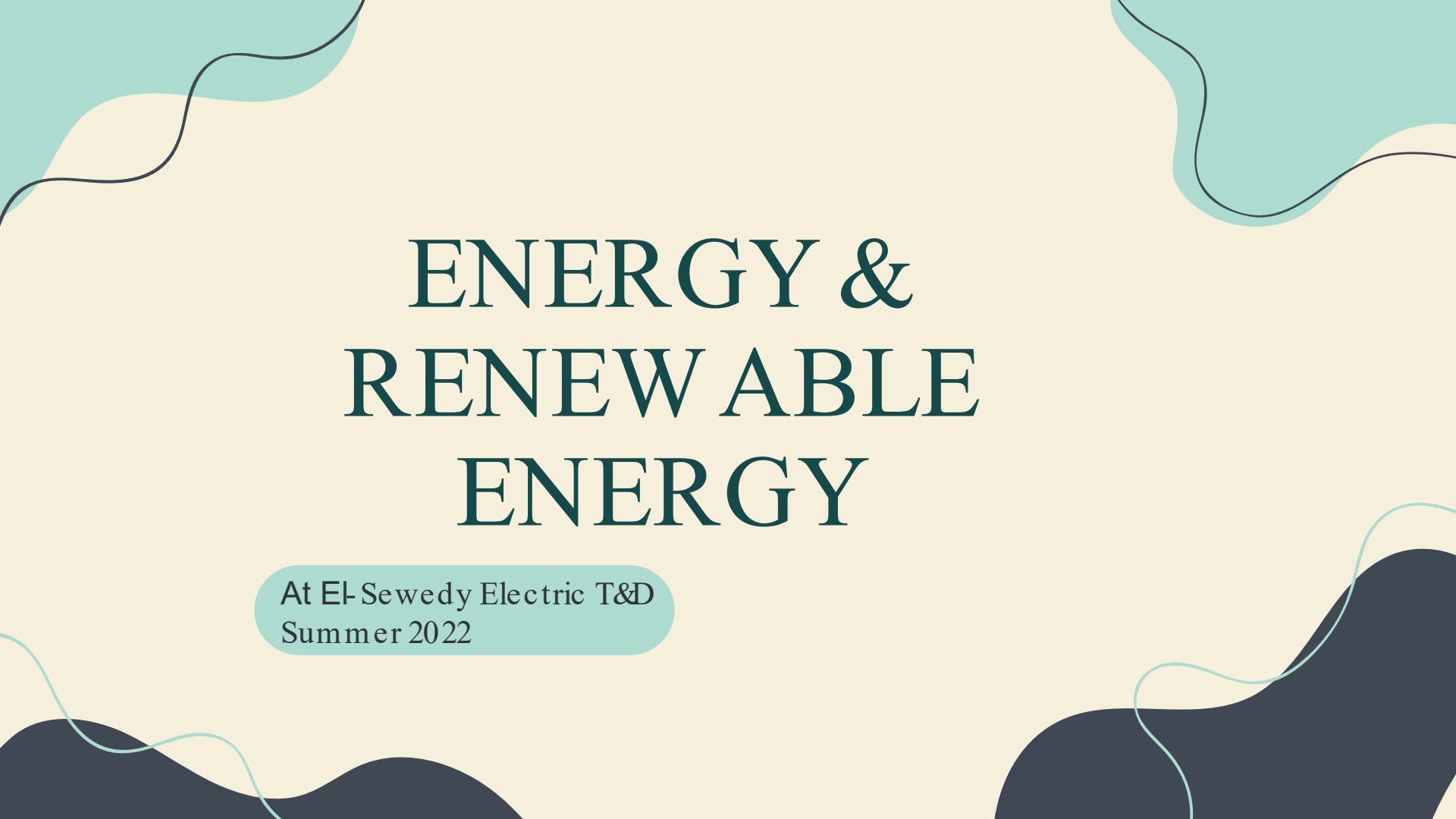




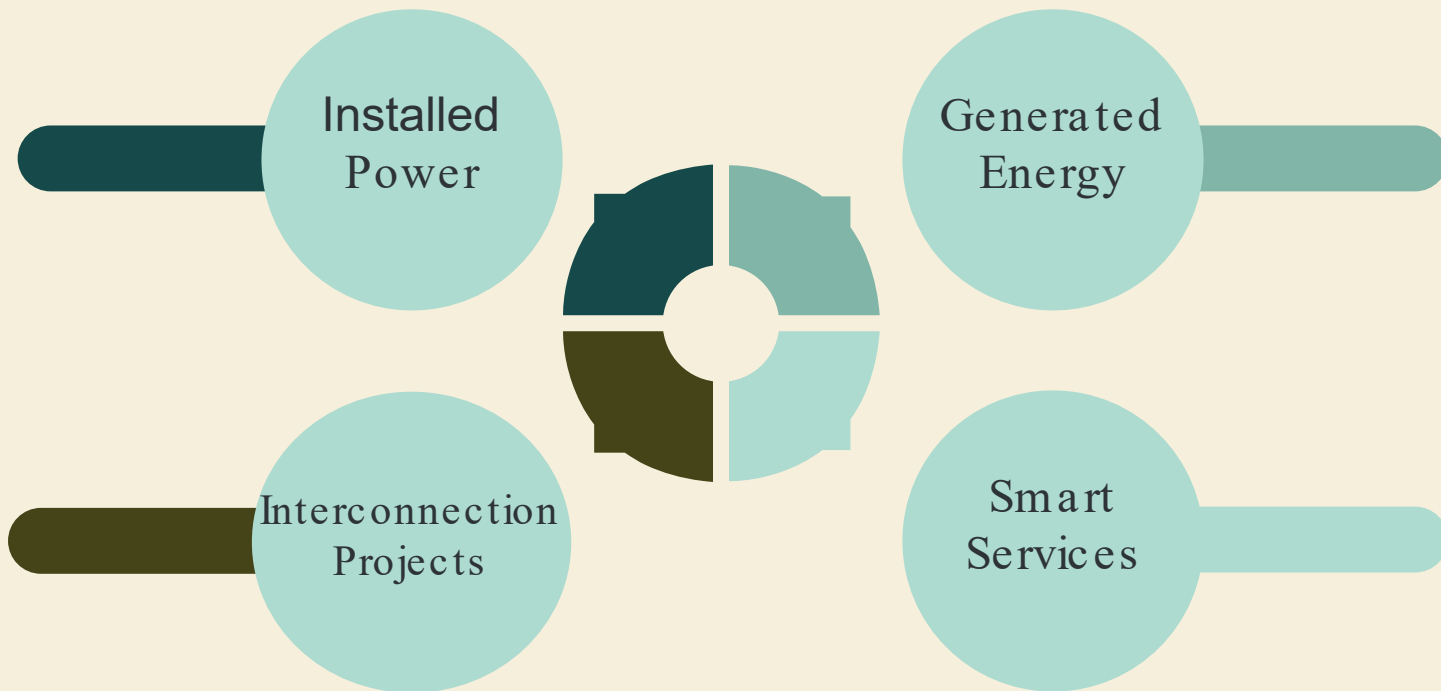
ENERGY & RENEWABLE ENERGY

At El-Sewedy Electric T&D
Summer 2022

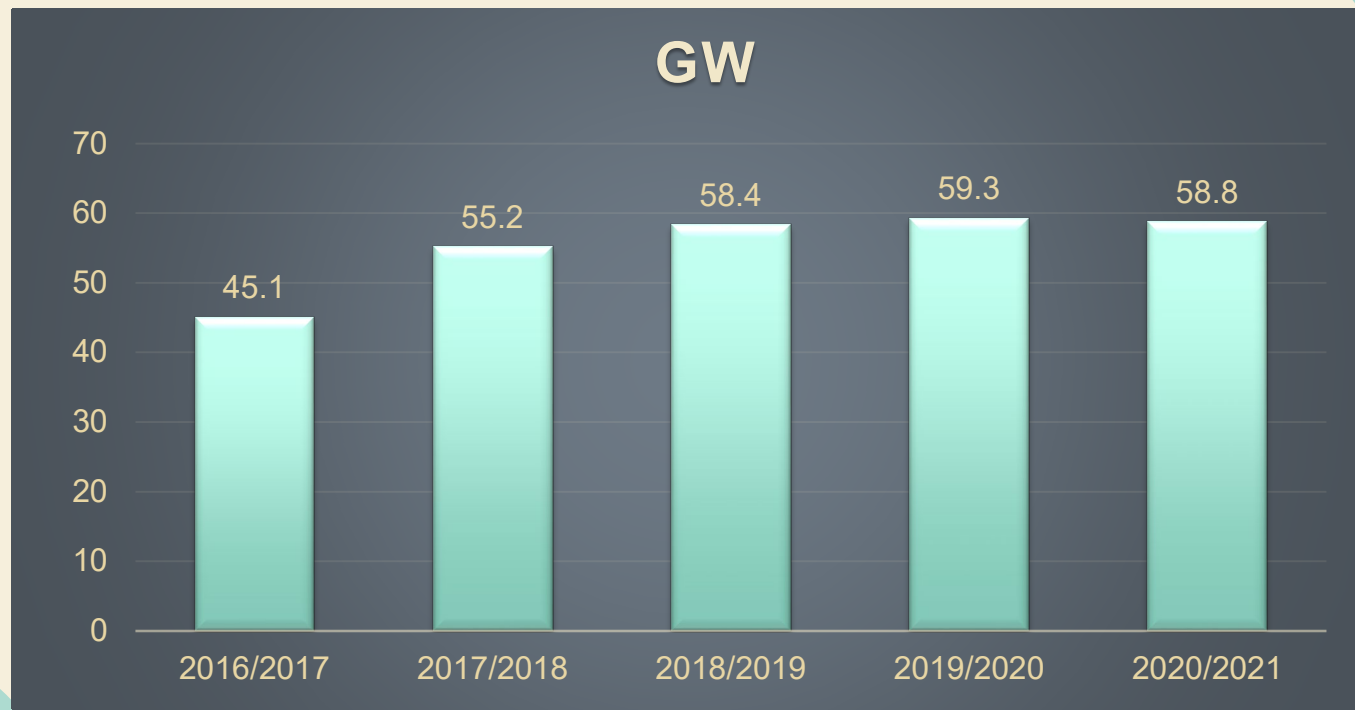
Energy in Egypt

4

Main Points



Total Installed Power



Energy Mix

01

Thermal

51 GW

02

Renewable

3.1 GW

03

Hydro

2.8 GW

04

Private sector

2.1 GW

Powerplants for Energy Mix

Thermal

• Beni Suef	(4800 MW)	Talkha	(1345 MW)
• Burullus	(4800 MW)	Banha	(750 MW)
• New Capital	(4800 MW)	Nubaria	(2250 MW)
• Kuriemat	(1500 MW)	Ka fr El Dawar	(320 MW)
• Upper Egypt	(350 MW)	Damanhour	(430 MW)
• West Assiut	(1500 MW)	Sidi Krir	(1390 MW)
• South Helwan	(1300 MW)	Abo Krir	(2103 MW)

Hydro

• Aswan High Dam	(2100 MW)
• Aswan Low Dam	(592 MW)
• Nagaa Hammadi Dam	(64 MW)
• Esna	(86 MW)
• Assuit	(32 MW)

Renewable

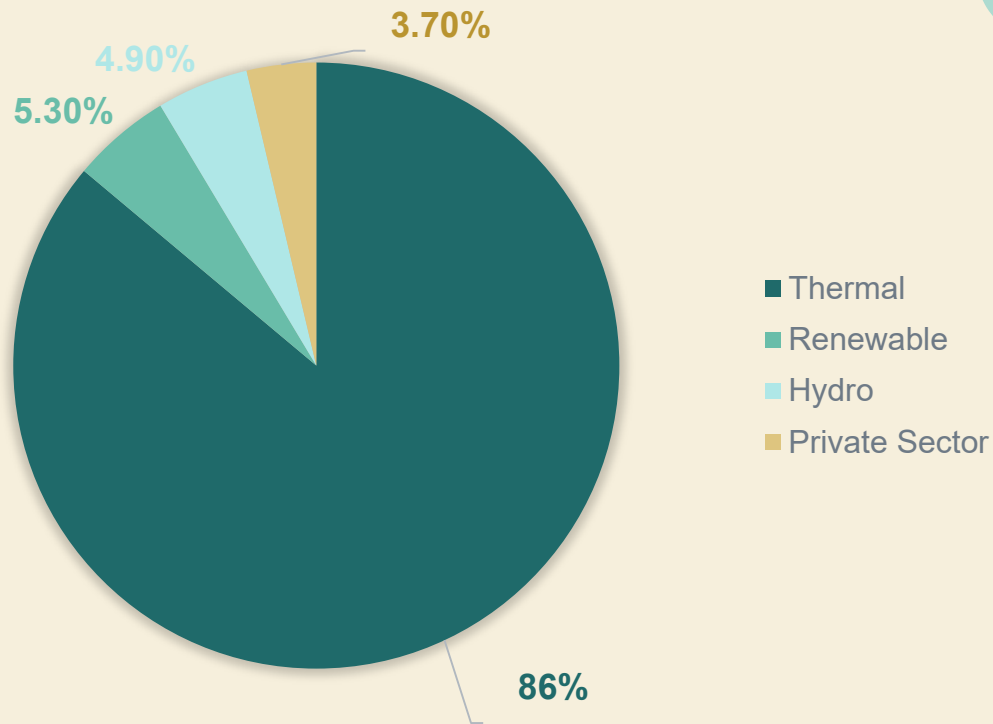
• Benban Solar Park	(980 MW)
• Kuriemat Solar	(140 MW)
• Zafarana Wind	(120 MW)
• 3 Gabal El Zeit	(337 MW)

Private Sector

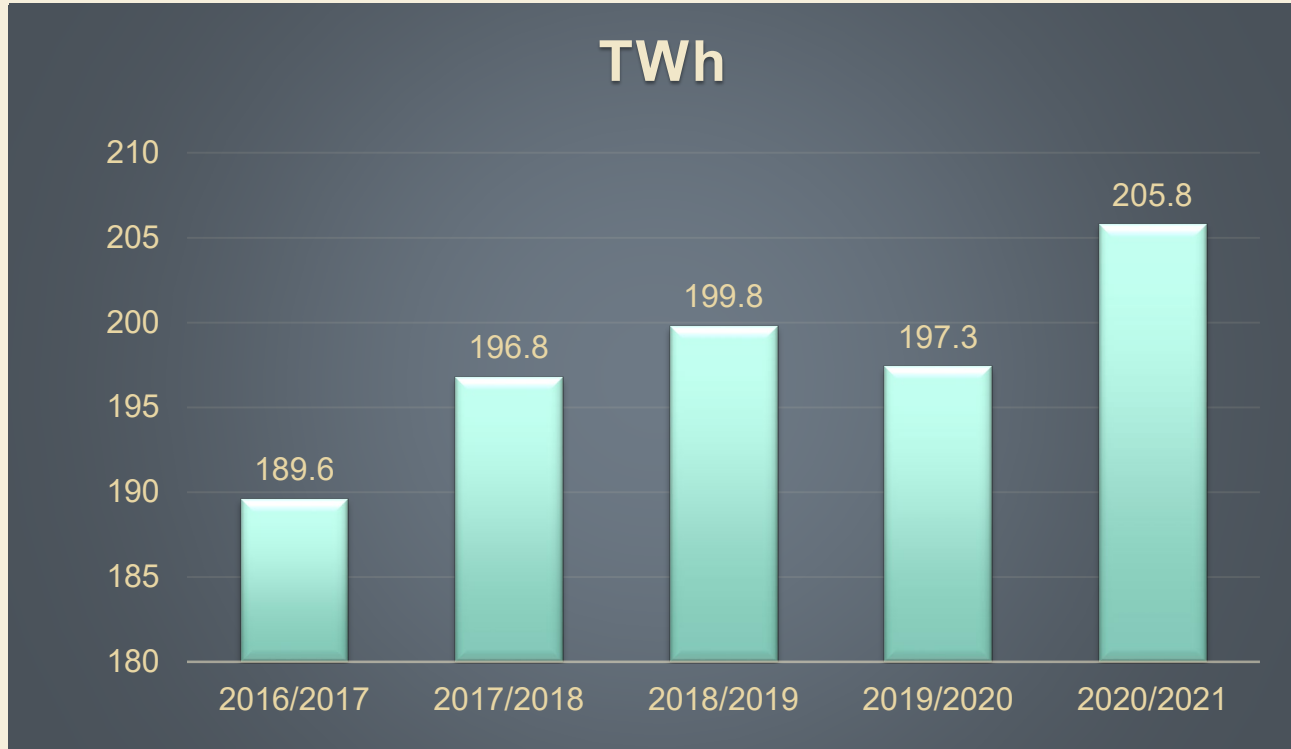
• Sidi Krir	(683 MW)
• Port Said East	(683 MW)
• Suez Gulf	(683 MW)

According
to: Egyptrol
2020

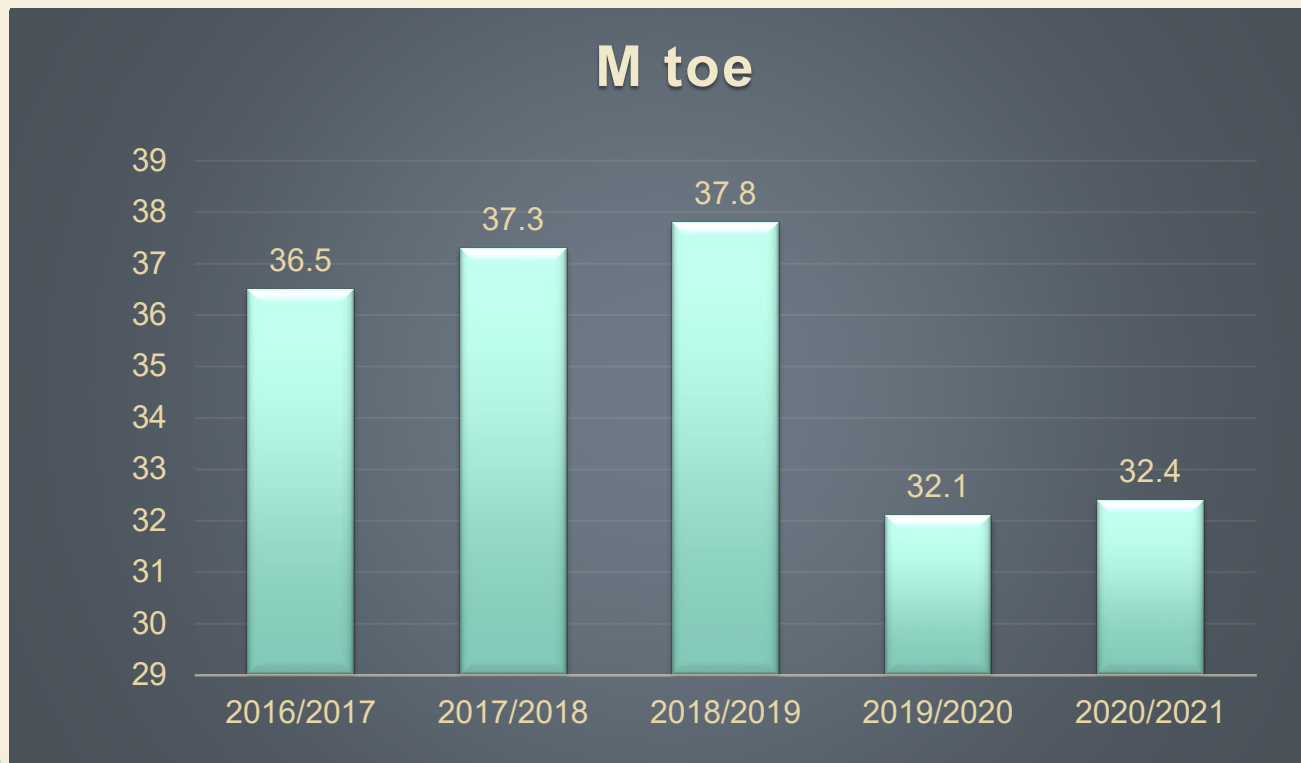
Energy Mix



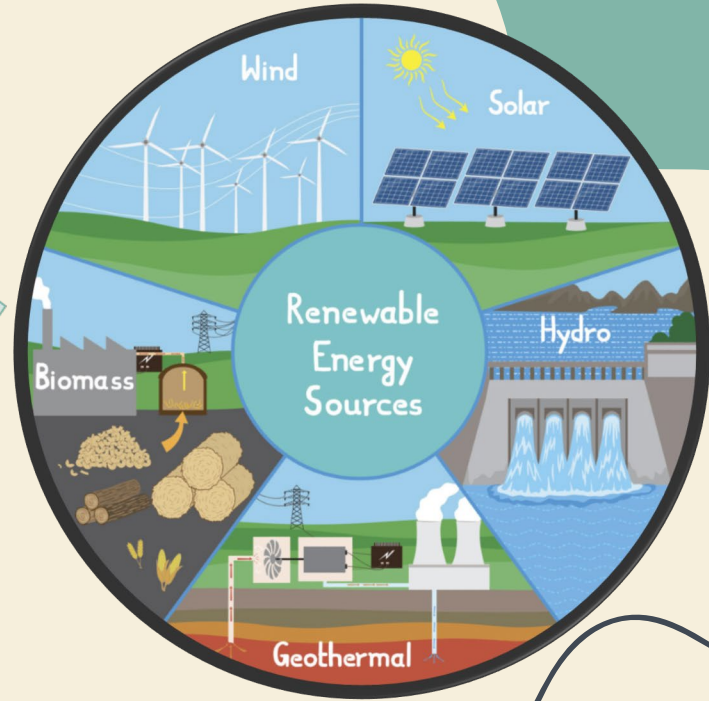
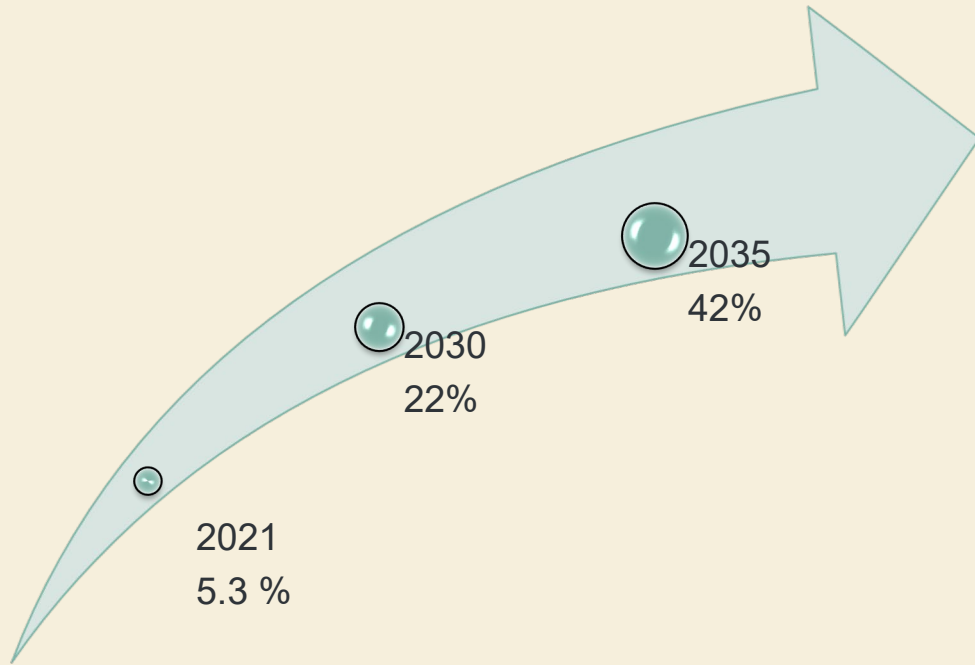
Generated Energy



Total Fuel Consumption

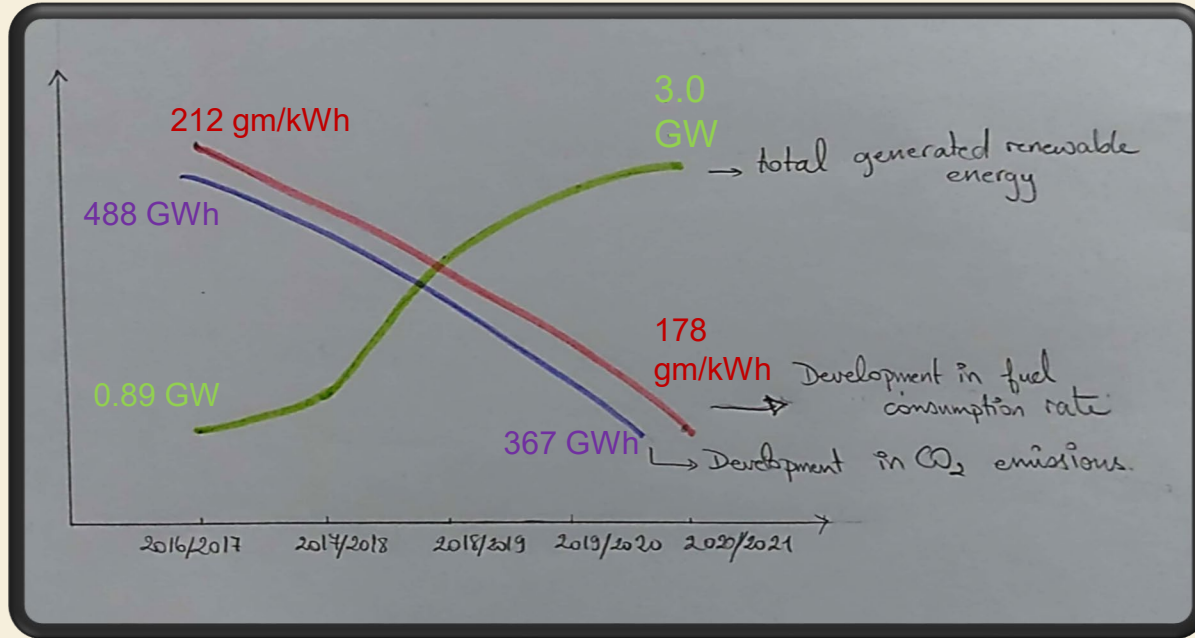


Renewable Energy



According to: International Renewable Energy Agency (IRENA)

In-Sync Curves



Interconnection Projects

Egypt with



Jordan

550 MW to 2000 MW
Feasibility study



Greece

2000 MW
Economical and
technical studies



Saudi Arabia

3000 MW
Operate in 2026

Interconnection Projects

Egypt with



Renewable Energy Projects



P V

El Nowais Group

500 MW

Kom Ombo

Commercial operation at 2023



W i n d

El Nowais Group

500 MW

Suez

Commercial operation at 2023

Smart Services



CID Consultancy

Improve Smart Services



Wasel

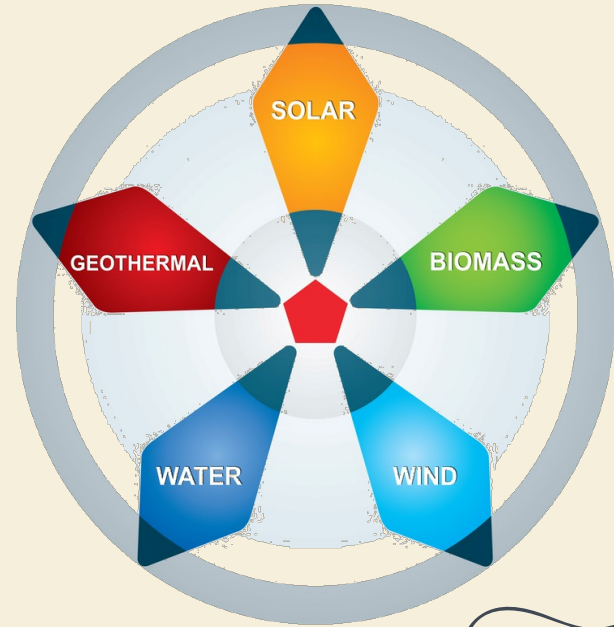
Aid for hearing disabilities' people



Pre - Paid Meters

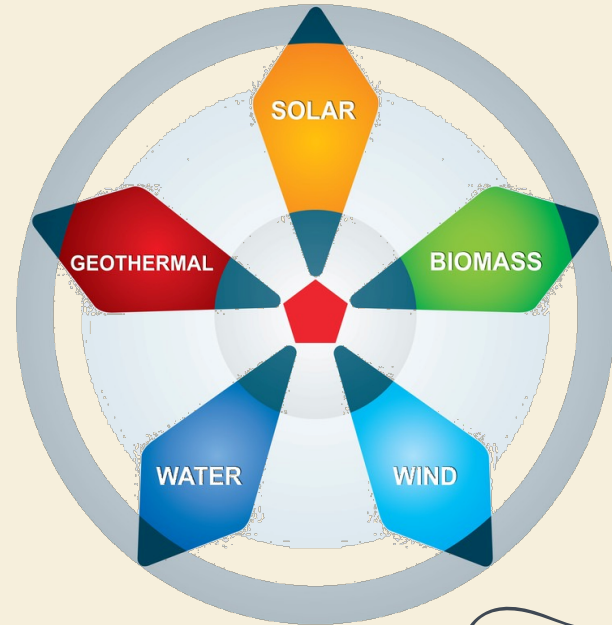
Smart applications

Introduction to renewable energy



Introduction to renewable energy

Renewable energy is generated by sources that can be constantly replenished.



WHY RENEWABLE ENERGY

Health & Environment



Community

Economic

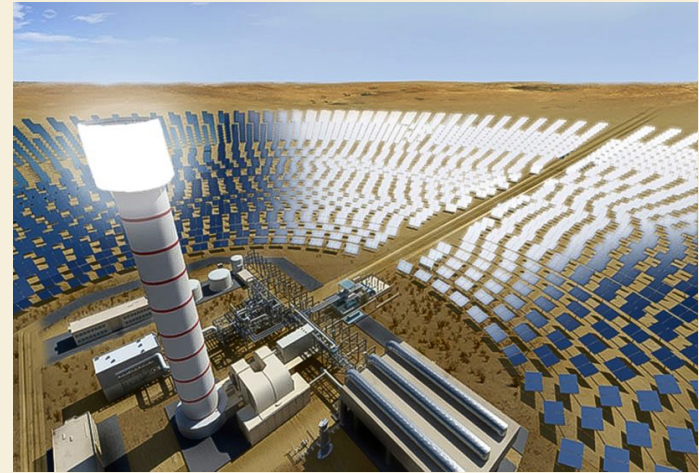


Solar energy

Solar energy is radiant light and heat from the Sun that is harnessed using a range of technologies such as solar power to generate electricity



Photovoltaic system



Concentrated solar power

Wind energy

Wind power or wind energy describes the process by which the wind is used to generate mechanical power or electricity.



horizontal axis wind
turbine



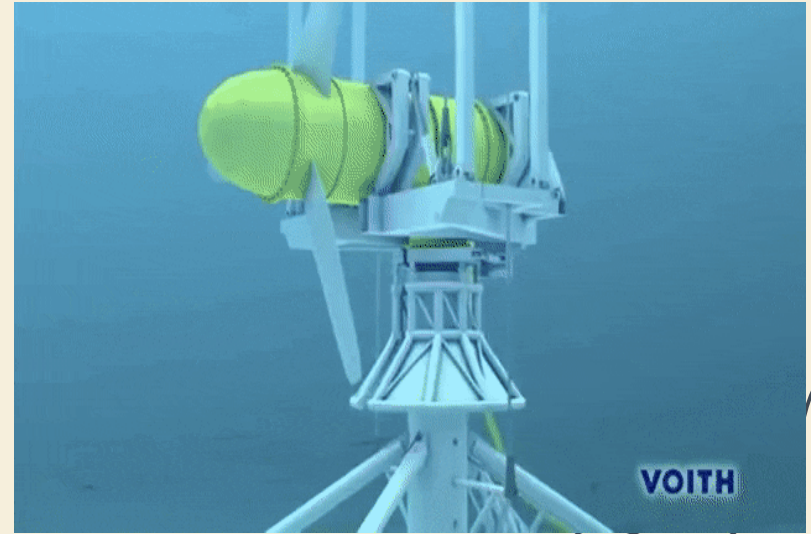
vertical axis wind
turbine

Hydropower energy

Hydropower uses moving water to generate electricity



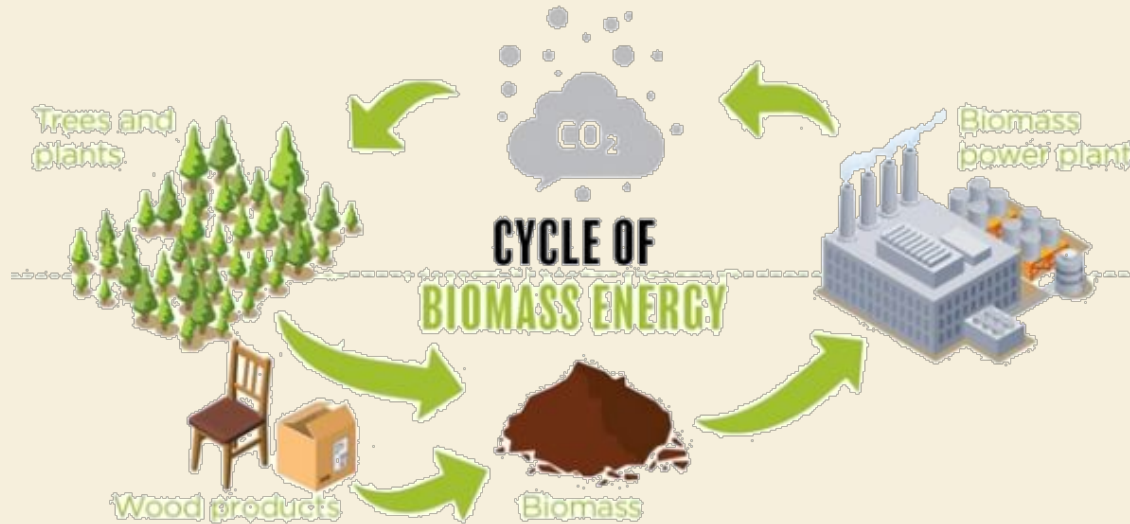
Dams



Tidal type

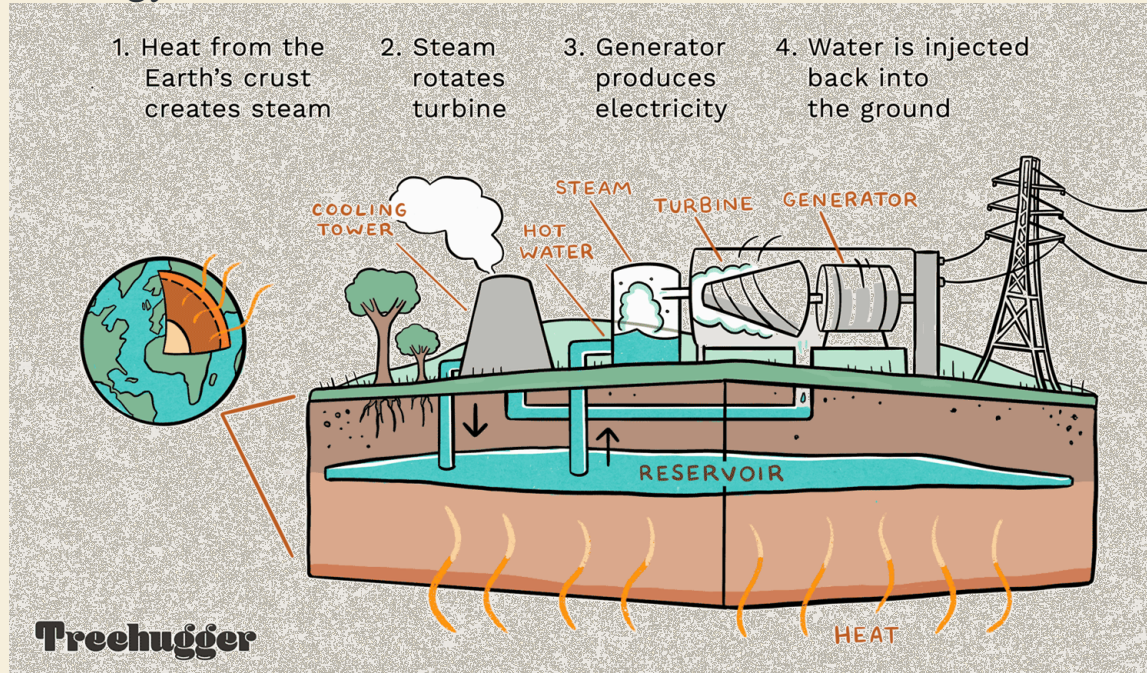
Biomass

Biomass is a renewable energy source because we can always grow more trees and crops, and waste will always exist.



Geothermal energy

Geothermal energy is heat derived within the sub-surface of the earth.



Applications of PV

1

Off-Grid domestic

2

Off-Grid non-domestic

3

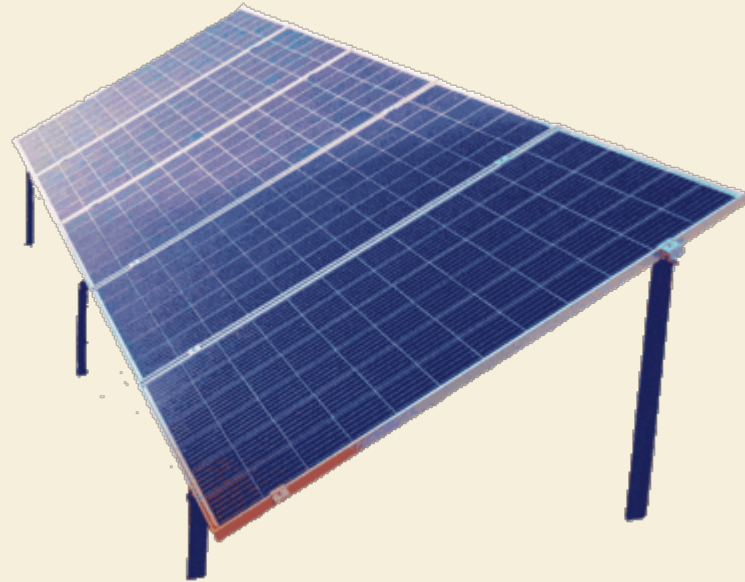
Grid-connected
distributed PV

4

Grid-connected
centralized PV

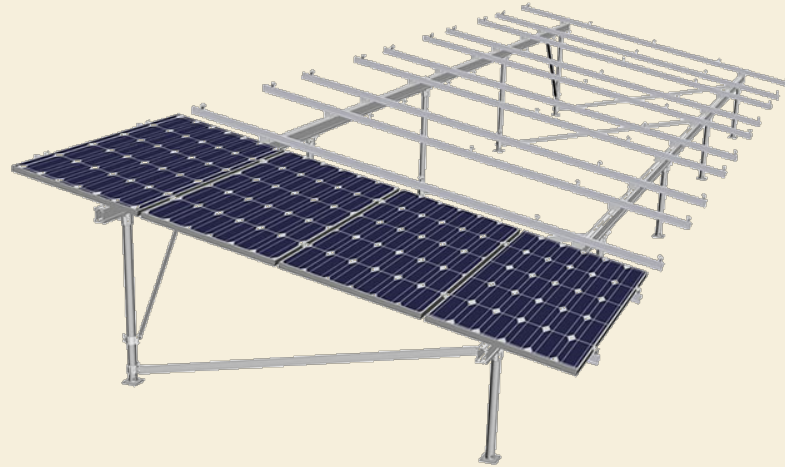
Main Components of PV power plant

Solar PV module



Main Components of PV power plant

Module Mounting
(Fixed) or tracking
systems



Main Components of PV power plant

String Inverter



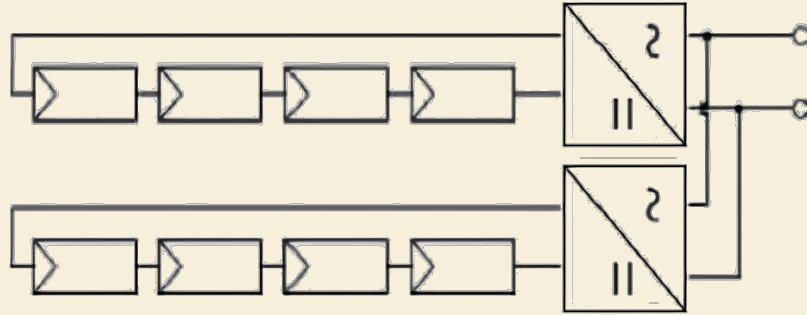
Or

Central Inverter

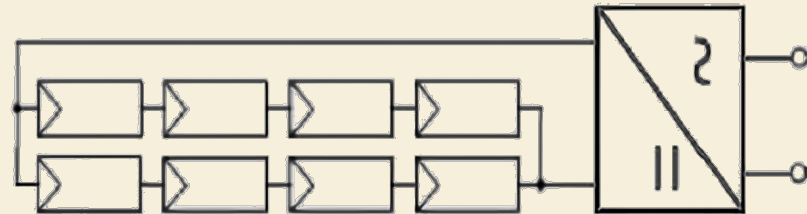


Inverter interconnection concepts

String Inverter

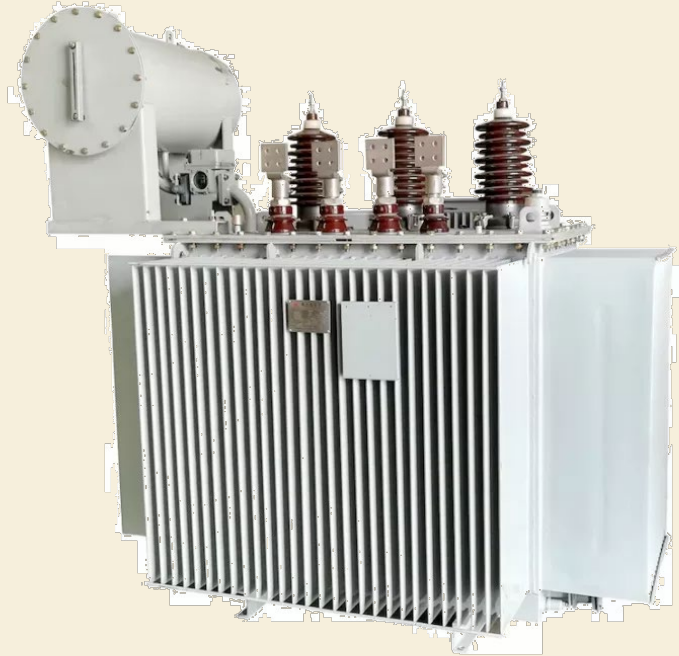


Central Inverter



Main Components of PV power plant

Step up transformer



Main Components of PV power plant

The Grid connection
interface
(Substation)



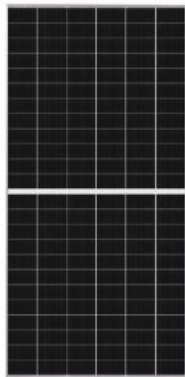
72M HC 520-540 Watt

MONOCRYSTALLINE MODULE

Positive power tolerance of 0~+3%

ISO9001:2015, ISO14001:2015, ISO45001:2018
certified factory.

IEC61215, IEC61730, certified products.



KEY FEATURES



Multi Busbar Solar Cell

MBS solar cell adopts new technology to improve the efficiency of modules, offers a better aesthetic appearance, making it perfect for rooftop installation.



PID Resistance

Excellent Anti-PID performance guarantee limited power degradation for mass production.



Higher Lifetime Power Yield:

0.55% annual power degradation
25 year linear power warranty



Low-light Performance

Advanced glass and cell surface textured design ensure excellent performance in low-light environment.



Severe Weather Resilience

Certified to withstand: wind load (2400 Pascal) and snow load (5400 Pascal).

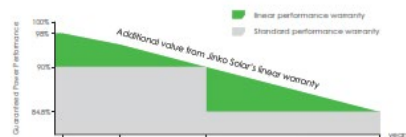


Durability Against Extreme Environmental Conditions

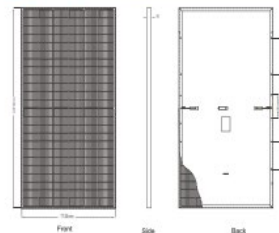
High salt mist and ammonia resistance certified by TUV NORD.

LINEAR PERFORMANCE WARRANTY

12 Year Product Warranty • 25 Year Linear Power Warranty
0.55% Annual Degradation Over 30 years



Engineering Drawings

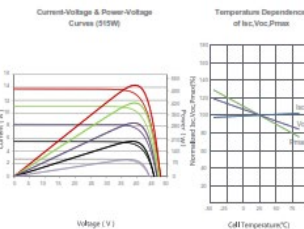


Packaging Configuration

(Two pallets = One stack)

31pcs/pallets, 62pcs/stack, 620pcs/ 40HQ Container

Electrical Performance & Temperature Dependence



Mechanical Characteristics

Cell Type	P type Mono-crystalline
No. of cells	144 (6x24)
Dimensions	2274 × 1134 × 35mm (89.53 × 44.65 × 1.38 inch)
Weight	29.4 kg (64.8 lbs)
Front Glass	5mm Anti-Reflection Coating, High Transmission, Low Iron, Tempered Glass
Frame	Anodized Aluminum Alloy
Junction Box	IP68 Rated
Output Cables	TUV 1~4.0mm² (±) 230mm, (≥) 130mm or Customized Length

SPECIFICATIONS

Module Type	JKM520M-T2H4-V		JKM525M-T2H4-V		JKM530M-T2H4-V		JKM535M-T2H4-V		JKM540M-T2H4-V	
	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT
Maximum Power (Pmax)	520Wp	387Wp	525Wp	391Wp	530Wp	394Wp	535Wp	398Wp	540Wp	402Wp
Maximum Power Voltage (Vmp)	40.47V	37.83V	40.61V	37.78V	40.74V	37.92V	40.88V	38.05V	41.01V	38.19V
Maximum Power Current (Imp)	12.85A	10.25A	12.93A	10.34A	13.01A	10.40A	13.09A	10.45A	13.17A	10.52A
Open-circuit Voltage (Voc)	48.90V	45.24V	49.13V	45.37V	49.26V	45.50V	49.40V	45.63V	49.53V	45.75V
Short-circuit Current (Isc)	13.53A	10.93A	13.61A	10.98A	13.69A	11.06A	13.77A	11.12A	13.85A	11.18A
Module Efficiency STC (%)	20.17%		20.36%		20.55%		20.75%		20.94%	
Operating Temperature(°C)	-40°C~+85°C									
Maximum system voltage	1500VDC (IEC)									
Maximum series fuse rating	25A									
Power tolerance	0~+3%									
Temperature coefficients of Pmax	-0.35%/°C									
Temperature coefficients of Voc	-0.28%/°C									
Temperature coefficients of Isc	0.048%/°C									
Nominal operating cell temperature (NOCT)	45±2°C									

* STC: ☀ Irradiance 1000W/m² ☀ Cell Temperature 25°C ☁ AM=1.5

NOCT: ☀ Irradiance 800W/m² ☁ Ambient Temperature 20°C ☁ AM=1.5

☁ Wind Speed 1m/s

• Power measurement tolerance: ± 3%

Reasons

1

**High
Efficiency**



2

**Higher Life
Span**



3

**Best
performance
in low levels
of sunlight**



Fixed



Single -
axis

Dual -
axis

Mounting
& tracking
systems

Tracking



Plant Performance Parameters

Performance
Ratio

Capacity
Factor

Specific
Yield

Irradiation Types

Global
Horizontal
Irradiation
(GHI)

Direct Normal
Irradiation (DNI)

Diffuse
Horizontal
Irradiation (DHI)

Solar Resource Assessment

1. Satellite Derived Data



Solar Resource Assessment

2. Land Based Measurement

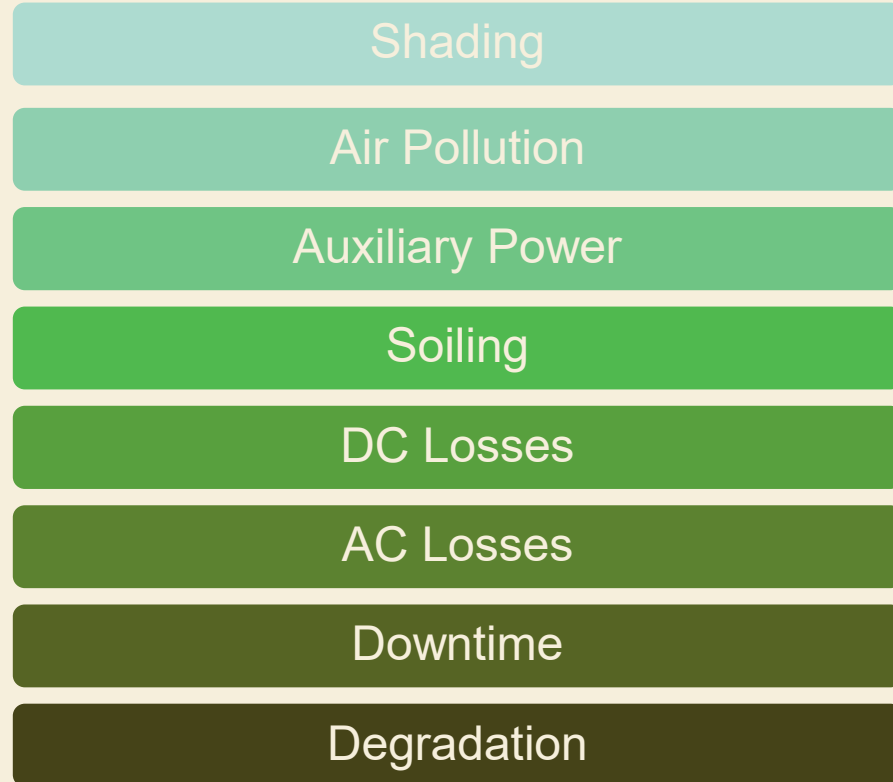


Thermal Pyranometer



Silicon Sensors

Losses in a PV Power Plant



Power Plant Design

DC System

Array of PV modules

DC Cabling

DC Connectors

Junction Boxes

Combiner Boxes

Disconnects/Switches

Protection Devices

Earthing

Selection of PV Modules

Degradation

Nominal Power

Technology

Temperature Coefficient

Selection of Inverters

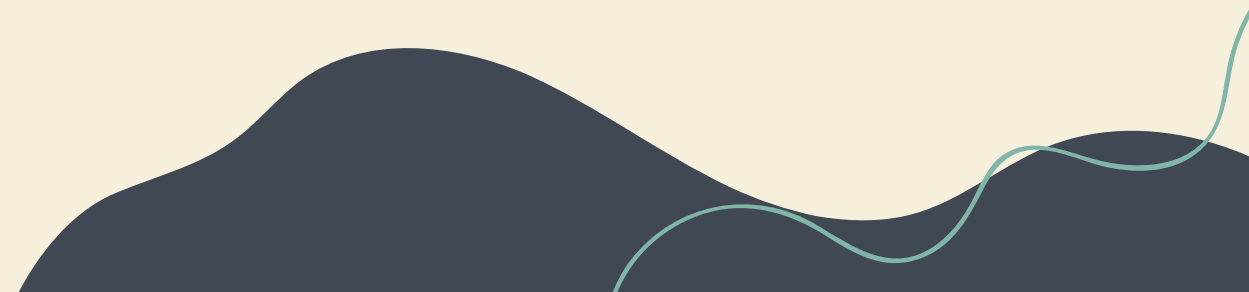
Project Size

THD

Reactive Power

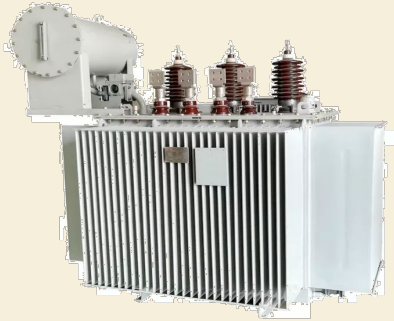
Performance

Installation Location



Cable Selection and Sizing

AC System



Transformer



Switchgear



Substation



Thank You!

Any Questions?

