LS	1
DESIGN	Inspection	By OEM, Installation Team	LS	1
DESIGN	CEIG	If required	LS	1
DESIGN	Net Metering	If required	LS	1

GROUP	ITEMS	SPEC	UOM	Qty
CIVIL	Sub-Station Room	Puff Panel Shed 5m x 5m x 3m	Pcs	1
CIVIL	MMS	0.125 cum each pedestal	CUM	19.1
CIVIL	Fencing	70m x 70m	LS	1

# SYSTEM ARCHITECTURE – LUMINARIES & INC



GROUP	ITEMS	SPEC	UOM	Qty
LUMINARY	Yard Light	100W with Pole	Pcs	8
LUMINARY	Yard Light	2C XLPE AL 10sqmm	Mtr	250
LUMINARY	Room Light	40W LED Tube	Pcs	4
LUMINARY	Room Light	3C Flex Cu 1.5sqmm	Mtr	30
LUMINARY	CCTV	8 Camera Set	LS	1

GROUP	ITEMS	SPEC	UOM	Qty
INC	Consumables	Rubber Mats	Pcs	6
INC	Consumables	Danger Notice Board	Pcs	30
INC	Consumables	Fire Bucket	Set	3
INC	Consumables	Fire Extinguisher	Pcs	4
INC	Team Charges	Fooding & Lodging	LS	1
INC	Housekeeping	Site Clearance	LS	1

GROUP	ITEMS	SPEC	UOM	Qty
ONM	Man Power Allocation	Engineer & Technician	Yrs	5
ONM	Conveyance	Site Visits	Yrs	5
ONM	Breakdown	Repairs & Replacements	Yrs	5

# PROJECT FINANCIALS



GROUP	SPECIFICATIONS	AMOUNT																								
<b>Solar</b>	101KWp Solar Modules, 240V 2000Ah Lead Acid Battery Bank, HDGI Structure, Hybrid 100KVA / 240VDC / 3Ph Power Conditioning Unit, Weather Monitoring System, SCADA, DC Cables, AC Cables, Battery Cables, 6nos Maintenance Free Chemical Earthing Set, ESE Type Lightning Arrestor, GI Strips, AJB, DCDB, LT Panels & Switchgears, Cable Trays, Consumables, String Monitoring Unit, Misc.	₹ 98,17,100																								
<b>Civil &amp; Design</b>	Site Survey, DWG Drafting, Sub-Station Room, MMS Civil, Peripheral Fencing, Final Inspection, CEIG approval, Net metering	₹ 8,14,600																								
<b>Luminaries</b>	<table border="0"> <tr> <td>Yard Light 100W with Pole</td> <td>8 Pcs</td> </tr> <tr> <td>Yard Light 2C XLPE AL 10sqmm</td> <td>250 Mtrs</td> </tr> <tr> <td>Room Light 40W LED Tube</td> <td>4 Pcs</td> </tr> <tr> <td>Room Light 3C Flex Cu 1.5sqmm</td> <td>30 Mtrs</td> </tr> <tr> <td>CCTV</td> <td>8 Camera Set</td> </tr> <tr> <td></td> <td>1 Set</td> </tr> </table>	Yard Light 100W with Pole	8 Pcs	Yard Light 2C XLPE AL 10sqmm	250 Mtrs	Room Light 40W LED Tube	4 Pcs	Room Light 3C Flex Cu 1.5sqmm	30 Mtrs	CCTV	8 Camera Set		1 Set	₹ 1,62,000												
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<b>Installation &amp; Commissioning Including 5years Maintenance Cost</b>	<table border="0"> <tr> <td>Solar, Civil &amp; O&amp;M</td> <td></td> <td></td> </tr> <tr> <td>Consumables</td> <td>Rubber Mats</td> <td>6 Pcs</td> </tr> <tr> <td>Consumables</td> <td>Danger Notice Board</td> <td>30 Pcs</td> </tr> <tr> <td>Consumables</td> <td>Fire Bucket</td> <td>3 Set</td> </tr> <tr> <td>Consumables</td> <td>Fire Extinguisher</td> <td>4 Pcs</td> </tr> <tr> <td>Man Power Allocation</td> <td>Engineer &amp; Technician</td> <td>5 years</td> </tr> <tr> <td>Conveyance</td> <td>Site Visits</td> <td>5 years</td> </tr> <tr> <td>Breakdown</td> <td>Repairs &amp; Replacements</td> <td>5 years</td> </tr> </table>	Solar, Civil & O&M			Consumables	Rubber Mats	6 Pcs	Consumables	Danger Notice Board	30 Pcs	Consumables	Fire Bucket	3 Set	Consumables	Fire Extinguisher	4 Pcs	Man Power Allocation	Engineer & Technician	5 years	Conveyance	Site Visits	5 years	Breakdown	Repairs & Replacements	5 years	₹ 8,02,100
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Conveyance	Site Visits	5 years																								
Breakdown	Repairs & Replacements	5 years																								
<b>Total (EXCL. GST)</b>		<b>₹ 1,15,95,800</b>																								

# WARRANTY & GST FOR MAJOR ITMES



GROUP	SPECIFICATIONS			GST	Warranty
<b>Solar</b>	101KWp Solar Modules, 240V 1000Ah Lead Acid Battery Bank, HDGI Structure, Hybrid 100KVA / 240VDC / 3Ph Power Conditioning Unit, Weather Monitoring System, SCADA, DC Cables, AC Cables, Battery Cables, 6nos Maintenance Free Chemical Earthing Set, ESE Type Lightning Arrestor, GI Strips, AJB, DCDB, LT Panels & Switchgears, Cable Trays, Consumables, String Monitoring Unit, Misc.			5 %	<b>5 Years</b>
<b>Civil &amp; Design</b>	Site Survey, DWG Drafting, Sub-Station Room, MMS Civil, Peripheral Fencing, Final Inspection, CEIG approval, Net metering			18 %	<b>1 Years</b>
<b>Luminaries</b>	Yard Light	100W with Pole	8 Pcs	12 %	<b>1 Years</b>
	Yard Light	2C XLPE AL 10sqmm	250 Mtrs		
	Room Light	40W LED Tube	4 Pcs		
	Room Light	3C Flex Cu 1.5sqmm	30 Mtrs		
	CCTV	8 Camera Set	1 Set		
<b>Installation &amp; Commissioning Including 5years Maintenance Cost</b>	Solar, Civil & O&M			18 %	<b>5 Years</b>
	Consumables	Rubber Mats	6 Pcs		
	Consumables	Danger Notice Board	30 Pcs		
	Consumables	Fire Bucket	3 Set		
	Consumables	Fire Extinguisher	4 Pcs		
	Man Power	Engineer & Technician	5 years		
	Conveyance	Site Visits	5 years		
	Breakdown	Repairs & Replacements	5 years		

# UNDERSTANDING **AD** BENEFIT



Solar power is being promoted in corporates and private sector by Govt of India through Tax relief by allowing them to avail higher rate of depreciation more often termed as **Accelerated Depreciation / AD Benefit**, under section 32 of Income Tax act.

The normal depreciation rate for any general plant and machinery is 15%.

## **Scenario after 31<sup>st</sup> march 2017**

From 1st April 2017.

Hence considering the new budget policy, all solar power plants commissioned after 1st April 2017 will be eligible for following benefits :

- ✓ Solar plant commissioned for more than 180 days in a financial year :- It will be eligible for 40 + 20 % depreciation. **Hence the asset owner can claim 60% depreciation in first year.** This itself is a very big benefit as it incentivizes investment in solar power systems.
- ✓ Solar power plant commissioned for less than 180 days in a financial year will be eligible for half of full year depreciation rate given above. Hence in percentage terms a solar asset owner can claim 30% depreciation (60% / 2).

# RETURN ON INVESTMENT



<b>Cost of Project</b>	<b>Rs.</b>	<b>₹ 1,15,95,800.00</b>
Electricity tariff (Landed inclusive of ED & Cess)	Rs. / kWh	₹ 10
Estimated Solar Generation / Day	kWh	3.50
No. of Days considered for Solar Generation	Days	330
Solar Power Plant Capacity Installed	kWp	101
Annual Expenses on DG Fuel during Power cuts (2hrs / day) (considering 63Lts / Hr. fuel consumption)	350KVA DG	₹ 32,19,300
Annual Expenses on DG Maintainance	350KVA DG	₹ 31,462
Annual Savings in Electricity Generated by Solar	101 kWp	₹ 11,66,550

# RETURN ON INVESTMENT



Savings : 1st Year		
Estimated Solar Generation	116655	kWh
Cost Savings from Solar	₹ 11,66,550	
Accelerated Depreciation Rate (%)	60%	
Accelerated Depreciation amount (Rs.)	₹ 69,57,480	
Tax saved on above amount	₹ 22,95,968	
Savings on Annual Expenses on DG Fuel during Power cuts (2hrs / day)	₹ 32,19,300	
Annual Expenses on DG Maintenance	₹ 31,462	
<b>Net Savings</b>	<b>₹ 67,13,280</b>	
Savings : 2nd Year		
Estimated Solar Generation	116655	kWh
Cost Savings from Solar	₹ 11,66,550	
Accelerated Depreciation Rate (%)	40%	
Accelerated Depreciation amount (Rs.)	₹ 18,55,328	
Tax saved on above amount	₹ 6,12,258	
Savings on Annual Expenses on DG Fuel during Power cuts (2hrs / day)	₹ 32,19,300	
Annual Expenses on DG Maintenance	₹ 31,462	
<b>Net Savings</b>	<b>₹ 50,29,570</b>	

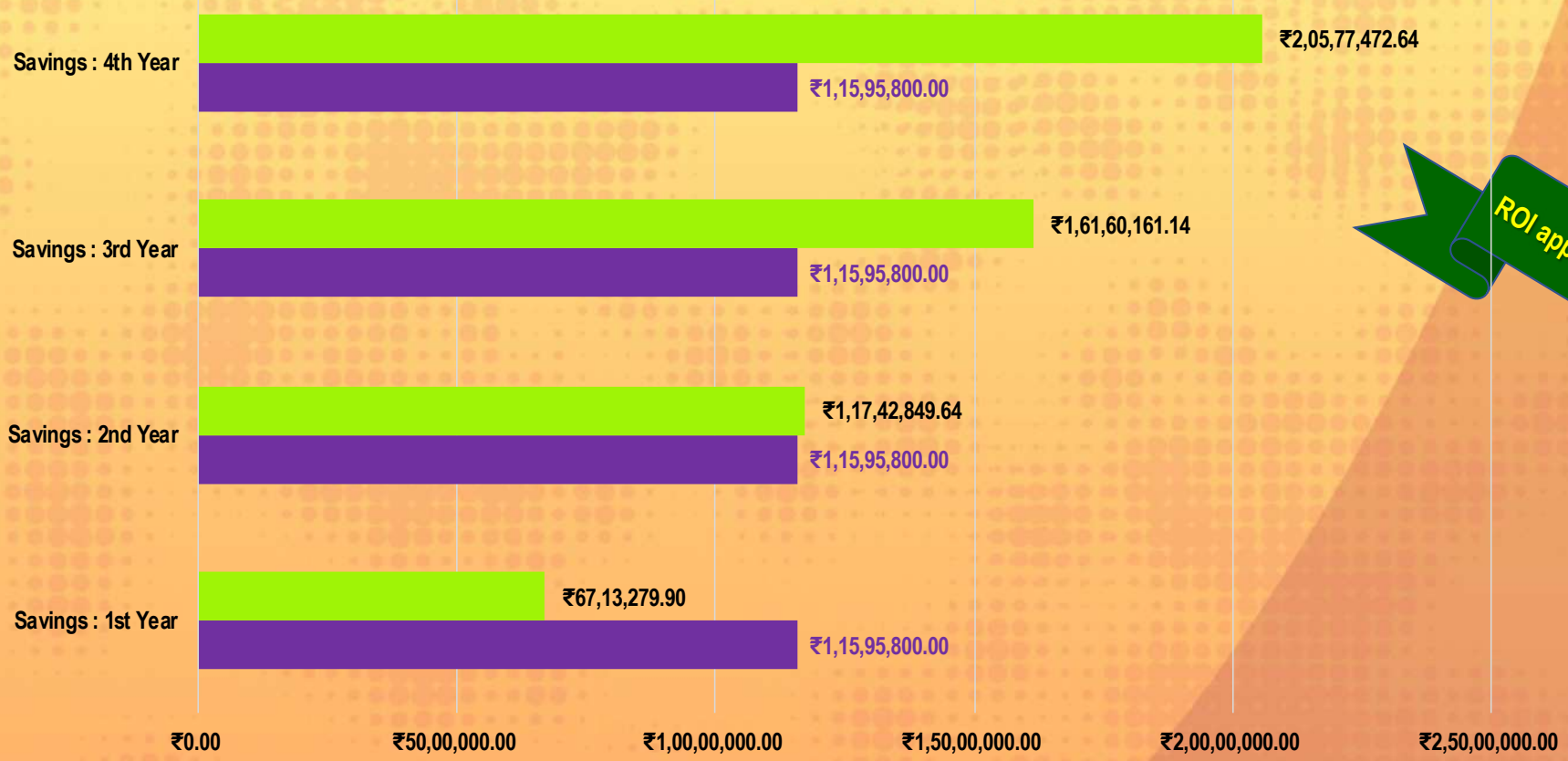
Savings : 3rd Year		
Estimated Solar Generation	116655	kWh
Cost Savings from Solar	₹ 11,66,550	
Accelerated Depreciation Rate (%)	0%	
Accelerated Depreciation amount (Rs.)	₹ -	
Tax saved on above amount	₹ -	
Savings on Annual Expenses on DG Fuel during Power cuts (2hrs / day)	₹ 32,19,300	
Annual Expenses on DG Maintenance	₹ 31,462	
<b>Net Savings</b>	<b>₹ 44,17,312</b>	
Savings : 4th Year		
Estimated Solar Generation	116655	kWh
Cost Savings from Solar	₹ 11,66,550	
Accelerated Depreciation Rate (%)	0%	
Accelerated Depreciation amount (Rs.)	₹ -	
Tax saved on above amount	₹ -	
Savings on Annual Expenses on DG Fuel during Power cuts (2hrs / day)	₹ 32,19,300	
Annual Expenses on DG Maintenance	₹ 31,462	
<b>Net Savings</b>	<b>₹ 44,17,312</b>	



# RETURN ON INVESTMENT



■ Cumulative Savings      ■ Cost of Project



ROI approx. 2 years



Contact Us

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**Warehouse: KOLKATA II MUMBAI**

**Stores: KOLKATA II GHAZIABAD**