MATRIX

RENEWABLE ENERGY DIVISION

BROCHURE

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Table of Content

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What is Solar Energy?

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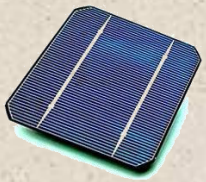
- Tapping of radiant light and heat from the sun by using ever-evolving technology.
- In 2000,World Energy Assessment found the annual potential of solar energy was 1,575–49,837 exajoules (EJ)
- Photovoltaics (PV) is the key component to drive from small scale applications towards becoming a mainstream electricity source.
- Solar Technologies provide long term global benefits .

The history of Solar Energy?



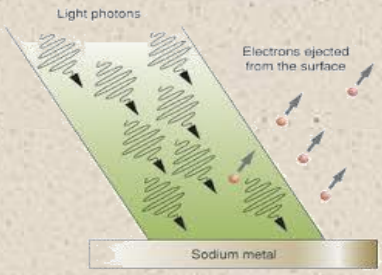
Albert Einstein-
photoelectric effect

7th Century

1905

1957

Magnifying glass used to concentrate sun rays to make fire and to burn ants

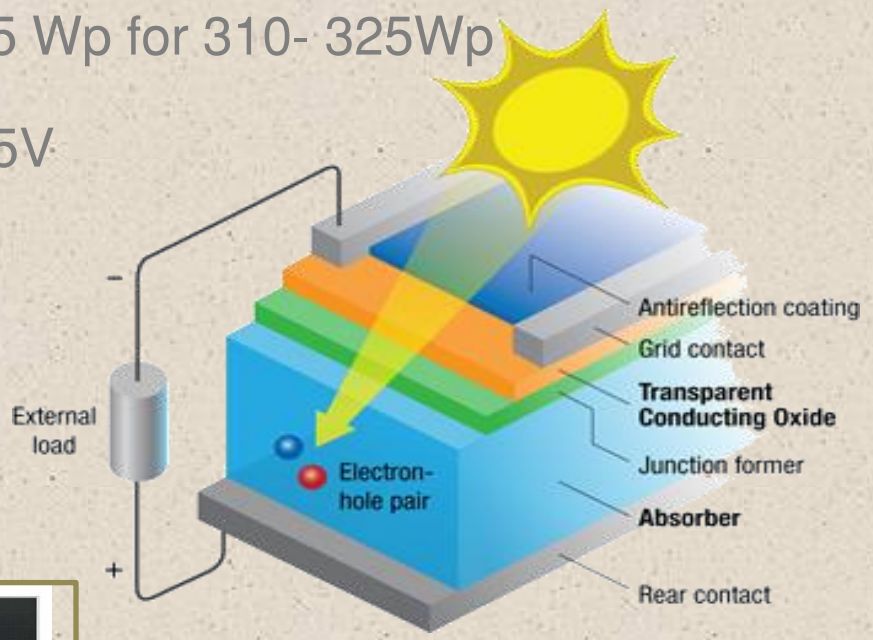


Hoffman electronics- achieved 8% efficiency photovoltaic cells

What is photovoltaics?

- Semiconductor cell generates DC current due to internally movement of excited electrons when exposed to sunlight.
- Single cell dimension multicrytalline156x156mm
- Single cell Watt range 4.3 – 4.5 Wp for 310- 325Wp
- Single cell Voltage range 0.3-0.5V
- Efficiency [η%] 16.8%

Working principle



Type of cell


Monocrystalline


Polycrystalline


Thin film

Major components

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05

Net meter

04

Solar inverter

03

Array

02

Module

01

Photovoltaic cell

DC side

AC side

Solar power plant Architecture

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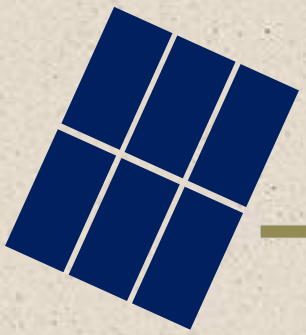
PV array`



- Tilt angle selection as per local coordinates and GHI data
- String as per proposed inverter{ typical range 18, 19,20)

GRID TIE SOLAR INVERTER IN SERIES

- Conversion string DC power [kWp] to required AC output [kW] with 98% efficiency(η)
- System 1000V
- MPPT voltage range- 500-850V
- Anti- islanding protection

INV01 INV02 . . . . INVn

AC DISTRIBUTION PANEL [ACDB]

- Grid & Inverter output Interfacing unit
- Voltage and power monitoring
- manual emergency shut down

NET-METERING

- Bi-direction rotation
- Calibration of power import & export

SCADA & e- MONITORING

- Real time data through online portal
- Power DC & AC
- Grid and system voltage

SENSORS

- Irradiations
- Ambient Temperature °C
- Wind pressure

INTERNET

UTILITY GRID

APPLICATIONS

Various applications

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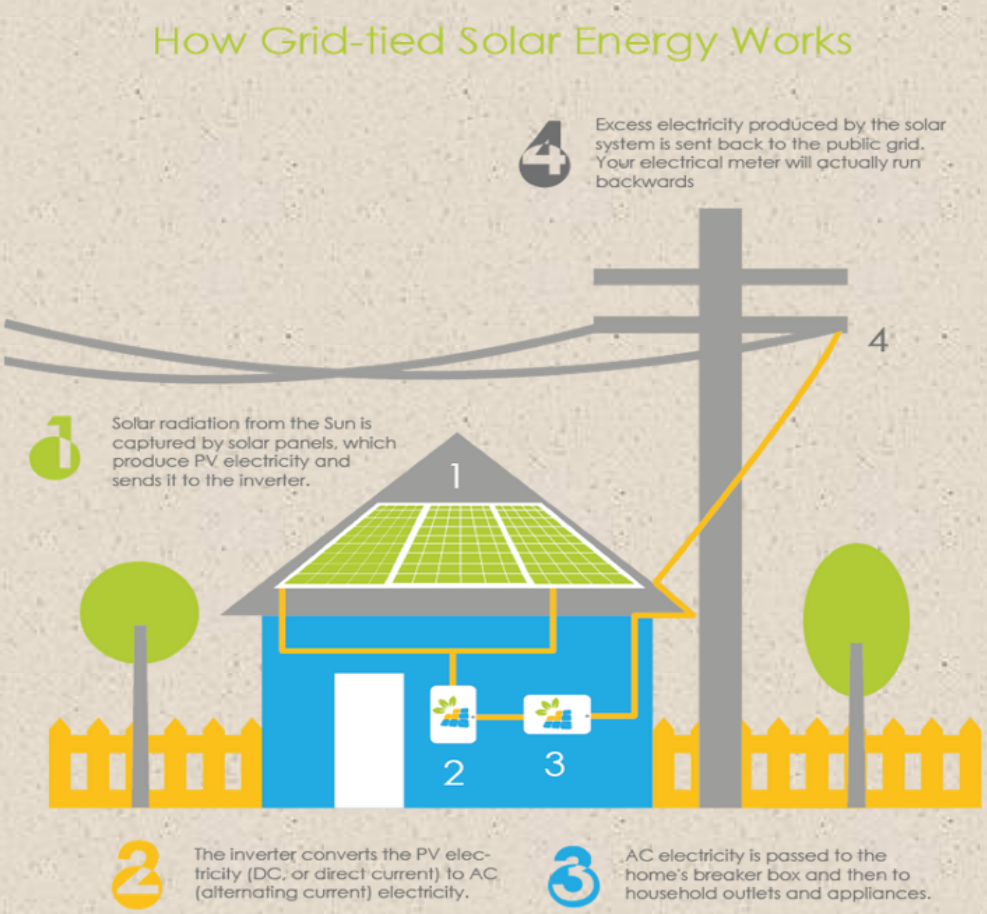
Main application

- On- Grid System
- Off- Grid System
- Hybrid System

Other application

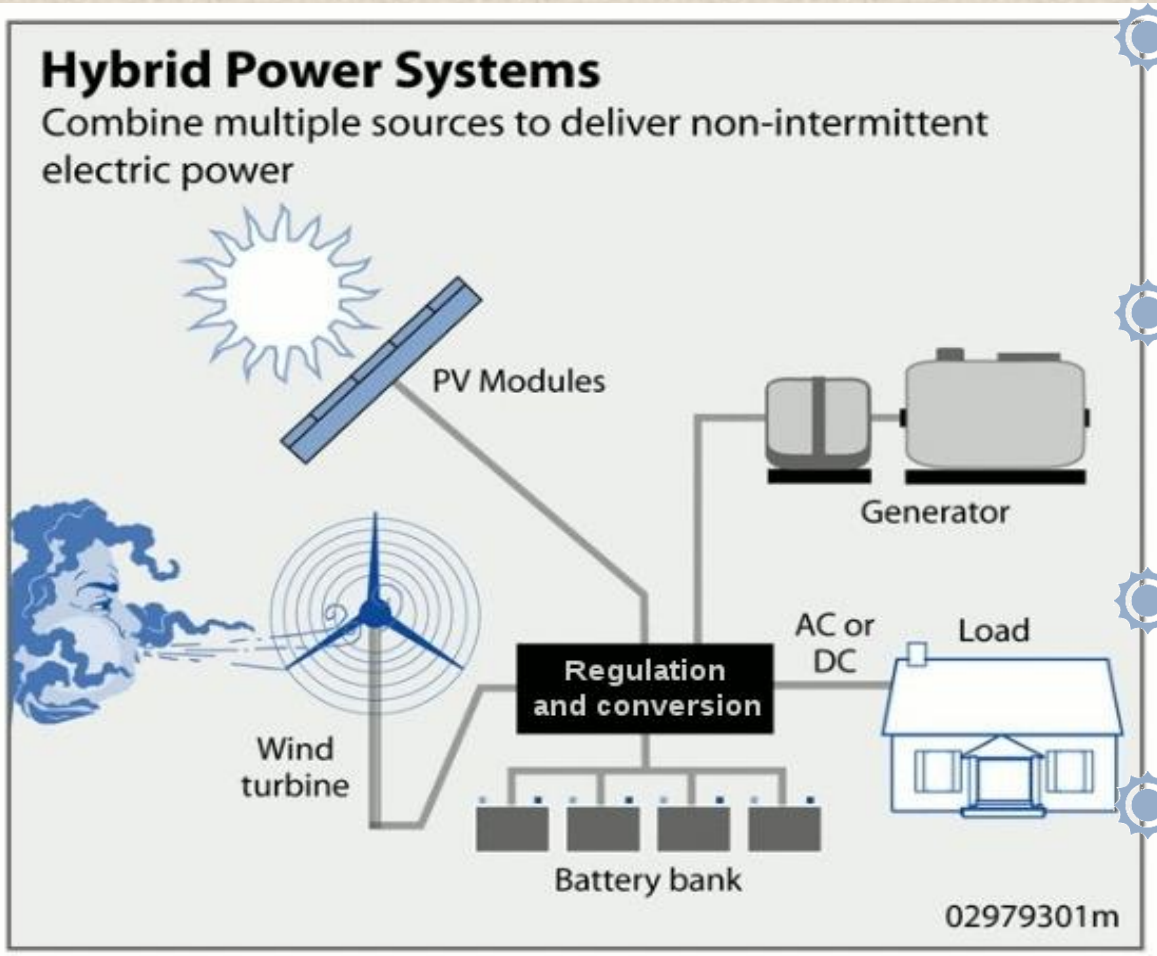
- Solar street light
- Solar lantern
- Solar water heating system
- Solar cooker
- Solar telecom solutions`

On-Grid Systems



- The system is a directly connected to utility grid
- Excess power, beyond the connected load consumption are exported to utility grid
- Automatic anti- islanding circuitry in grid tie inverter enable complete isolation
- Net-metering and Feed-in tariff offset customer electricity usage cost
- Poses many protection related issues
- Causes issue with voltage regulation

Off-Grid Systems or hybrid system



- Sometime known as stand alone power system which are practically independent of the utility grid.
- An autonomous system and a lifestyle designed for distant population & scatter locations
- In Grid parity situations, self power generation is cheaper
- Major Back-up system are Battery bank, Generator & Wind power

TYPE OF ROOF TOP INSTALLATION

1. Concrete roof
2. Tin roof
3. Ground mounted
4. Carport
5. Floating

Concrete roof top installation

- Orientation can either be portrait or landscape
- Selection tilt angle depends on local GHI
- O & M safety clearance range from 300 to 500mm

Tin roof top installation

- Orientation can either be portrait or landscape
- Sealant are used to avoid leakage
- O & M safety clearance range from 300 to 700mm

Ground Mounted installation

- Orientation can either be portrait or landscape
- Selection of Interspace and pitch as per desirable tilt angle
- 5m to 6 m Safety clearance from perimeter boundary

Carport installation

- Carport s are favorable for public parking space
- Multi purpose project that protects car from sunlight and at the same generate electricity`

Floating installation

- Floating SPV has become a trend where power demand are typical high particularly in coastal region`
- India’s largest floating solar plant is situated in banasura sagar dam Kerala with a plant capacity of 500kw

Why Solar PV ?

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Trio hope their solar panels will light up Third World

Renewable energy can change power scenario, give 10L jobs

Solar supply set to power northern suburb of future

GULF NEWS 30 Years

Solar panel plant planned

DUBAI WILL BE HOME TO THE LARGEST POWER PANELS

सफलता | सु-कैम पावर के सहयोग से पेट्रोल पंप पर लगाया 10 केवीए की सोलर यूनिट

S-Su-Kam Ek nayi soch

पानीपत में पहला सोलर पेट्रोल पंप

सोलर उपकरणों की समीक्षा

Now, solar energy benefits dhal mills

It helps in conserving fossil fuel and keeping environment clean

India to set up $350 mn fund for solar projects to meet renewable energy target

Minister confident of achieving 175 GW of installed capacity well before 2020

D4

Energy from the sun is an affordable reality

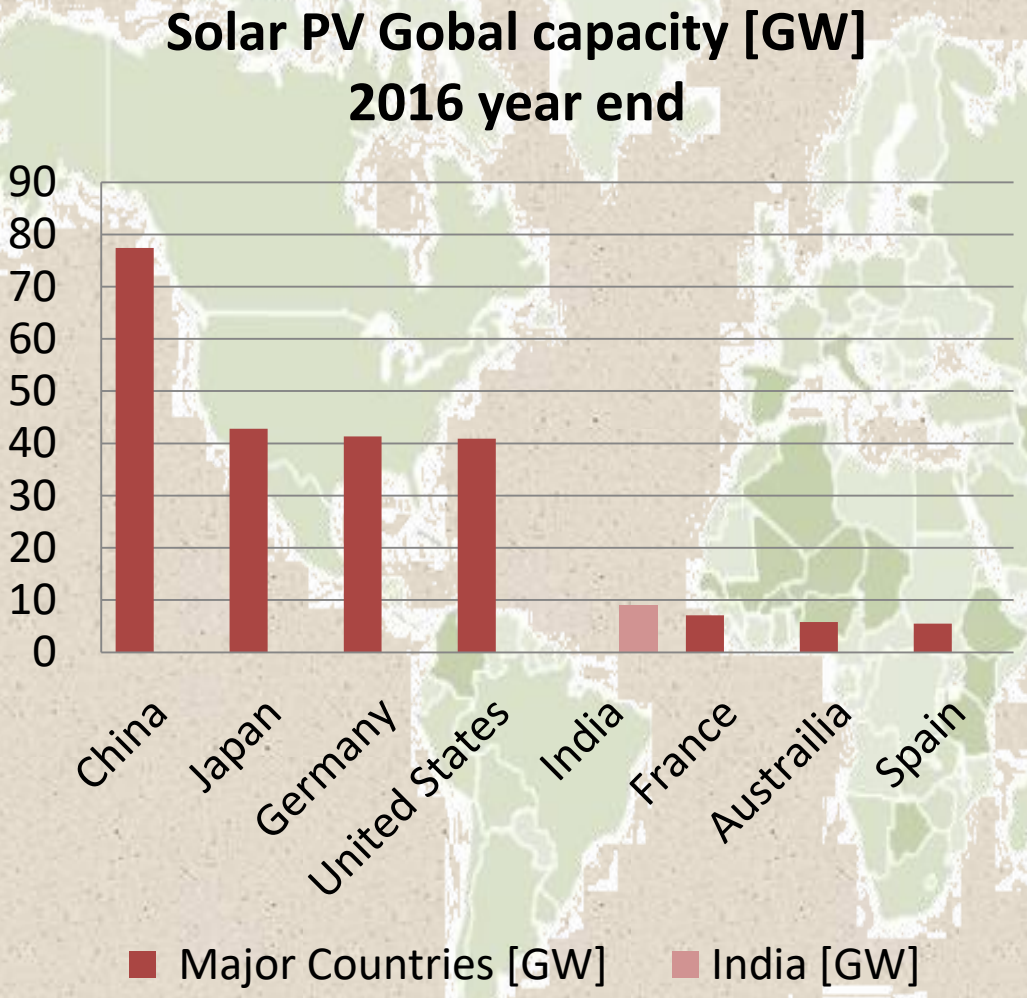
Grid parity automatically attracts millions of customers

Cutting edge renewable energy technology in competitive price.

CO2 emission is negligibly small.

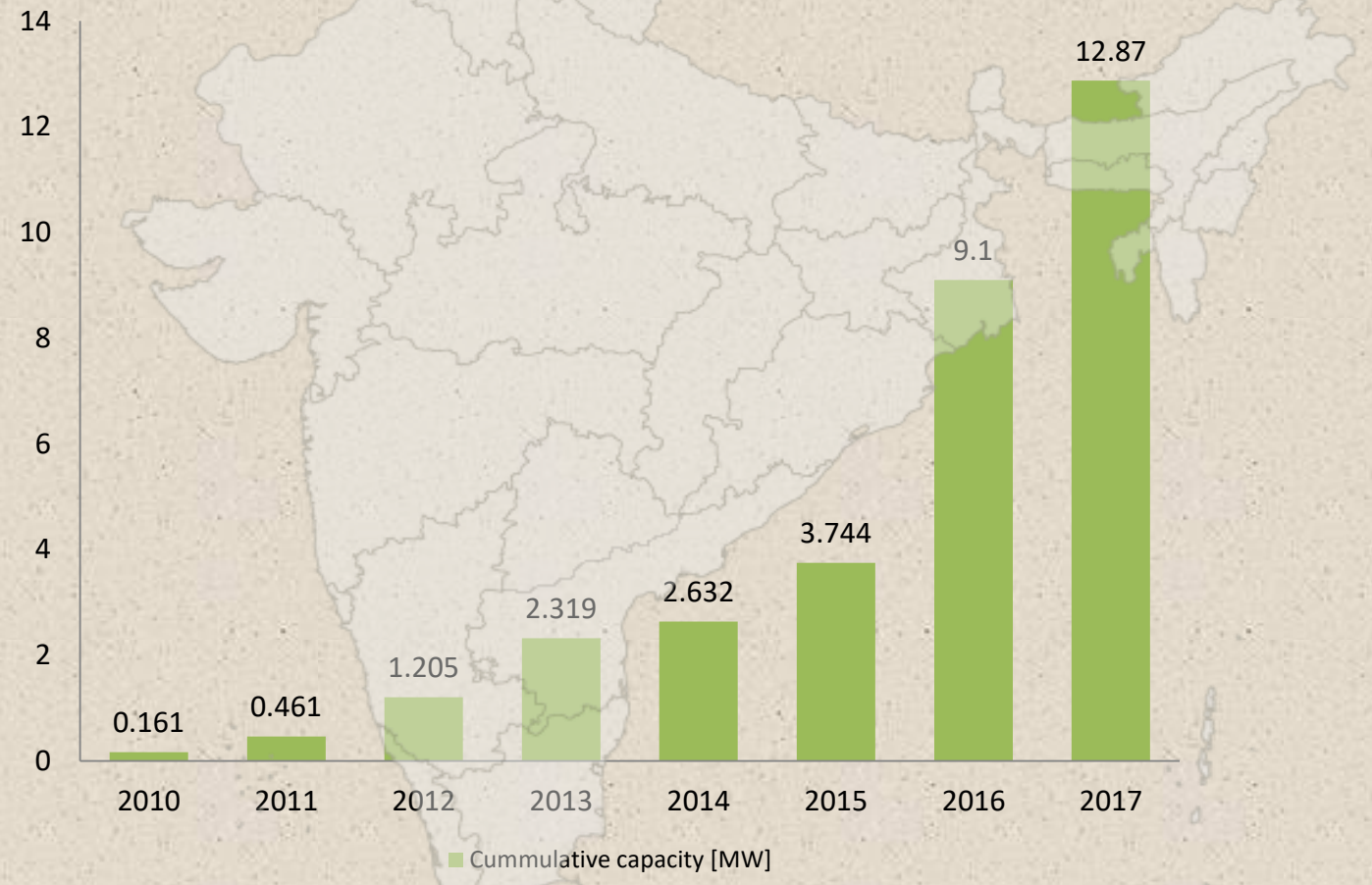
Lucrative schemes create a conducive environment for investment and growth.

Global trends in Solar energy



Source

India trends in solar energy



Ambitious target for 2022 is 20GW or more

Deploy 20 million solar lighting system for rural areas by 2022

BUSINESS MODELS

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- Capital used to acquire PP&E
- Generation is used by sole owner
- O & M is under owner scope

CAPEX

OPEX /RESCO

- The household does not own the generation equipment
- Generation may distributed among many households
- O& M are provided by RESCO

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POLICIES

SPV Policies

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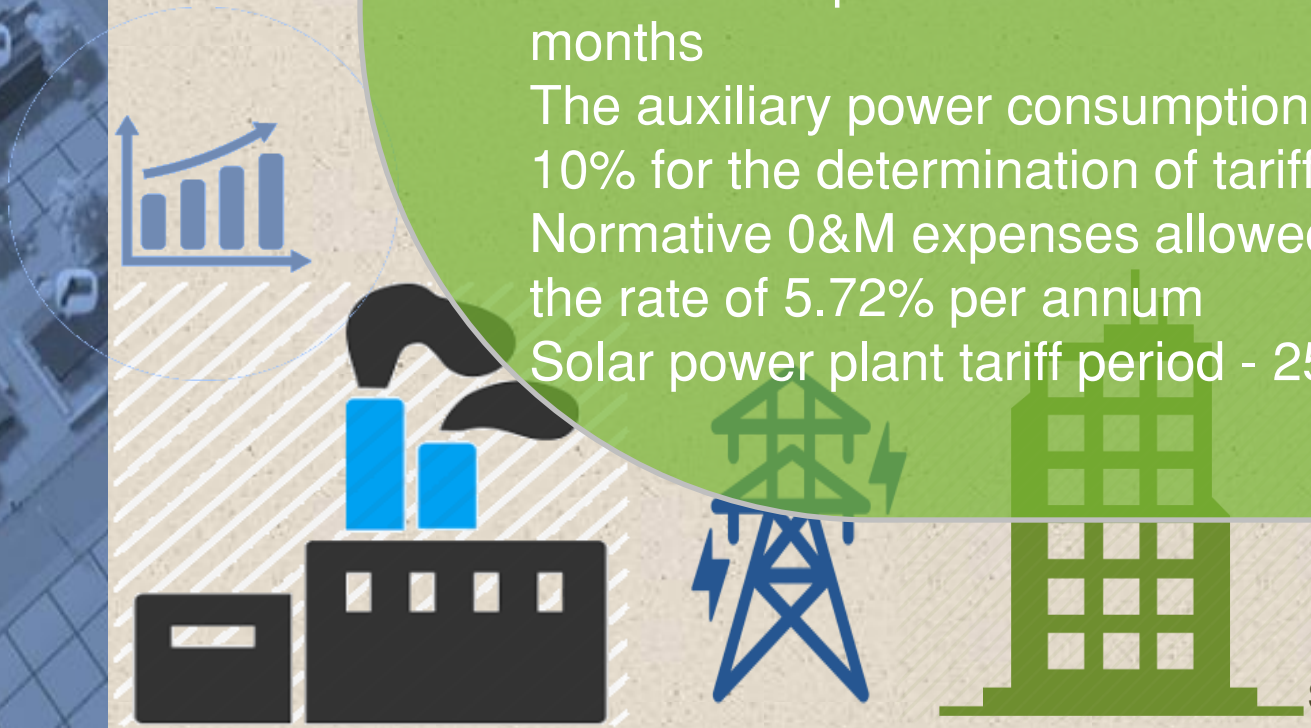
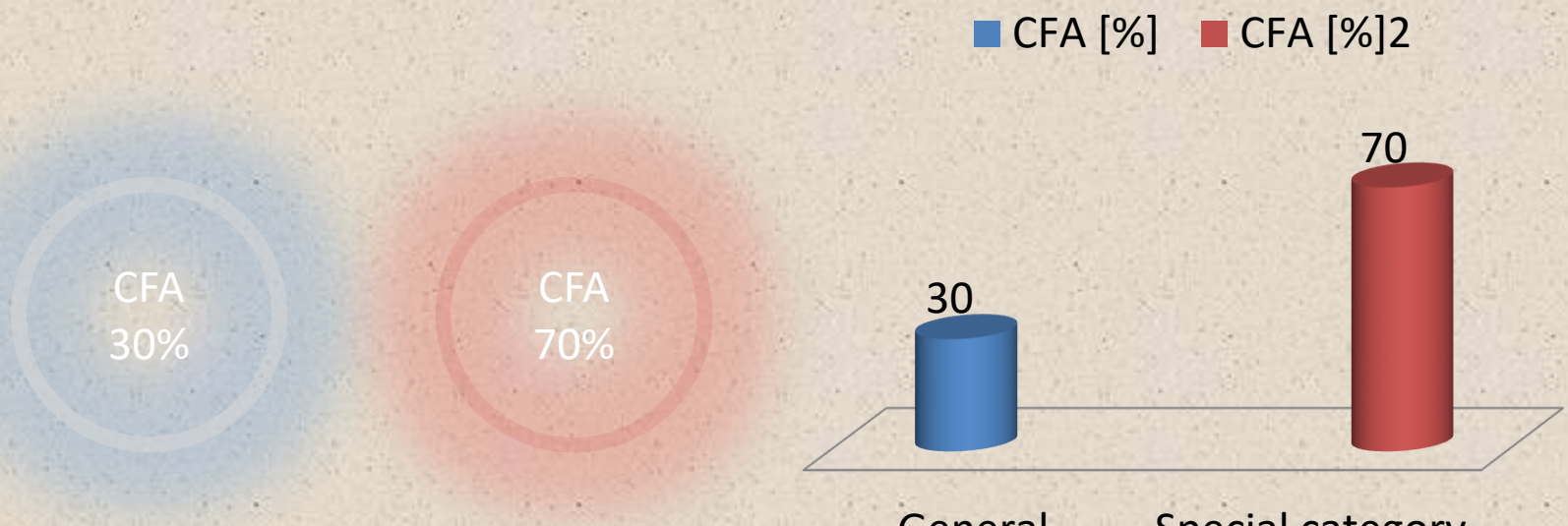
Plant Load Factor [PLF/ PR] not less than– 75%
Capacity Utilisation Factor [CUF] not less than- 15%
Solar power plant tariff period - 25 years
Maximum depreciation of the capital cost-90%
Stabilization period shall not be more than 6 months
The auxiliary power consumption factor shall be 10% for the determination of tariff
Normative 0&M expenses allowed to escalate at the rate of 5.72% per annum
Solar power plant tariff period - 25 years



केन्द्रीय विद्युत विनियामक आयोग

Source: CENTRAL ELECTRICITY REGULATORY COMMISSION

Understanding roof top solar : Subsidy



Institutional buildings

- ✓ Universities
- ✓ Schools
- ✓ Hospitals
- ✓ Medical colleges

Social sector buildings

- ✓ Community centers
- ✓ Welfare homes
- ✓ orphanages
- ✓ Trusts, NGOs & voluntary organizations

All types

Understanding roof top solar :Non- Subsidy

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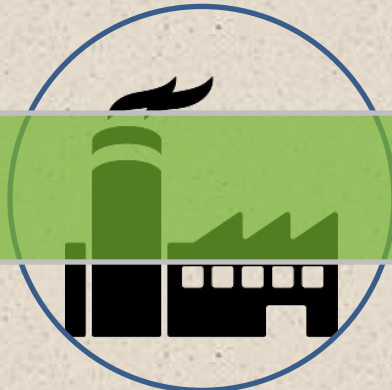
- Private Building

- Commercial Building

- Commercial Building



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RETURN OF INVESTMENT ROI

Calculation

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Plant Capacity (kWp)		250	Proposed
Minimum Annual Generation/kWp		1450	as per PV Syst
Annual Degradation from 2nd Year		1%	Standard
Applicable Tariff		7.11	Please Put the Value
Tariff Escalation		3%	Historical Data-Assumption
Investment (INR)		₹14,000,000.00	
Year	Generation	Savings	
1	362500	2577382.204	
2	362500	2706251.314	
3	358875	2679188.801	
4	355250	2652126.288	
5	351625	2625063.775	ROI on 6th year of operation
6	348000	2598001.262	
7	344375	2570938.749	
8	340750	2543876.235	
9	337125	2516813.722	
10	333500	2489751.209	

TAB: 01

Big saving

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250 kWp Sample plant

refer tab: 01

- 1st year 18%
- 2nd year 38%
- 3rd year 57%
- 4th year 76%
- 5th year 95%
- 6th year 113 %

Who we are?

Who we are?

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Deep expertise and 7-year track record in consulting, engineering, system integrator and solutions provider.

Delivers reliable, dependable, and cost effective solar PV energy solutions to our customers

Provides ecofriendly PV solutions which generate more energy at a competitive cost with the smallest environmental impact.

We are committed to sustainable SPV plant and responsible code of practices and standards and maximizes the overall plant life cycle.

Achievement Ladder

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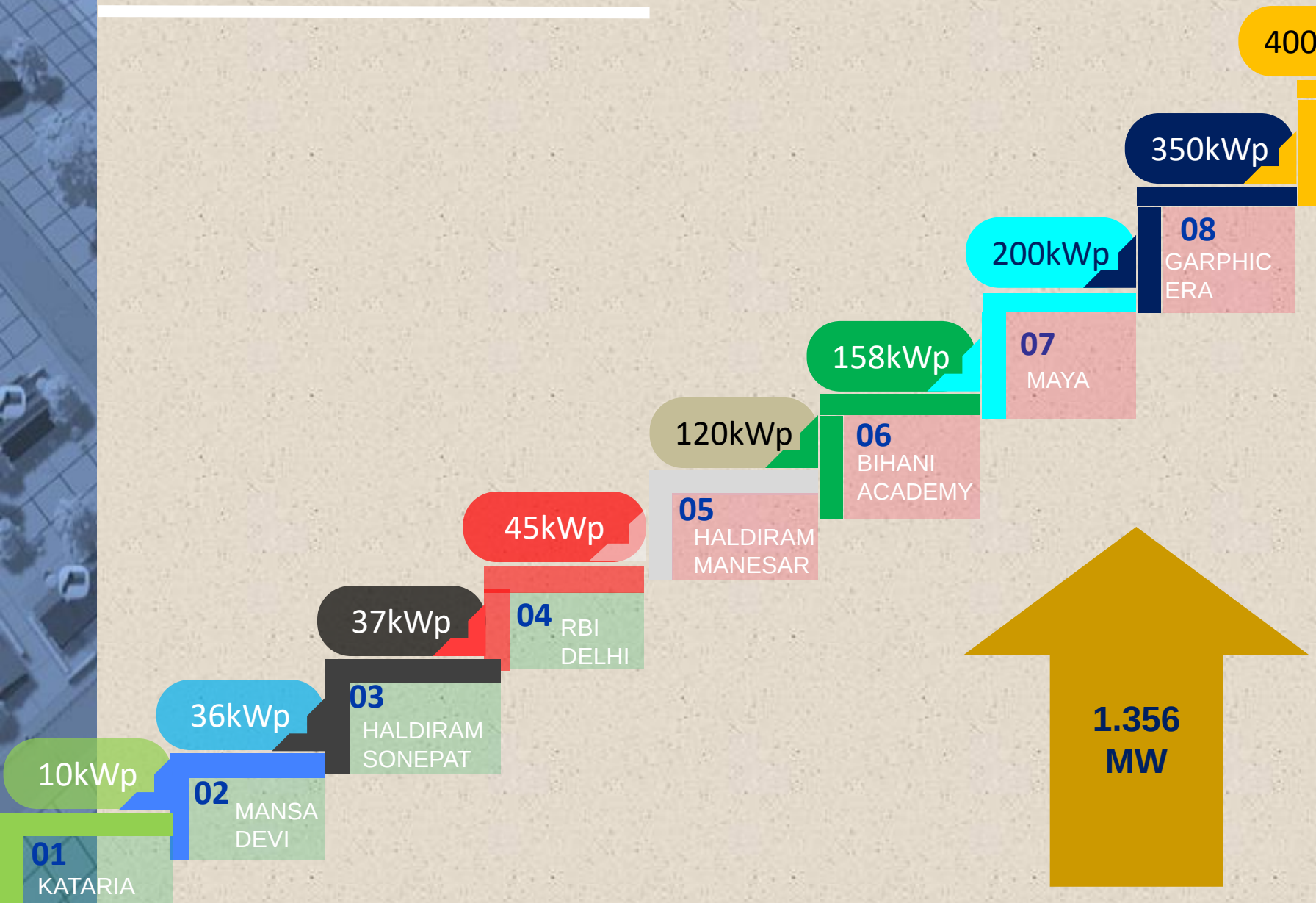
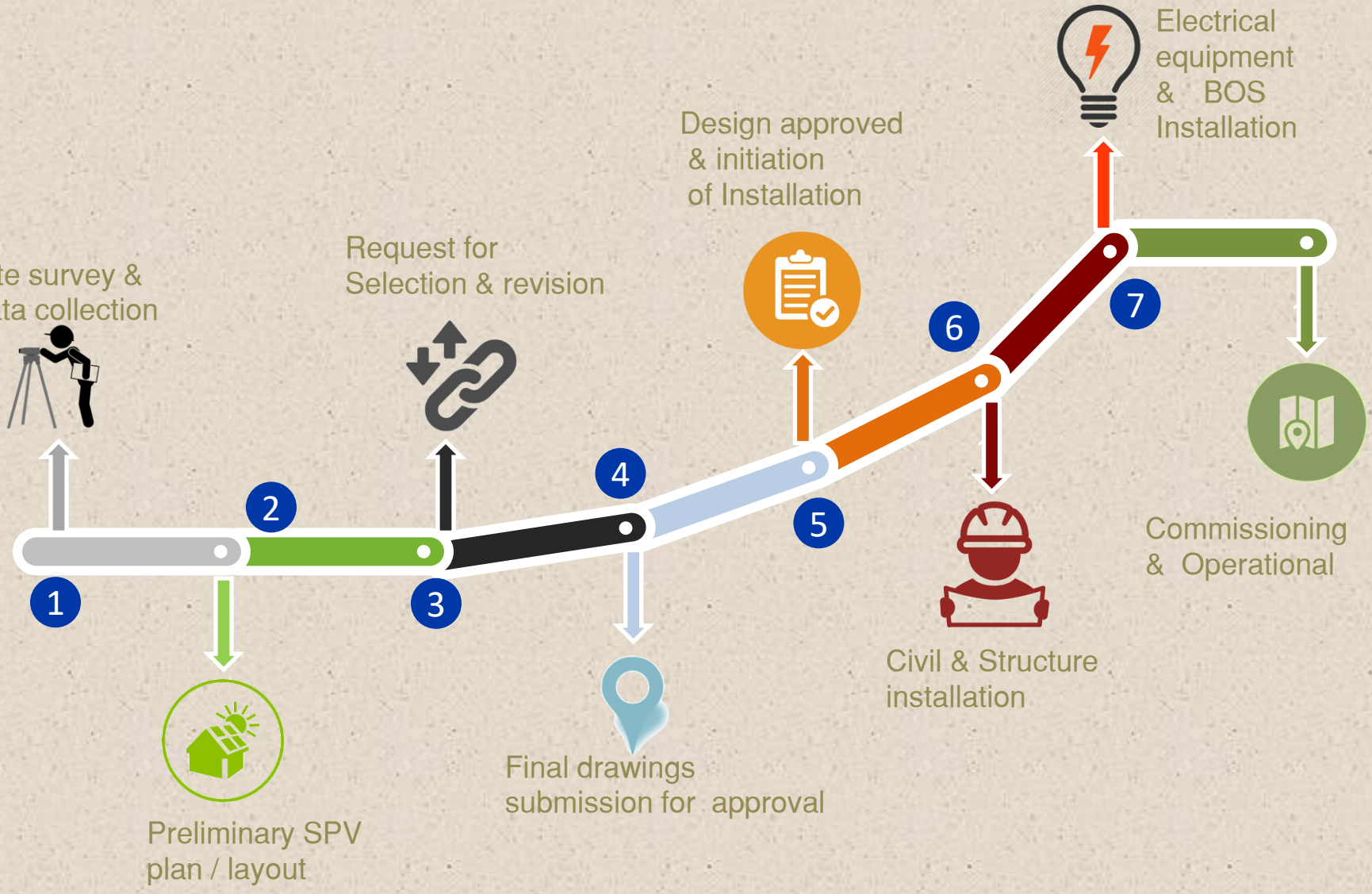


PROJECTS

Project Road Map



45kWp roof top solar PV power plant, New Delhi.

Off taker-RBI

- Scope of work: turnkey EPC
- Commissioned: Nov. 2017
- Module: Polycrystalline [Vikram Solar]
- Inverter: Delta`

Location:
- RBI vasant vihar
- RBI RK puram

Performance Data:

- Approx. Annual generation-16314kWh
- First year annual Performance Ratio [PR] as per IEC 61724- 78.6%

10kWp roof top solar PV power plant, Haryana.

- Scope of work: turnkey EPC
- Commissioned: Feb 2018
- Module: Polycrystalline [Vikram Solar]
- Inverter: Delta

Location:
- Mayfield Garden

Performance Data:

- Approx. Annual generation-15078kWh
- First year annual Performance Ratio [PR] as per IEC 61724- 78.5%

36kWp roof top solar PV power plant, Panchkula.

- Off taker: Mansa Devi Society
- Scope of work: turnkey EPC
- Commissioned: Feb 2018
- Module: Polycrystalline [Vikram Solar]
- Inverter: Hauwei

Location:
- Mansa Devi Complex, Panchkula.

Performance Data:

- Approx. Annual generation-50667kWh
- First year annual Performance Ratio [PR] as per IEC 61724- 79.3%

157kWp roof top solar PV power plant, Sonepat.

Off taker: Haldiram

- Scope of work: turnkey EPC
- Commissioned: Jan & Feb 2018:
- Module: Polycrystalline [Sova Solar]
- Inverter: Sungrow

Location:

- Haldiram, Manesar
- Haldiram, sonepat

Performance Data:

- Approx. Annual generation-51630kWh
- First year annual Performance Ratio [PR] as per IEC 61724-75%

400kWp roof top solar PV power plant, Dehradun.

Off taker: DIT

- Scope of work: turnkey EPC
- Commissioned: Feb 2018

- Module: Polycrystalline
- Inverter: Sungrow

Location:
- DIT, Dehradun

Performance Data:

- Approx. Annual generation-
- First year annual Performance Ratio [PR] as per IEC 61724-

350kWp roof top solar PV power plant, Dehradun.

Off taker: Graphic Era

- Scope of work: turnkey EPC
- Commissioned: Feb 2018

- Module: Polycrystalline
- Inverter: Sungrow

Location:
- Graphic Era, Dehradun

Performance Data:

- Approx. Annual generation-
- First year annual Performance Ratio [PR] as per IEC 61724-

200kWp roof top solar PV power plant, Rajasthan.

Off taker: Bihani Children's Academy

- Scope of work: turnkey EPC
- Commissioned: Jan 2018

- Module: Polycrystalline
- Inverter: Sungrow

Location:
- Ganga Nagar

Performance Data:

- Approx. Annual generation-
- First year annual Performance Ratio [PR] as per IEC 61724-

CHALLENGES

SOLAR POWER PLANT **CHALLENGES**

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- Cleaning dust on modules- AI state of the art 
- Automation, monitoring, SCADA, validation and alerting for various severities 
- Power backflow- backup unit & grid 
- Cloud on a specific module/ or array location- fluctuation 
- Solar eclipse- power generation fluctuation & grid unbalance 
- Transfer overheating due to fan cut-down 

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Thanks for Watching