



Federation of Myanmar Engineering Society

Experience on Large Scale Solar Power Plants

Date- 27-7-2024

**Presented By U SHWE
BE(EP) 1977(Nov) PE 0063(BS)
ACPE 00700/MM
Fed-Mes Member – 020646 – M/EP**

TYPE OF SOLAR SYSTEM

GROUND MOUNTED FIXED TYPE SOLAR SYSTEM

GROUND MOUNTED HORIZONTAL SINGLE AXIS SOLAR TRACKING SYSTEM

GROUND MOUNTED DUAL AXIS SOLAR TRACKING SYSTEM

FLOATING MOUNTED SOLAR SYSTEM (FIXED TYPE)

ROOF TOP SOLAR SYSTEM

GROUND MOUNTED FIXED TYPE SOLER SYSTEM



GROUND MOUNTED HORIZONTAL SINGLE AXIS SOLAR TRACKING SYSTEM



GROUND MOUNTED DUAL AXIS SOLAR TRACKING SYSTEM



FLOATING MOUNTED SOLAR SYSTEM



ROOF TOP SOLAR SYSTEM



Solar power generation Projects



1.30MW SOLAR POWER PLANT GROUND MOUNTED HORIZONTAL SINGLE AXIS SOLAR TRACKING SYSTEM
Strings Inverters

2.20MW SOLAR POWER PLANT GROUND MOUNTED HORIZONTAL SINGLE AXIS SOLAR TRACKING SYSTEM
Strings Inverters

3.30MW SOLAR POWER PLANT GROUND MOUNTED HORIZONTAL SINGLE AXIS SOLAR TRACKING SYSTEM
with 13.761MWh BESS
Central Inverters

4.30MW SOLAR POWER PLANT GROUND MOUNTED HORIZONTAL SINGLE AXIS SOLAR TRACKING SYSTEM
with 13.758 MWh BESS
Strings Inverters

30MW GROUND MOUNTED SOLAR POWER PLANT

Project 1



Naypyitaw

January 15, 2023

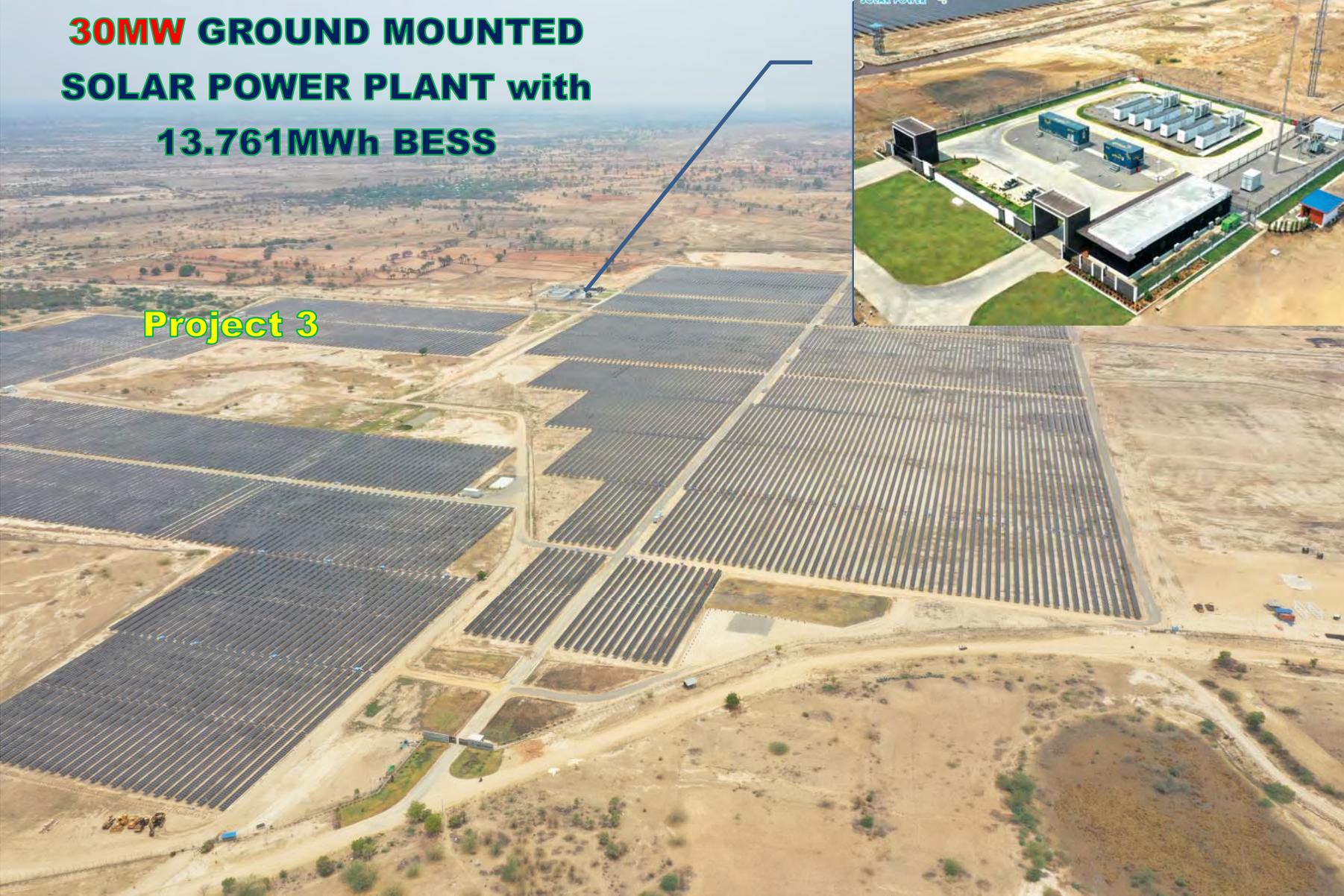
20MW GROUND MOUNTED SOLAR POWER PLANT

Project 2



**30MW GROUND MOUNTED
SOLAR POWER PLANT with
13.761MWh BESS**

Project 3





**30MW GROUND MOUNTED
SOLAR POWER PLANT with
13.761MWh BESS**

Project 4



Important Points for Engineering

- (1) Geographic Location (N, E)
- (2) Weather condition
- (3) Solar Energy Resources
- (4) System Voltage
- (5) Capacity limitation of regional Substation.
- (6) Install Capacity (A C)
- (7) Install Capacity (D C)
- (8) Geotechnical Information
- (9) Project area preparing of design requirement
- (10) Electrical Design Standards
- (11) Selection of main equipment
- (12) Solar Panel arrangement
- (13) Power House

- (14) Transmission Line**
- (15) Receiving Main Power Station**
- (16) Solar Control System**
- (17) Testing sequences and power energizing to Box-type transformer**
- (18) How to Synchronize Solar power generating to Grid system**
- (19). How to control entire Solar Power generation system**
- (20) Bracket type selection of Photovoltaic Array depends on fixed or tracker**
- (21) BESS(Battery Energy Storage System)**
- (22) Battery Rack Container Construction Images**
- (23) SCADA Home screen and Monitoring Screens**
- (24) Other System in Solar plants**
- (25) Implementations and Construction Process**

Important Points for Engineering

(1) Geographic Location (N, E)

Project (1)

(20° 58' 39.33"N, 96° 0' 45.20"E)

Project (2)

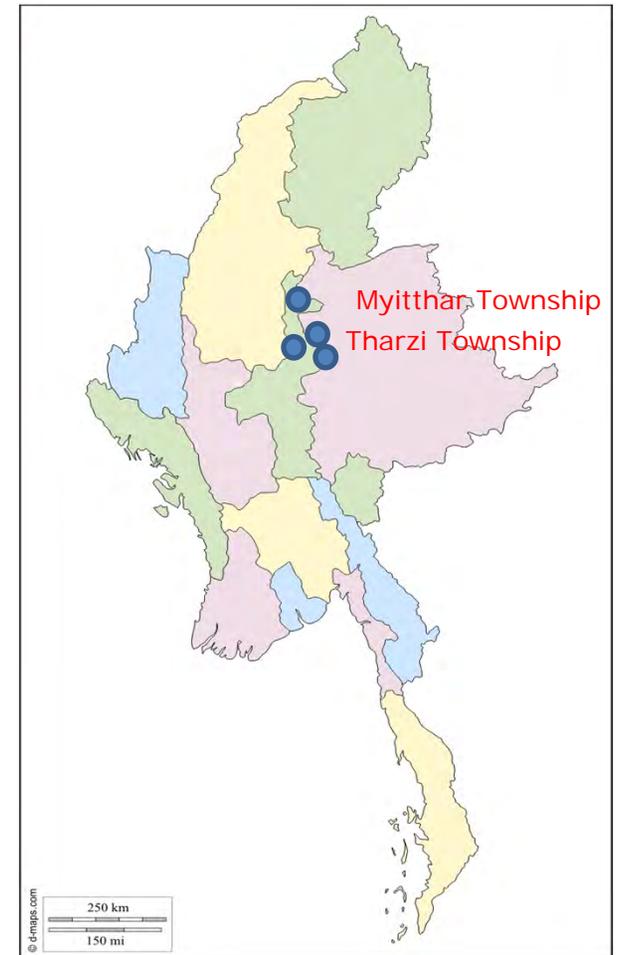
(21° 30' 10" N, 96° 14' 56" E)

Project (3)

(20° 98' 10" N, 96° 02' 56" E)

Project (4)

(20° 51' 33.8" N, 96° 03' 21.04" E)



(2) Weather condition

Weather Station (project 1)



Weather Station (project 2)



Weather station

- Global horizontal irradiance (GHI)
- Plane of the array irradiance (POA)
- Ambient temperature
- Wind direction and wind speed
- Humidity
- Atmospheric pressure, etc.

Weather Status Show on SCADA system

DSE8000
Monitoring
System

The main
wiring diagram

Communication
Status

Page index

Five Preventior input/exit
x

Eliminate Flash

Wind direction	352.00 °	
Wind speed	20.70 m/s	
2-minute wind speed	16.40 m/s	
10 minute wind speed	10.50 m/s	
rainfall	0.00 mm	
Ambient temperature	30.10 °C	
Maximum temperature	37.10 °C	
Minimum temperature	25.90 °C	
Ambient humidity	60.00 %RH	
Dew point temperature	21.60 m/s	
Pressure	990.60 hPa	
Horizontal total radiation	0.00 W/m ²	
Tilted total radiation	0.00 W/m ²	
Anti total radiation	0.00 W/m ²	
Total horizontal daily	-86.78 MJ	
Total daily accumulation of tilt	113.94 MJ	
Daily accumulation of anti radiation	-79.76 MJ	
Total monthly accumulation of horizontal	3845.00MJ	
Total monthly accumulation of tilt	4701.00MJ	
Monthly accumulation of anti radiation	1230.00MJ	
Total annual accumulation of horizontal	3845.00 MJ	
Total annual accumulation of tilt	4701.00 MJ	
Annual accumulation of anti radiation	1230.00 MJ	
Daily radiation	0.00 W/m ²	
Scattered radiation	0.00 W/m ²	
Daily accumulation of direct radiation	6.15 MJ	
Daily accumulation of scattered radiation	10.39 MJ	
Monthly accumulation of scattered radiation	117.00 MJ	
Monthly accumulation of scattered radiation	275.00 MJ	
Annual accumulation of radiation	1425.00 MJ	
Annual cumulative of radiation	1333.00 MJ	
Sunshine hours	5.00 h	
Back temperature	28.60 °C	

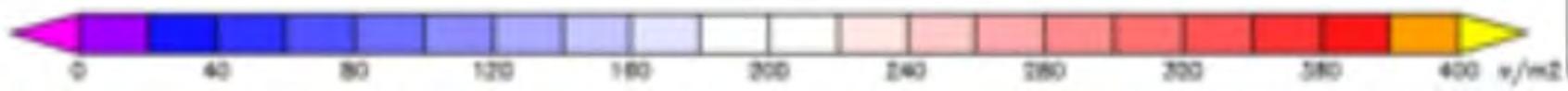
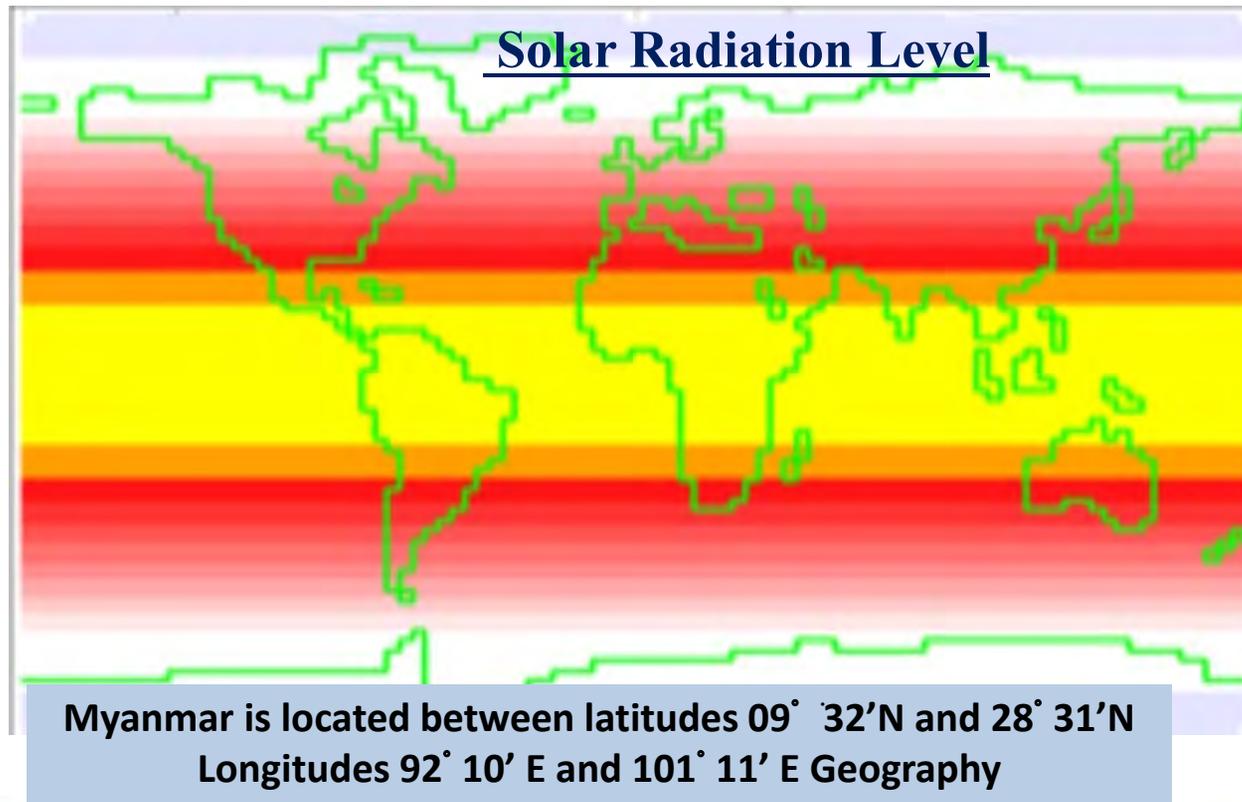
Output area

All

Tag	Document
<input type="checkbox"/>	000000-
<input type="checkbox"/>	000000-

(3) Solar Energy Resources

Study about annual average horizontal global radiation and diffuse radiation of project area.

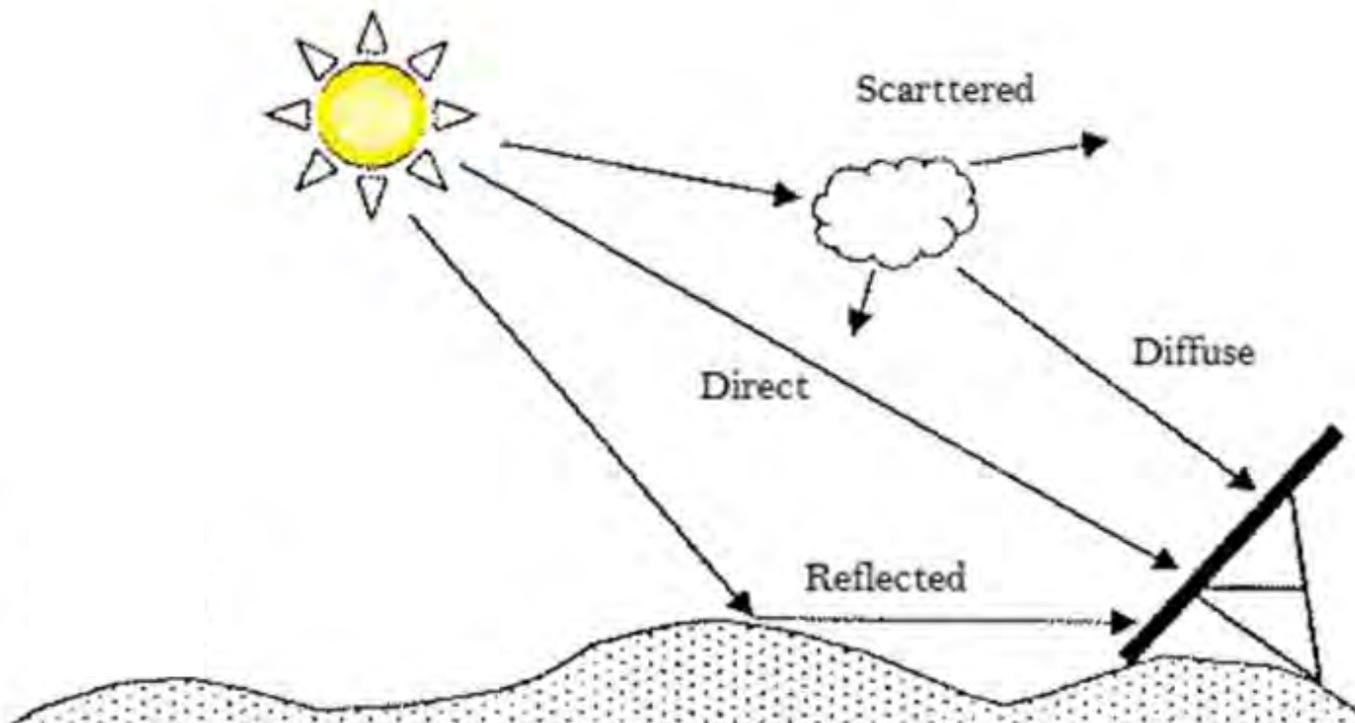


Monthly Average Solar Radiation Level at project site(project 1)

	Global Horizontal (kWh/m ²)	Diffuse Horizontal (kWh/m ²)	T_Amb °C
January	147.40	42.04	21.68
February	144.2	52.15	23.79
March	172.1	71.13	27.64
April	178.0	83.14	30.82
May	178.5	91.68	29.11
June	163.0	91.74	27.78
July	153.5	92.11	27.62
August	134.2	85.82	27.58
September	144.9	79.73	27.20
October	148.6	68.25	27.20
November	140.00	43.45	24.38
December	146.30	32.42	22.14
Year	1850.5	833.69	26.42

Solar irradiation (1850.5kwh/m² and 833kwh/m² respectively)

Direction of irradiation



(4) System Voltage

Consider on project region's substation

33kV

(5) Capacity limitation of regional Substation.

Consider on project region's substation requirement.

30MW

(6) Install Capacity (A C)

Design on project region's substation requirement.

30MW

20MW

30MW+3 MW BESS

30MW+3 MW BESS

(7) Install Capacity (D C)

Photovoltaic panel capacity (DC)

37.27MW

25.06MW

40.88MW

40.88MW

(8) Geotechnical Information

-Topography of project site is relatively

Flat(or)

Not Flat Land

Farmland (or)

Not Farmland

Hill (or)

Included hill

Others Terrain

-Altitude

Included hill, Valley and waste un-agriculture lands

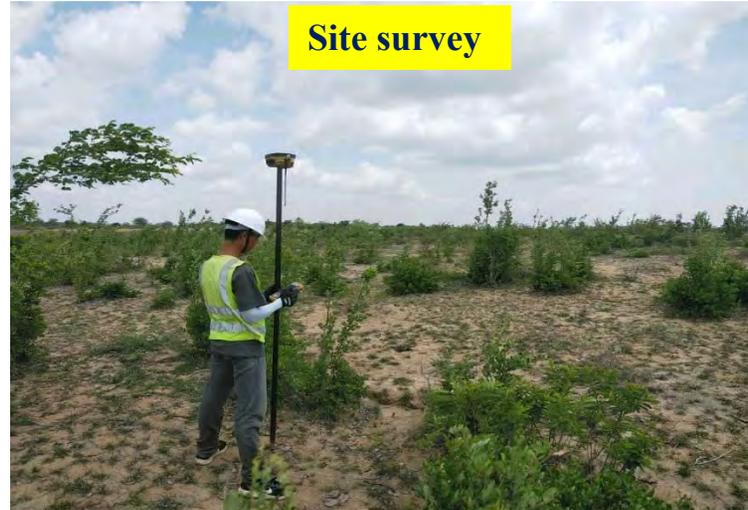
Need to Support all data to designer.

(9) Project area preparing of design requirement

Project 1 view before starting the project



Site survey



Cutting – 133,133.93 m³



Filling – 113,085.58



Project Site implementation



(10) Electrical Design Standards

(10.1) Main design Standards and Codes (IEC standard)

- IEC 61836, 2007 Ed 3, IEC/TS 61836 Ed. 3.0, Solar photovoltaic energy systems - Terms, definitions and symbols.
- IEC 60891, 2009 Ed 2, IEC 60891 Ed. 2.0, Photovoltaic devices - Procedures for temperature and irradiance corrections to measured I-V characteristics.
- IEC 60904-1, 2006 Ed 2, Photovoltaic devices-Part 1: Measurements of PV current-voltage characteristics.
- IEC 60904-2, 2007 Ed 2, Photovoltaic devices-Part 2: Requirements for reference solar devices.

- IEC 60904-3, 2008 Ed 2, Photovoltaic devices-Part 3: Measurement principles for terrestrial photovoltaic (PV) solar devices with reference spectral irradiance data
- IEC 60904-4, 2009 Ed 1, Photovoltaic devices-Part 4: Reference solar devices - Procedures for establishing calibration traceability
- IEC 60904-5, 2011 Ed 2.0, IEC 60904-5 Ed. 2.0, Photovoltaic devices-Part 5: Determination of the equivalent cell temperature (ECT) of photovoltaic (PV) devices by the open-circuit voltage method.
- IEC 60904-7, 2008 Ed 3, Photovoltaic devices-Part 7: Computation of the spectral mismatch correction for measurements of photovoltaic devices.
- IEC 60904-8, 1998 Ed 3, IEC 60904-8 Ed. 3.0 Photovoltaic devices - Part 8: Measurement of spectral response of a photovoltaic (PV) device
- IEC 60904-9, 2007 Ed 2, Photovoltaic devices -Part 9: Solar simulator performance requirements.
- IEC 60904-10, 2009 Ed 2, Photovoltaic devices -Part 10: Methods of linearity measurement.

-
- IEC 61215, 2005 Ed 2.0: Scope of the work in progress includes design qualification and type approval for crystalline silicon terrestrial PV module, Ed 3; publish 4Q 2011.
 - IEC 61345, 1998 Ed 1, UV test for photovoltaic (PV) modules.
 - IEC 61646, 2008 Ed 2, Thin-film terrestrial photovoltaic (PV) modules - Design qualification and type approval.
 - IEC 61701: 1995 Ed 1.0: Scope of the work in progress includes salt mist corrosion testing of PV modules for Edition 2; publish 4Q 2010.
 - IEC 61730-1: 2004 Ed 1.0: Scope of the work in progress includes PV module safety qualification requirements for construction for Part 1/Amendment 1; publish 4Q 2010.
 - IEC 61730-2, 2004 Ed 1, Photovoltaic (PV) module safety qualification-Part 2: Requirements for testingÂ Amendment 1 in process; publish 2Q 2011.
 - IEC 61829, 1995 Ed 1.0: Scope of the work in progress includes on-site measurement of I-V characteristics for crystalline silicon PV array, Ed 2; publish 1Q 2011.
 - IEC 61853-1: Ed 1.0: Scope of the work in progress includes irradiance and temperature performance measurements and power rating for PV module performance testing and energy rating, Part 1; publish 1Q 2011.

(10.2) Electrical Primary

- Total install capacity on the AC(Alternative Current)
- Total Install capacity on the DC (Direct Current) depends on Solar specification



Project 1 (30MW)

SY#P rqxch
 Eudqg#Qdp h #Wulqd
 Pd{lp xp #Srz hu#S#p d{,# 778Z "6 (
 W|sh #Elidfld#p rqrfu|vwdolqh#vldfrq
 Glp hqvlrq #A373{5444{63p p
 Wrwdq#Txdqwlw| #;6:85#Sfv1

GF#Fdsdfw|#@#778{#;6:85,#@#6:15:P Z

Project 2 (20MW)

SY#P rqxch
 Eudqg#Qdp h #Wulqd
 Pd{lp xp #Srz hu#S#p d{,# 878Z
 W|sh #Elidfld#p rqrfu|vwdolqh#vldfrq
 Glp hqvlrq #A3<9{56;7{#68p p
 Wrwdq#Txdqwlw| #78<;3#Sfv

GF#Fdsdfw|#@#878{#78<;3,#@#58139#P Z

Project1 $37.27\text{MW}/30\text{MW} = 1.24$

Project2 $25.06\text{MW}/20\text{MW} = 1.25$

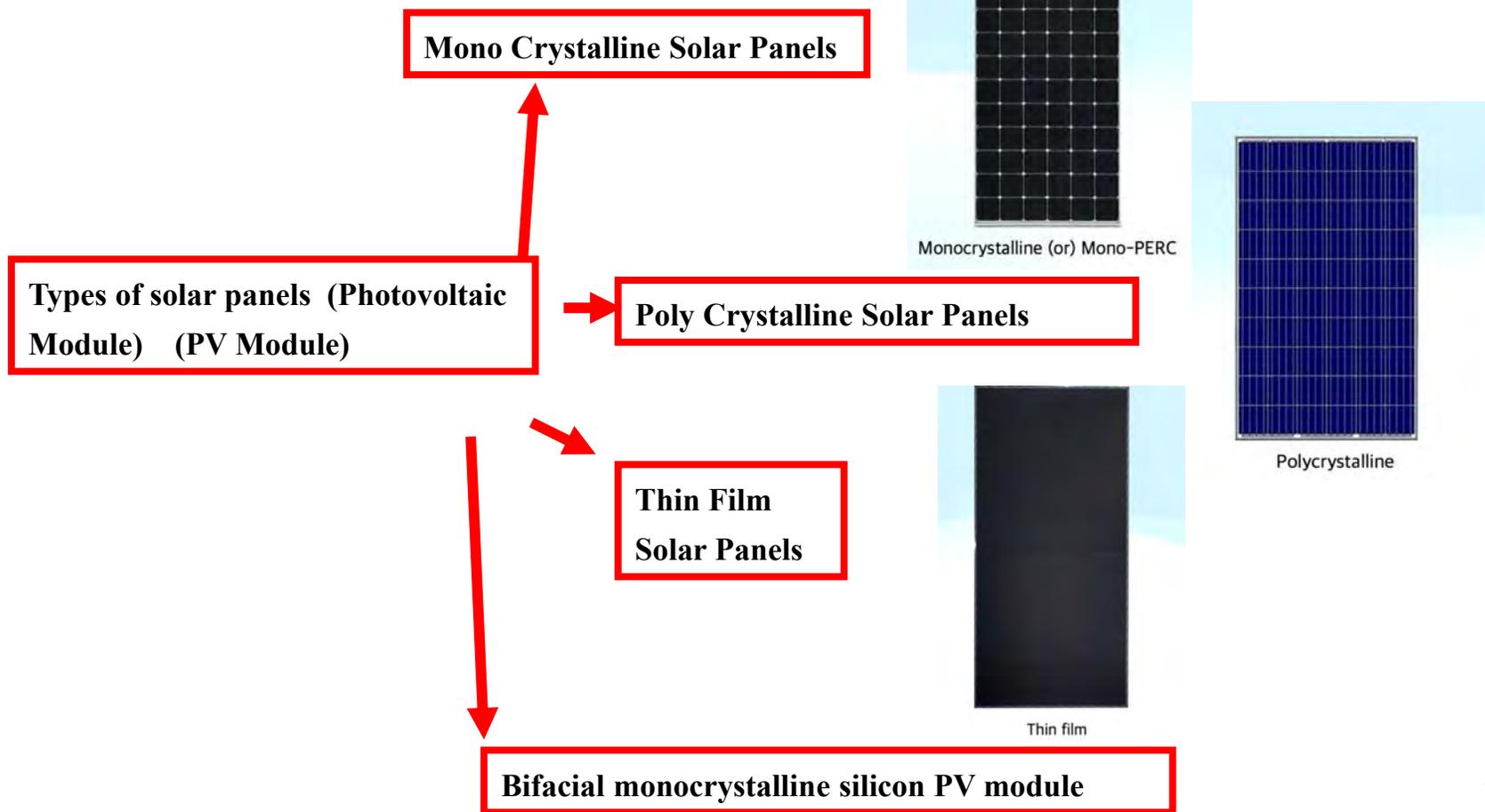
Project3 $40.88\text{MW}/33\text{MW} = 1.24$

Project4 $40.88\text{MW}/33\text{MW} = 1.24$

DC install capacity(PV module) should be install about~25% more than AC capacity

(11) Selection of main equipment

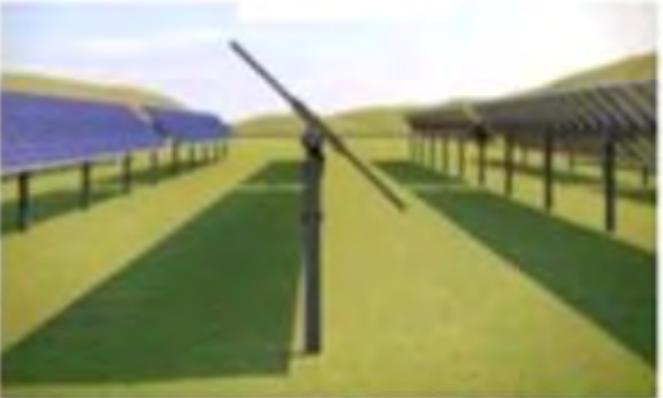
Solar Panels (Photovoltaic Module) (PV Module)



(11.1) PV Module selection



Morning



Afternoon

Bifacial photovoltaic Module (Bifacial Solar Panel)

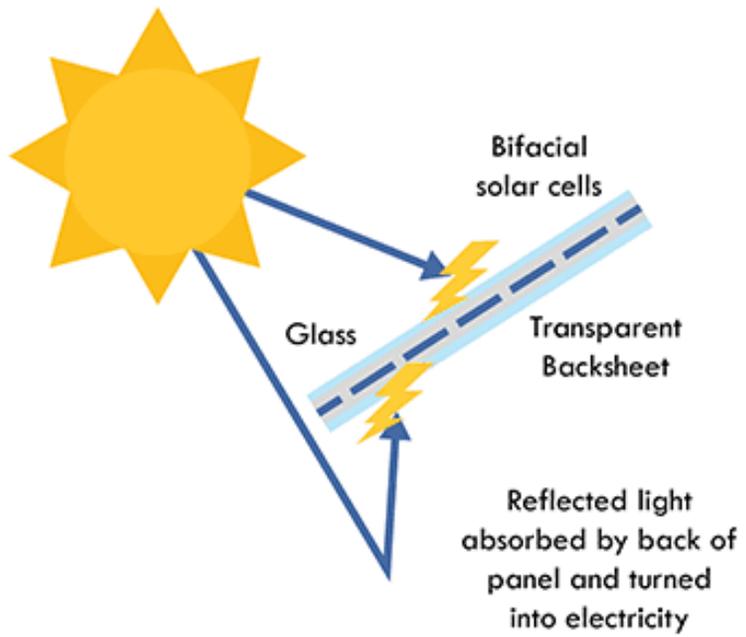


Noon

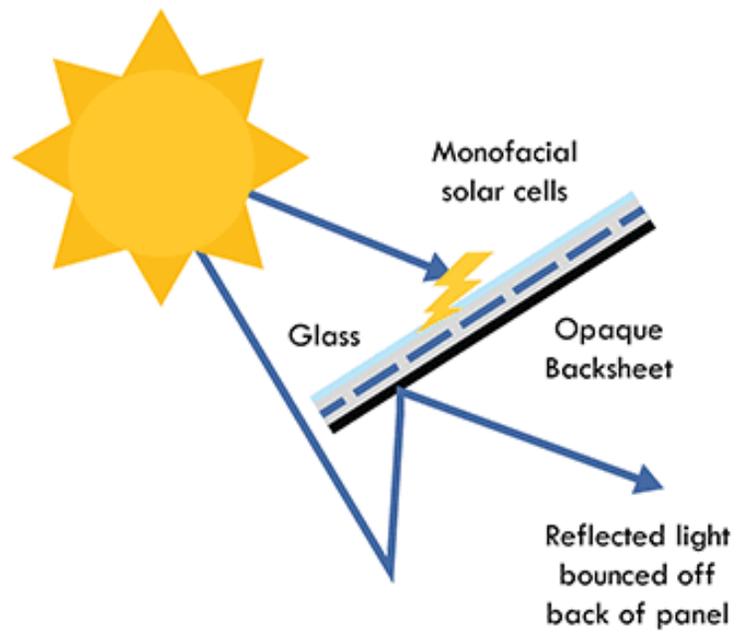


Evening

Bifacial Solar Panel



Monofacial Solar Panel



Solar Panels Record photos



Data of Solar panels of four projects

Project	Product Name	Watt (W)	Open circuit Volt (Voc)	Voltage at Pmax (Vmax)	Current at Pmax (Imp)	Short circuit current (Isc)	Maximum System Voltage (V) dc	Total Qty	Unit generation milKWh	Install DC watt (MW)
Project (1) (30MW)	Trina	445	49.3	41.1	10.75	11.32	1500	83752	66	37.27
Project (2) (20MW)	Trina	545	49.3	37.9	17.2	18.0	1500	45980	45	25.06
Project (3) (33MW)	Longi	550	49.8	41.95	13.12	13.99	1500	74340	74	40.887
Project (4) (33MW)	Longi	550	49.8	41.95	13.12	13.99	1500	74340	74	40.887

LR5-72HBD-550M



WARNING ELECTRICAL HAZARD

Tested to IEC 61215: 2015 and IEC 61730: 2015

STC: AM1.5 1000W/m² 25°C

Rated Maximum Power (P_{max}) 550 W

Power Tolerance 0 - 3%

Voltage at P_{max} (V_{mp}) 41.95 V

Current at P_{max} (I_{mp}) 13.12 A

Open-Circuit Voltage (V_{oc}) 49.80 V

LONGI



LR5-72HBD-550M
WARNING ELECTRICAL HAZARD
Tested to IEC 61215: 2015 and IEC 61730: 2015

STC: AM1.5 1000W/m² 25°C
Rated Maximum Power (P_{max}) 550 W
Power Tolerance 0 - 3%
Voltage at P_{max} (V_{mp}) 41.95 V
Current at P_{max} (I_{mp}) 13.12 A
Open-Circuit Voltage (V_{oc}) 49.80 V

Short-Circuit Current (I_{sc}) 13.99 A
Voc & Isc Tolerance ±3%
Maximum System Voltage 1500 V
Maximum Series Fuse Rating 30A
Operating Temperature -40°C ~ +85°C
Protection Class Class II

LONGI Green Energy Technology Co., Ltd.
No. 388, Middle Hangtian Road, Chang'an District,
Xi'an, Shaanxi 710100, P. R. China
www.longi.com



Short-Circuit Current (I_{sc}) 13.99 A
Voc & Isc Tolerance ±3%
Maximum System Voltage 1500 V
Maximum Series Fuse Rating 30A
Operating Temperature -40°C ~ +85°C
Protection Class Class II

LONGI Green Energy Technology Co., Ltd.
No. 388, Middle Hangtian Road, Chang'an District,
Xi'an, Shaanxi 710100, P. R. China

www.longi.com

Made in China



Trinasolar

TSM-445DEG17MC.20(II)



12

Maximum Power(Pmax)	445W±3%*
Maximum Power Voltage(Vmp)	41.4V
Maximum Power Current(Imp)	10.75A
Open Circuit Voltage(Voc)	49.3V±3%*
Short Circuit Current(Isc)	11.32A±5%*
Maximum Series Fuse	20A
Power Selection	0~5W
Maximum System Voltage	IEC1500V
Electrical Rating At STC	AM1.5 1000W/m ² Tc=25°C

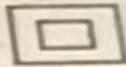
(Considering LID, the power range of the certification authority)
For field connections, use minimum 4mm² (No. 12AWG) copper wires insulated for a minimum 90°C.

WARNING-ELECTRICAL HAZARD

This module produces electricity when exposed to light.
Follow all applicable electrical safety precautions.



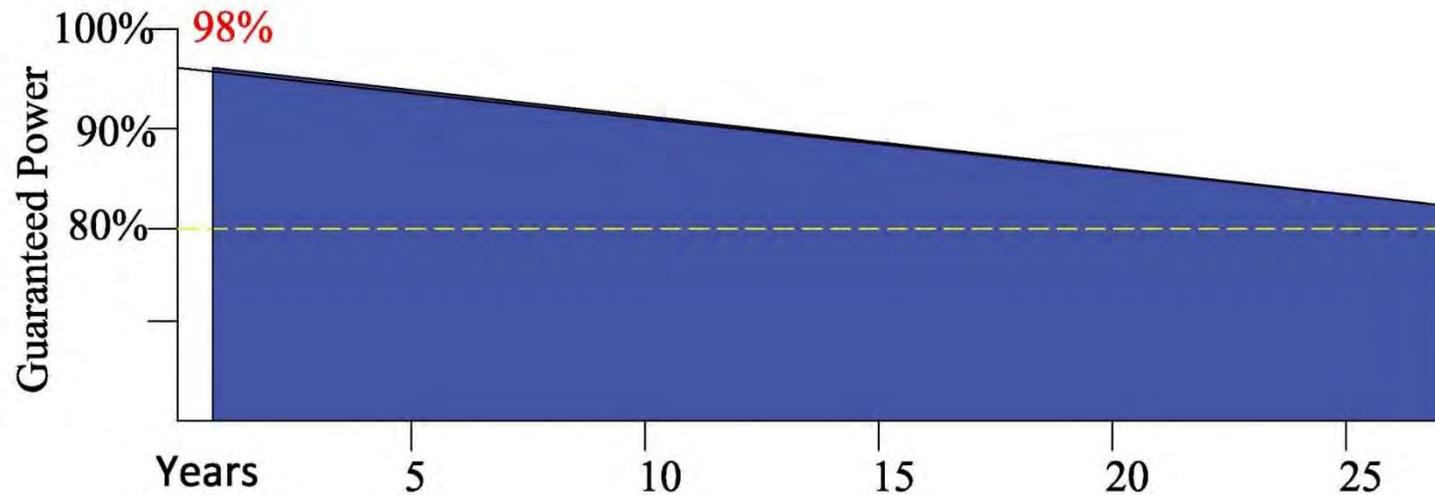
CE



No.2 TianHe Road, Trina PV Industrial Park, New District, Changzhou
City, Jiangsu Province 213031, P. R. China

Trina Solar Co., Ltd.
www.trinasolar.com
Made in China

Solar Panel Life



Advantages of bifacial solar panel

1. Photovoltaic Panel are bifacial solar panel, it is not one face solar panel.
2. Back side of solar panel also produce energy by reflected radiation from ground.
3. **30% more efficiency than one sided solar panel.**

Power generation Estimate

Power generation Estimate for 1 ~ 10 years

Year	Estimated Contracted Capacity	Estimated Contractor Energy						
	Indicative MWAC	Net Year Output (MWh)	Permissible limit of generation 80%	lower annual	Maximum Generation (MWh)	Power 105%		
1	30	70248	56198		73760			
2	30	68803	55042		72243			
3	30	68475	54780		71899			
4	30	68148	54518		71555			
5	30	67820	54256		71211			
6	30	67493	53994		70868			
7	30	67166	53733		70524			
8	30	66838	53471		70180			
9	30	66511	53209		69836			
10	30	66183	52947		69493			

Power generation Estimate for 11 ~ 20 years

Year	Estimated Contracted Capacity	Estimated Contractor Energy			
	Indicative MWAC	Net Year Output (MWh)	Permissible limit of generation 80%	lower annual Maximum Generation (MWh)	Power 105%
11	30	65856	52685	69149	
12	30	65529	52423	68805	
13	30	65201	52161	68461	
14	30	64874	51899	68117	
15	30	64546	51637	67774	
16	30	64219	51375	67430	
17	30	63891	51113	67086	
18	30	63564	50851	66742	
19	30	63237	50589	66398	
20	30	62909	50327	66055	

11.2 Inverter Selection

Type of Inverters

Project 1



String Inverters

Project 2



String Inverters

Project 3



Central Inverters

Project 4



String Inverters

11.2 Inverter Selection

	String Inverters	Central Inverters
Capacity	250 ~ 330 KW	1100 KW
Max input Voltage	1500V DC	1500V DC
Output AC Voltage	800V	630V
DC working Voltage	600~1300V DC(1500)	900~1300V DC(1500)

Technical points of Inverters

Note that

Inverter input Voltage = 1500 V DC (Never accept exceed 1500V)

The solar panel string voltage must be less than 1500V
($29 \times 41.1 = 1191.9V$)
($29 \times 49.3 = 1429.7 V$)

In practically the peak working voltage will be reached to **1350 V DC** and it is greater than ($29 \times 41.1 = 1191.9V$)

So that quantity of panel selection must calculated with open circuit voltage ($29 \times 49.3 = 1429.7 V$)

Sungrow String Inverter Capacity = 250kW (if power factor 1)

Sungrow String Inverter Capacity = 250kW = (Power factor 1)

Sungrow Central Inverter Capacity = 1100kW = (Power factor 1)

Hwawei String Inverter capacity = 330kW = (Power factor 1)

Inverter output AC voltage = **800V AC**

Inverter output AC voltage = **800V AC**

Central Inverter Output Voltage = **630V AC**

Inverter output AC voltage = **800V AC**

Present project reference1 250kW x 126 inverters = 31500kW = 31.5MW

say 30 MW

Present project reference 2 250kW x 91 inverters = 22750kW = 22.75MW

say 20 MW

Present project reference3 1100kW x 30 inverters = 33000 kW = 33MW

say 30MW + (13.761MWh BESS)

Present project reference4 330kW x 110 inverters = 36300 kW = 36.3MW

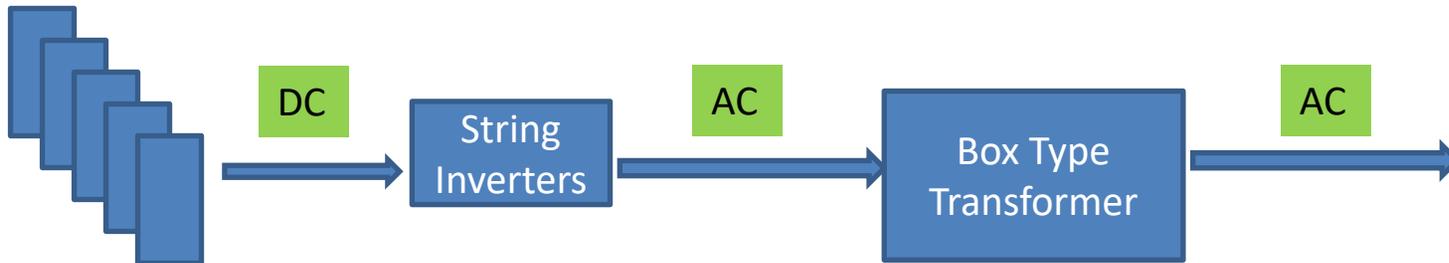
Say 30MW + (13.758MWh BESS)

Equipment different on type of Inverters

Project (1)



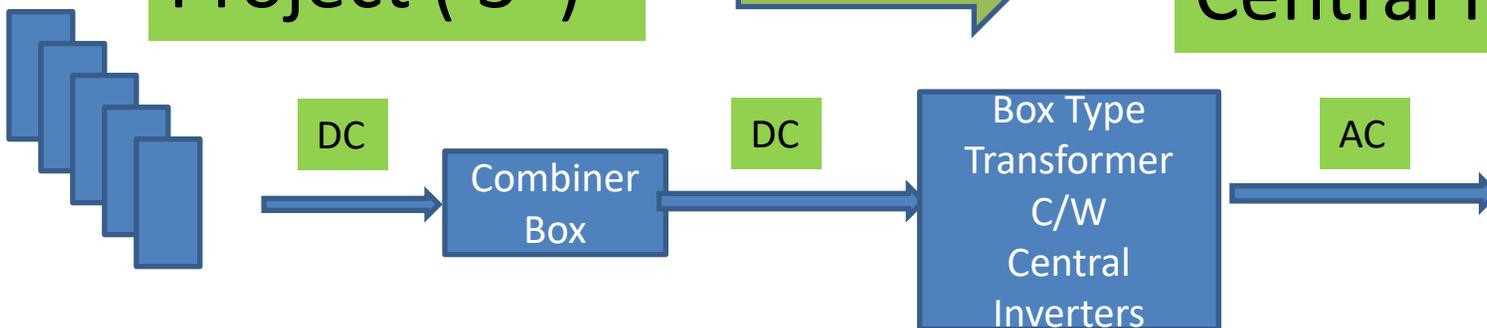
String Inverters



Project (3)



Central Inverters



Inverter output AC voltages & Grid System Voltage

	Power Conversion System					
	Solar DC voltage	Inverter output AC Voltage	Step up Grid system AC Voltage	Step down For Charging AC Voltage	Charger AC/DC	Dc/DC Converter & Battery DC Voltage
Project1	600~1300 V	800 V	800 V/ 33kV	Not Include BESS		Not Include BESS
Project2	600~1300 V	800 V	800 V/ 33kV	Not Include BESS		Not Include BESS
Project3	900~1300 V	630 V	630 V/ 33kV	33kV/550 V	550V/1025 V	1025/ 1025~1500V
Project4	600~1300 V	800 V	800 V/ 33kV	33kV/800 V	800V/1025 V	1025/ 1025~1500V

Record photos of INVERTER

Strings Inverters



Central Inverters



Inverters Operation & Monitoring

Inverters located in PV Sub Array:

Analog Signals:

- DC current, voltage, power of each input
- Output AC Phase-Phase voltage, current, active power, reactive power, apparent power, power factor, frequency
- Inverter efficiency
- Daily power yields, total power yields
- Total operation time
- Internal temperature, etc.

Status signals:

- Operation Status: Run, Stop, Initial Standby, Emergency Stop...
- Alarm state signal: Communication fault, Low Insulation resistance, Insulation plate abnormal, fault, derating run, alarm run
- Fault state: DC under-voltage, DC over-voltage, AC under-voltage, DC overvoltage, Under-frequency, Island protection, Over-temperature, Overload protection, Earth Fault protection, AC switch abnormal, DC switch abnormal...
- Device status signal: AC switch state, DC switch state, DC fuse state, etc.

Combiner Box

If install Central Inverters



COMBINER BOX

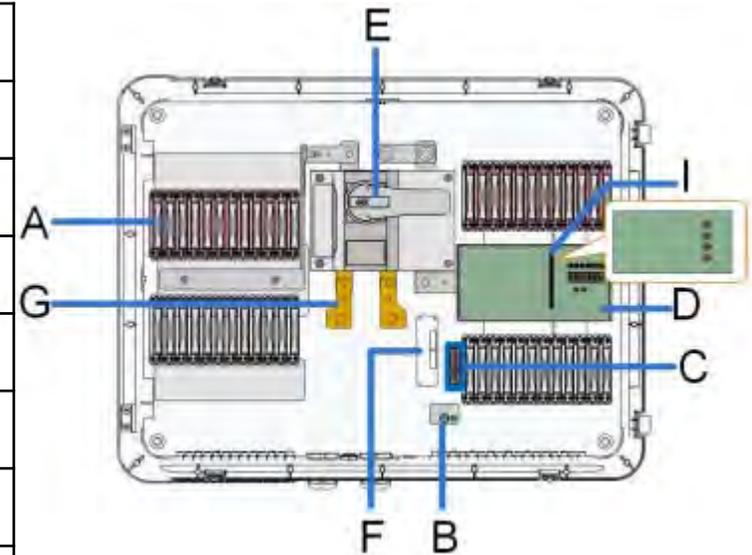
- A combiner box in a central inverter PV system serves as a connection point for multiple strings of solar panels.
- It combines the output from these strings into a single DC input that goes into the central inverter for conversion into AC electricity.
- It also have overcurrent protection devices like fuses and DC circuit breakers for safety.

Specification

- Maximum system voltage: 1500V
- Maximum no of DC input strings: 20
- Maximum input current per string:
11/13/15.5*/18.5(A)
- Maximum continuous output current:
220/280/310*/370(A)

INSIDE VIEW OF COMBINER BOX

A	DC fuse holder and fuse
B	Grounding point, for equipotential connection
C	RS485 communication terminal
D	Monitoring panel
E	Load switch/ Circuit breaker
F	SPD
G	DC output wiring terminal
H	Copper bar and wiring hole
I	DC PLC communication module



Type Designation	PVS-16MH	PVS-18MH	PVS-20MH	PVS-24MH
Parameters				
Max. PV string voltage	1500 V			
Max. PV string parallel inputs	16	18	20	24
Max. string input current	21A	20A	18.5A	15.5A
Max. output current	336A	360A	370A	372A
SPD	1500 Vdc Type II (optional: Type I+II)			
Input terminal type	PG Gland / MC4 terminal			
Output terminal type	120 – 400 mm ²			
Protection class	IP65 / IP67 (optional)			
Environment temperature	-35 to 60 °C			
Environment humidity	0 – 95%			
Dimensions (W*H*D)	950*730*275 mm			
Weight	40 kg	40 kg	42 kg	44 kg
Switch disconnect handle	Internal handle			
Material	SMC			
Standard Accessories				
DC output load switch	Yes			
PV specific application SPD	Yes			
Optional Accessories				
String current and bus voltage monitoring	Optional			
RS485 communication port	Optional			
PV SPD failure monitoring	Optional			
Monitoring for load switch state	Optional			
Operator access areas IP2X	Optional			
Parallel arc fault circuit interrupter	Optional			
Wireless communication	Optional			



EFFICIENT AND SAFE

- 1500V-Specific PV fuse, both positive and negative terminal
- 1500V-Specific PV SPD with fault alarm
- String current and voltage monitoring
- Main load switch state monitoring (optional)



FLEXIBLE

- Optional IP67 protection, meeting the outdoor installation and usage requirements
- Self-powered power supply with lightning protection
- Output cable cross section area 120 – 400 mm² (max. 400 mm² Al cable)
- PG Gland / MC4 terminal connector



QUALIFIED

- CE
- Highly optimize the system wiring
- Modular design, easy and quick maintenance

11.3 Box Type Transformer Prefabricated substation

Electrical Design requirement

-How to boosted(Step Up) to local power system Voltage

Accordance with Tender Requirement

Local Main receiving substation that have connected with Grid is 33kV voltage system.

High Tension side of solar plant = 33kV

Project (1)

Er{#Wudqvirup hu##

Eudqg# #Gdtr
Udwhg#Fdsdfw| #916P YD
Glp hqvlrq #958 {5;3 {698fp
Qhw#Z hljkW #55833NJ
Glp hqvlrq+Irxqgdwlrq, #9;3fp # {633fp # {543fp
Wrwdc#Txdqwl| #8#Qrv1##
Wrwdc#Tqwdc#Fdsdfw| #@#6418P YD

Project (2)

Er{#Wudqvirup hu##

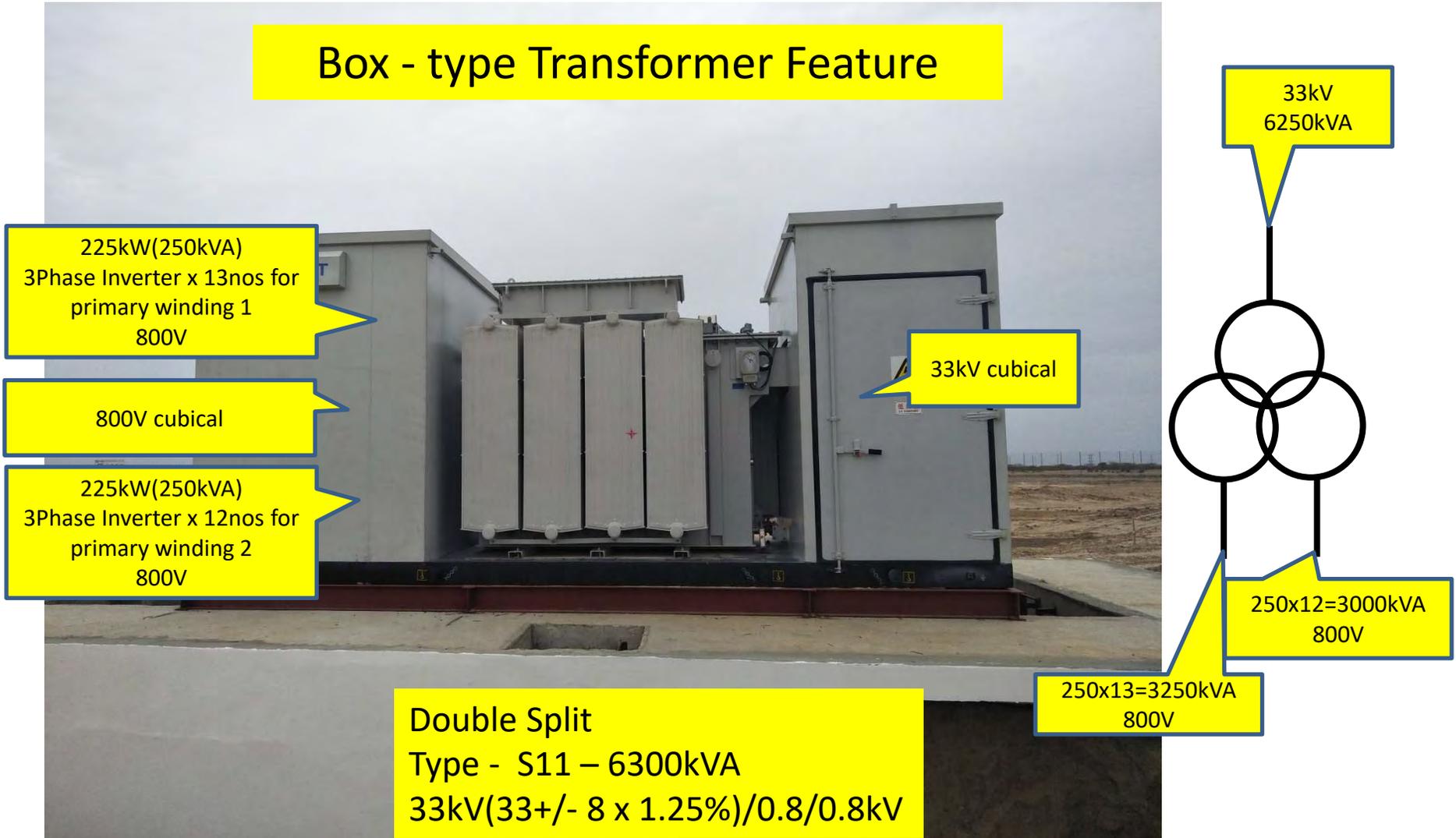
Eudqg# #Vkdqjgrqj Gdfkl
Udwhg#Fdsdfw| #916P YD#{6#vhw#. 7P YD {#4#vhw
Glp hqvlrq =
Qhw#Z hljkW =
Glp hqvlrq+Irxqgdwlrq,=
Wrwdc#Txdqwl| #7#Qrv1##
Wrwdc#Tqwdc#Fdsdfw| #@#551<#P YD

Voltage ratio 0.8-0.8/33± 2.5%KV



-Box typed Transformer setups and Switchgear arrangement

Box - type Transformer Feature



Where do we get the electrical supply for control devices inside the Box - type Transformer



Comparison Of Solar Project							
Sr No	Description	TPW_I (30MW)	TTG (20MW)		NSP (30MW)	GSE (30MW)	Remark
1	Auxiliary Trasformer	15kVA	15kVA		5kVA	5kVA	

Box-type transformer Design



Box transformer Monitoring

MV transformer

- Oil/Winding temperature alarm
- Pressure trip
- Buchholz alarm
- Buchholz trip
- Oil temperature
- Winding temperature

(12) Solar Panel arrangement
Tracker System

Ground mounted single axis solar tracking system



Solar Tracker End support view



Bearing Seat

Bearing Pedestal

GI Column post

Purlin(Panel support)

U bolt to fix
Purlin(Panel support)

Square torque tube

Damper (Hydraulic type)



RoLa wire less antenna
(NCU)

TCU(Tracker control unit)

PV module

Slewing Drive
(Dual shaft worn Gear)

Slewing Drive
24V DC motor

Torque tube connector

Drive column post

Tracking motor drive control box wiring and program configuration.

Drive unit control box



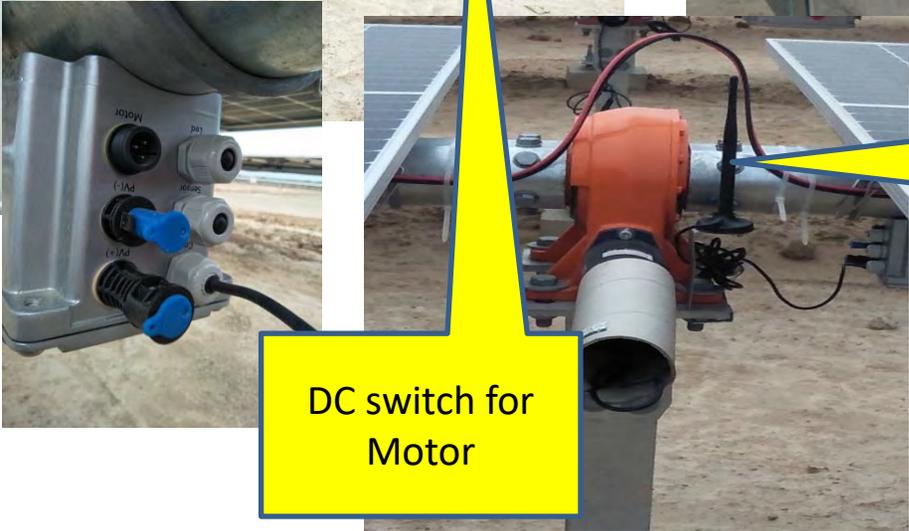
24V DC Power for drive motor 300-600V /32V DC/DC converter



DC switch for Motor



Antenna for remote control LoRA Wi Fi



The advantages of **Horizontal single axis tracker system.**

1. This projects are using **HORIZONTAL SINGLE AXIS TRACKER (HSAT)** system in Myanmar with advance control systems and equipments.

Advantages of trackings system are:-

- a) Independent row by row trackers.
 - b) It is stable, Simple, Best cost structure.
 - c) Specially designed D-Tube and easy to install.
 - d) LoRa-wireless communication, it is long range, low power consumption.
 - e) String powered with backup li-ion battery. (**Charged by Solar power Y Termination 300-600/32 solar charge controller**)
 - f) Strong wind resistance capability.
 - g) The tracking technology uses geographic latitude, longitude, and time as the main parameters and astronomical algorithms. (**Individual tracking program configuration**)
 - h) To avoid shadow occlusion between PV arrays, backtracking technology is provided.
- 2 We can get more power production even the same capacity rather than fixed type system.

BACKTRACKING

During sunrise and sunset, shadow will be casted on consecutive PV arrays due to the low altitude of the Sun. Increasing row spacing can effectively reduce power caused by shadow occlusion, but it will increase investment costs such as land, cables, and construction.

Backtracking technology is a reverse-direction tracking routine. Its application in PV tracking systems can avoid shadow occlusion between PV arrays ensuring the optimisation of power generation of PV systems, and reducing the land area.

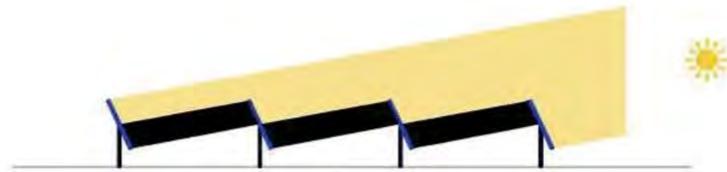


Figure. PV arrays in the morning or evening without backtracking



Figure PV arrays in the morning or evening with backtracking

Horizontal single axis tracker Control system.

Tracker:

NCU:

- Longitude, Latitude
- Wind speed, direction, Irradiance, rainfall, snow, water level, temperature
- General alarm, working status

TCU:

- Status, working mode, alert information
- Target angle, current angle
- Motor current

(13) Power House

Power House Construction & Installation



(13.1) Electrical Primary(33kV Switchgears)

Previous Project



Update Project



(13-2) Electrical secondary(Station power low voltage & control panels)

Previous



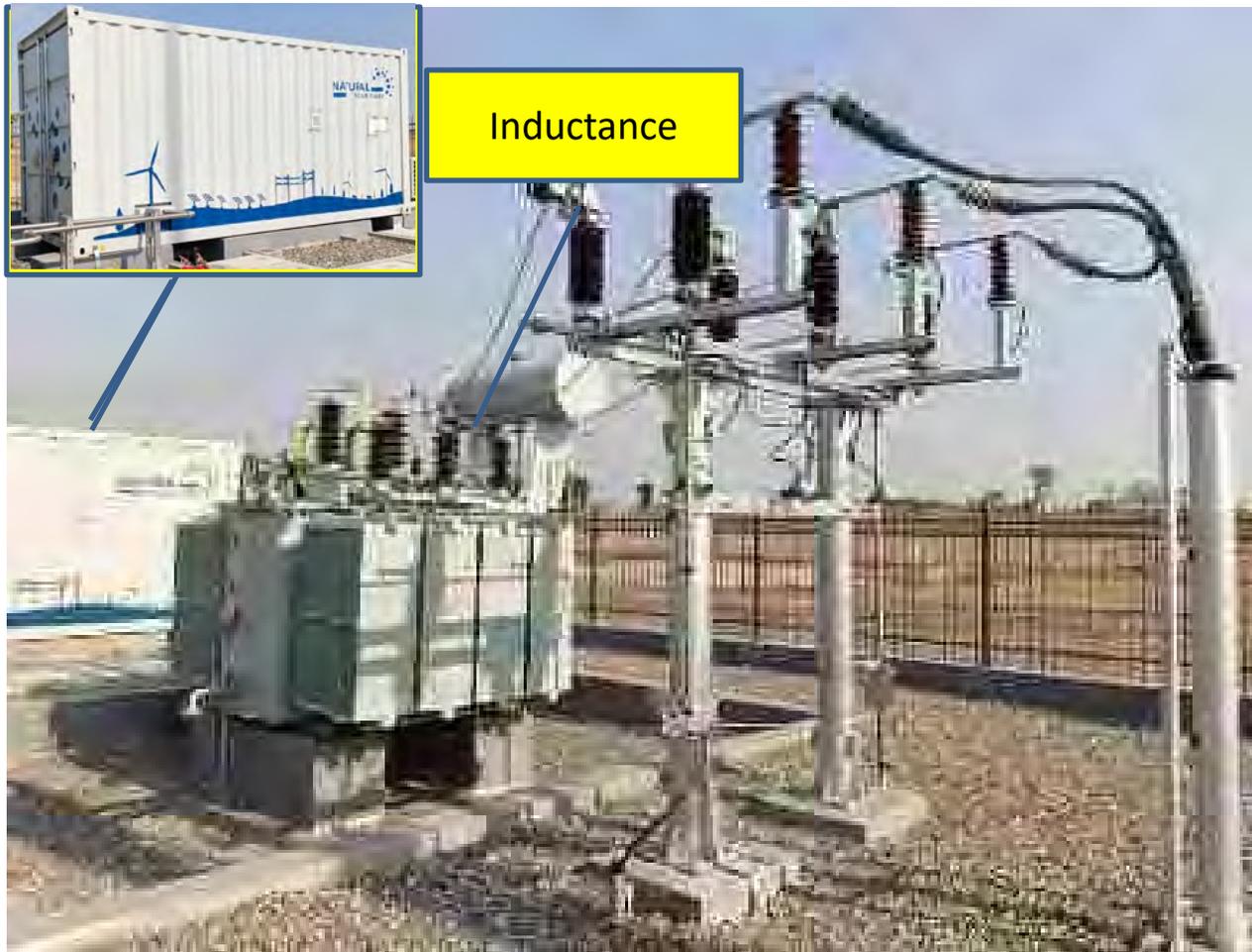
Update



(13.3) SVG (Static Var Generator)



Inductance



SVG Install capacity

20% of Install capacity

Project 2 (5MVar)

Project 3 (6MVar)

Project 4 (6MVar)

SVG (Static Var Generator) Control system.

SVG:

Analog Signals:

- Total reactive power, power factor, voltage, current
- Operation mode
- Voltage limit

Status signals:

- Cabin door status
- Grid connection status, malfunction,
- Running status, FC and insulation status

(14) Transmission Line

Twin Bundle Single Circuit



Single Bundle Double Circuit



(15) Receiving Main Power Station



Switchgear yard arrangement at Receiving Grid Power Station

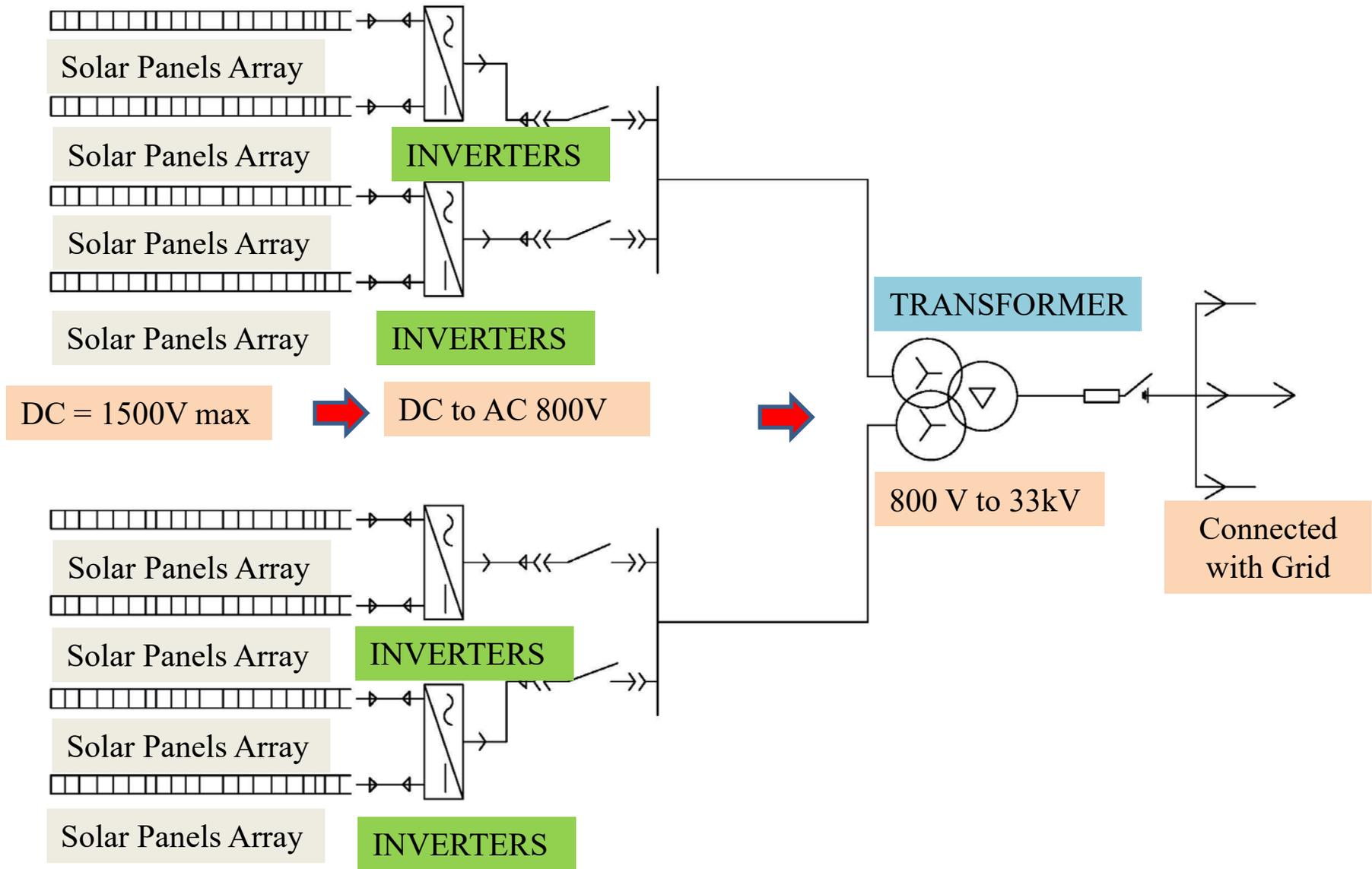


(16) Solar Control System

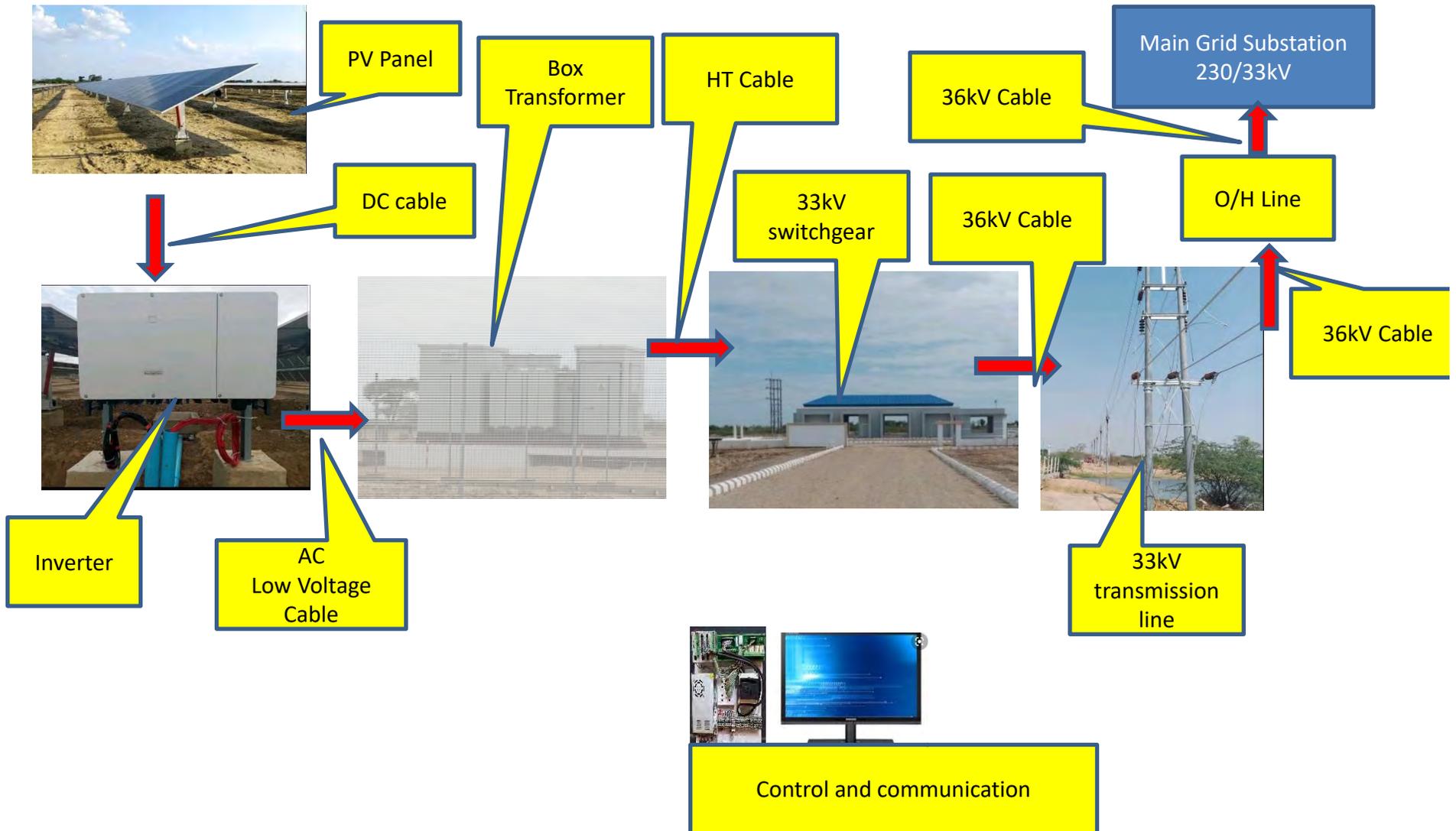
(16.1) Operation and monitoring



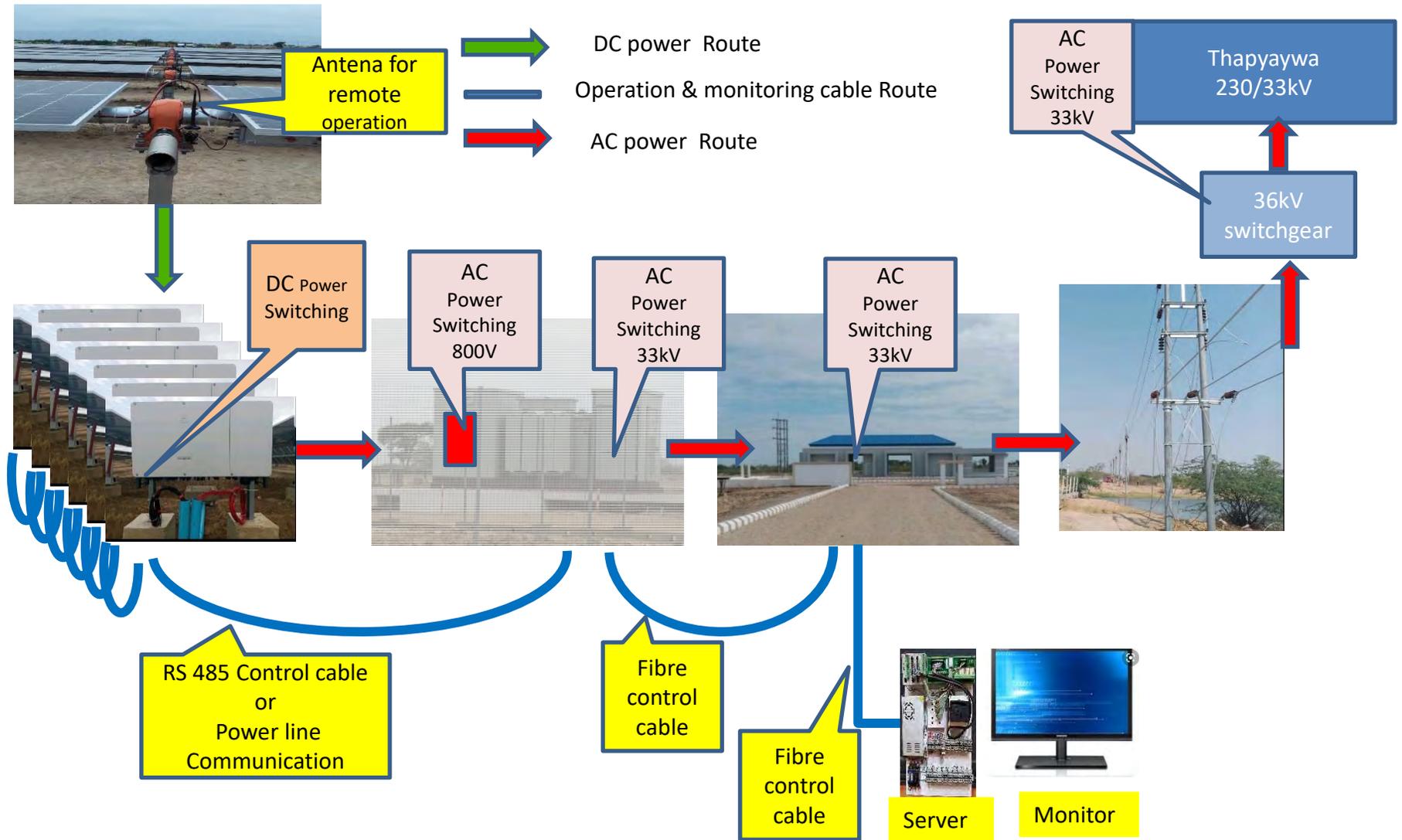
16.2 Basic concept of Solar power Generating System



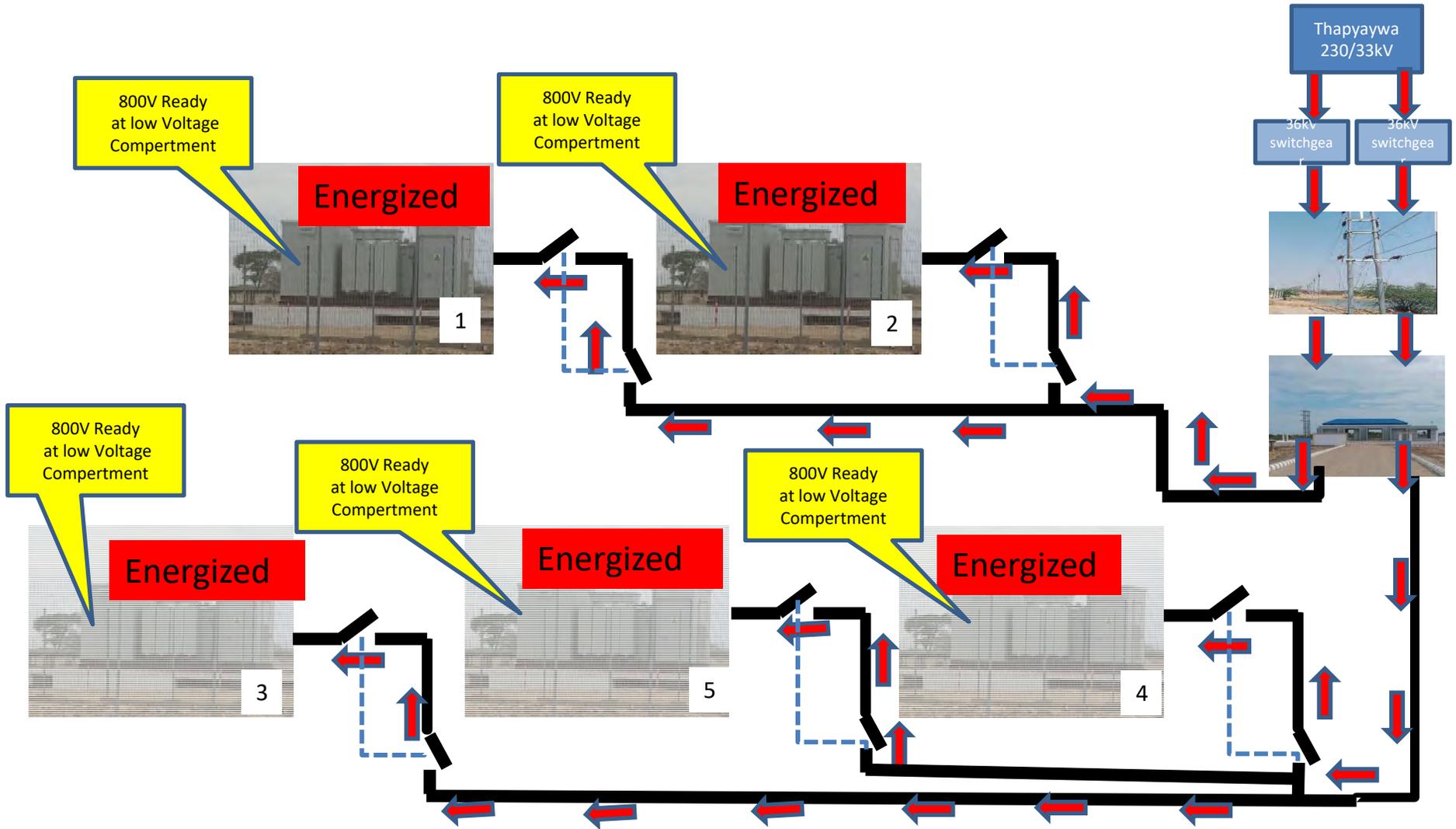
16.2 Basic concept of Solar power Generating System with images



16.3 Tracking & power generation Control System

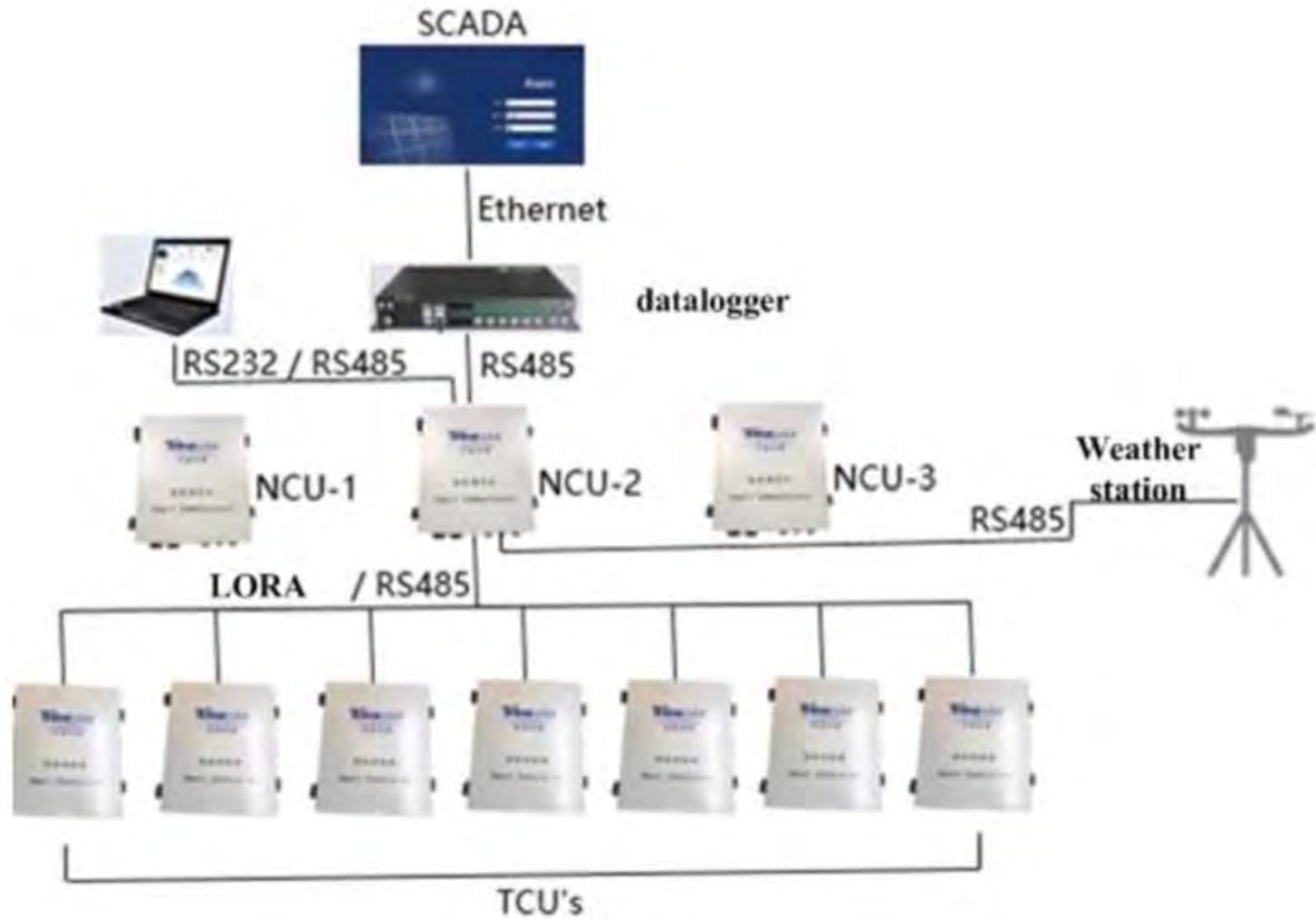


17 Testing sequences and power energizing to Box-type transformer



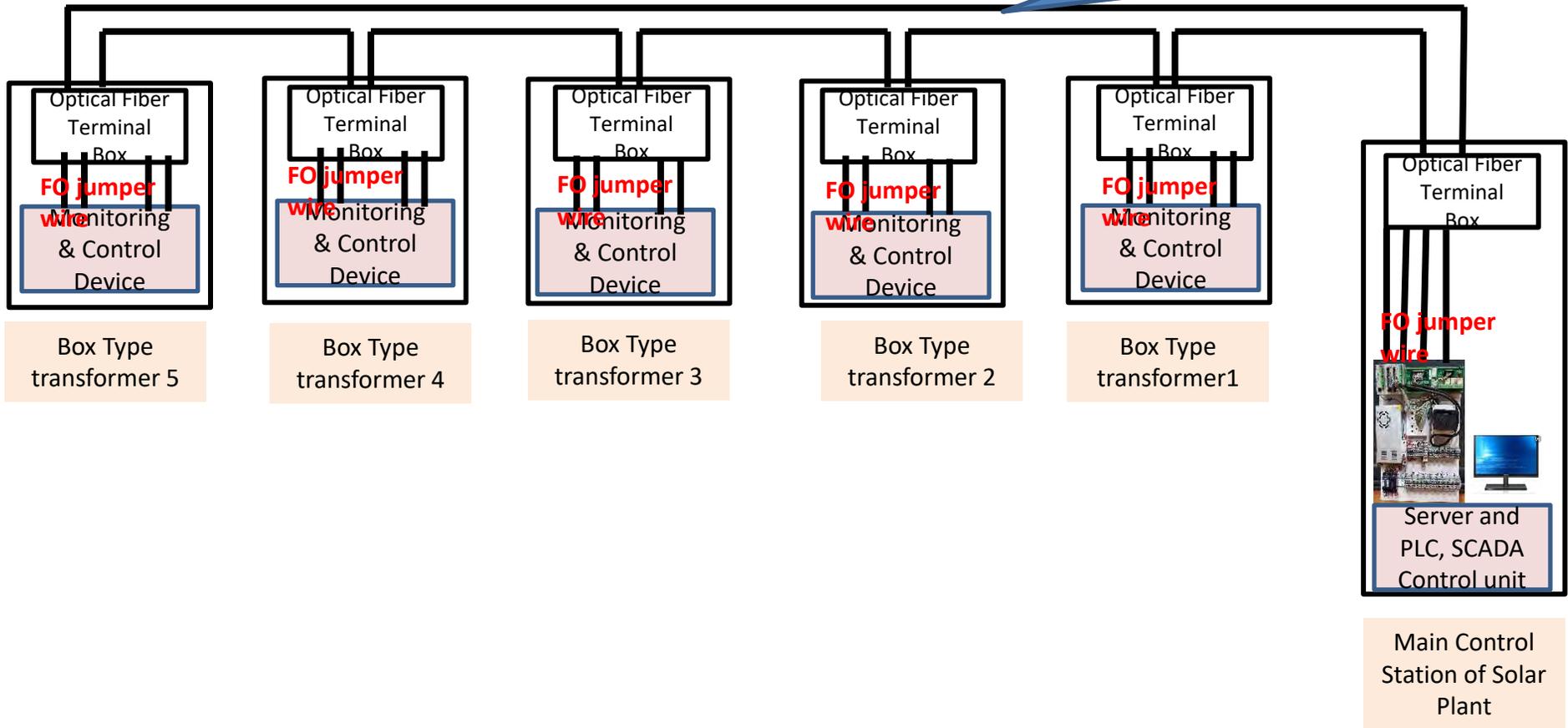
19. How to control entire Solar Power generation system

Communication Architecture

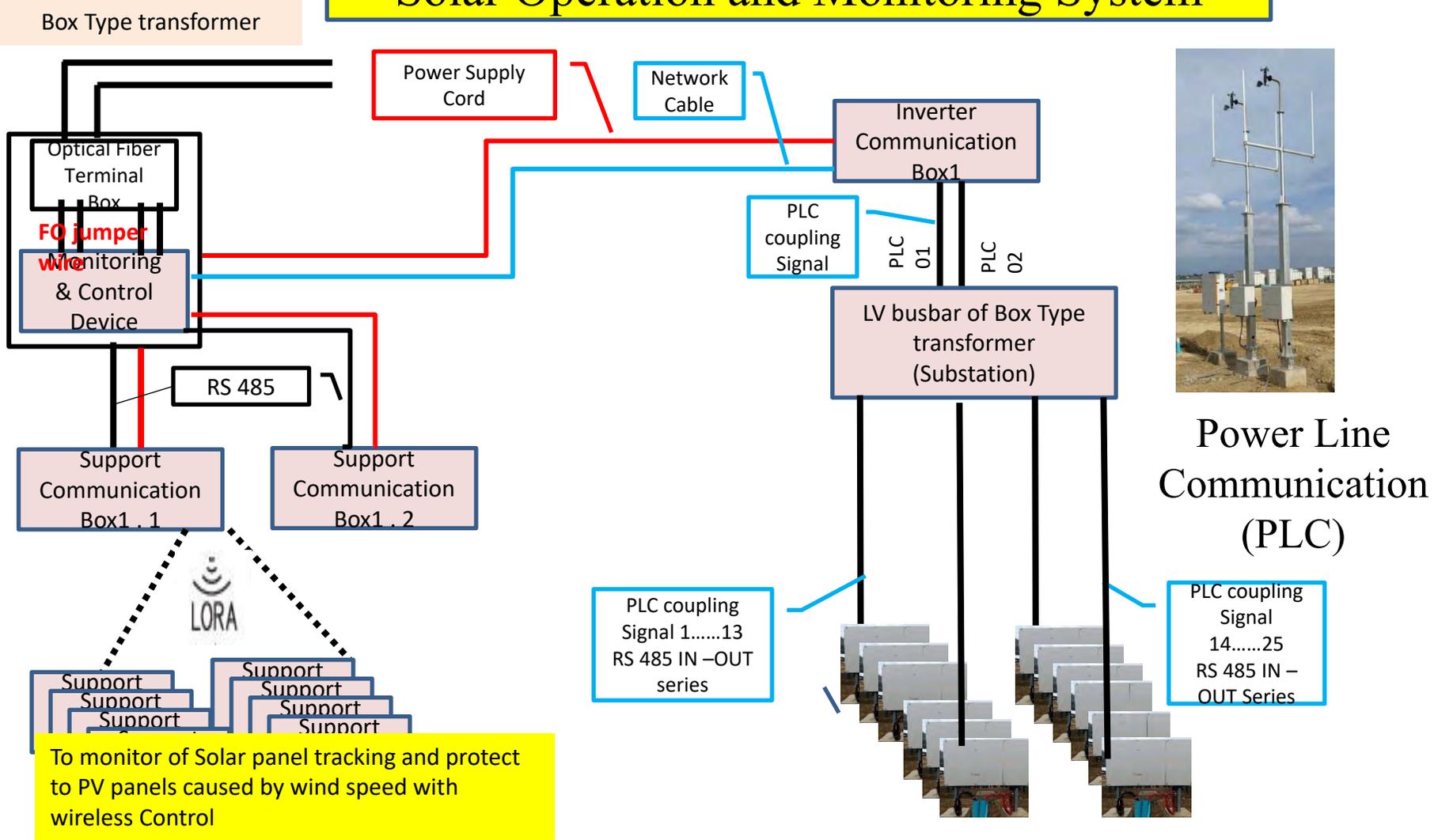


Communication System installation at work site

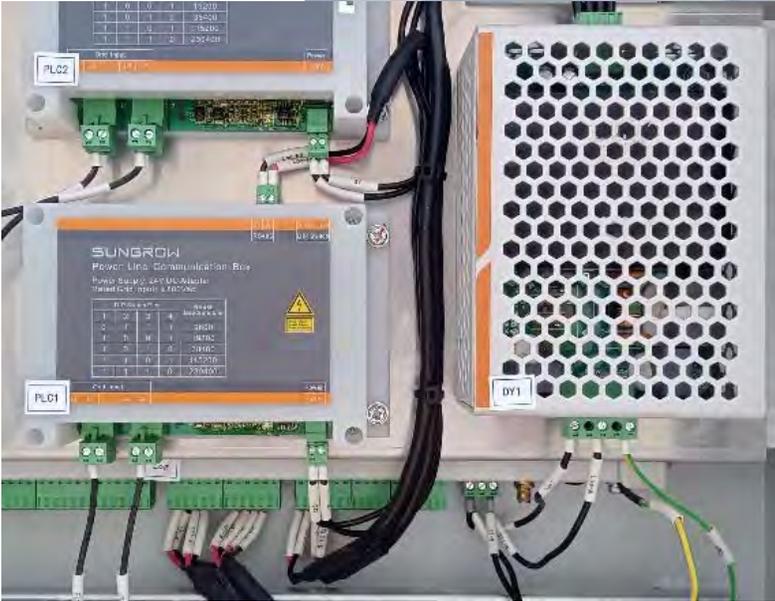
12 C Single Mode armored Optical fiber Cable



Solar Operation and Monitoring System



Power Line Communication(PLC) and LoRA wi fi system



Tracker configuration link cable

(20) Bracket type selection of Photovoltaic Array depends on fixed or tracker

Important Points for Tracking material installation

- h) Wind resistance of column base structure design
- I) Short absorber for to maintain during turning movement
- j) Stronger support column for 24V DC drive gear motor fixing
- k) Do not forget detail accessories of solar panel supporting structure such as anchor bolts , nuts & washer, bearing rings & brackets, solar panel supporting bars, panel fixing brackets, bolts & nuts, washers,..etc.
- L) Total support structure's Earth Quik resistance



Function of solar Tracking system

According to the local longitude, latitude and time, solar tracking system developed the tracker control box.

The program automatically calculates the sun's motion trajectory and the location of the azimuth Angle and Angle at the time.

In the tracking stage, the system automatically issues instructions according to the tracking range

Controls the operation of the motor actuator, and adjusts the tracking Angle every period of time

So that the PV module is always aligned with the current position of the sun.

The System enters the phase of anti-shadow tracking to avoid the shadow occlusion of the bracket, when the solar altitude Angle is low.

The tracker communication box is to collect the data of all the control boxes, send it to the background server, and send the control instructions of the background server to all the control boxes.

At the same time the communication box collects meteorological information such as wind speed, snow thickness and radiation, automatically determines bad weather and issue warning instructions to all control boxes

So that the control box can push the motor and support to make corresponding actions to avoid bad weather.

The communication box also incorporates the intelligent algorithms to increase the generation of photovoltaic panel

Solar Tracker Control Position

Wind Protection



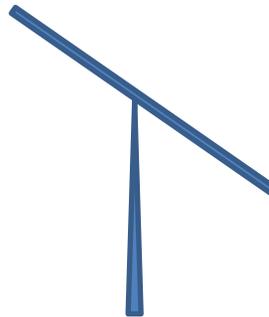
CPE 16m/s NSP 14m/s GSE 14m/s

Snow Protection

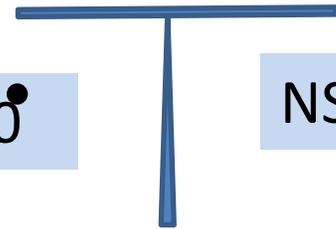


West 120°

Night Drop



CPE 120°



NSP 90°

Operation



East 150°

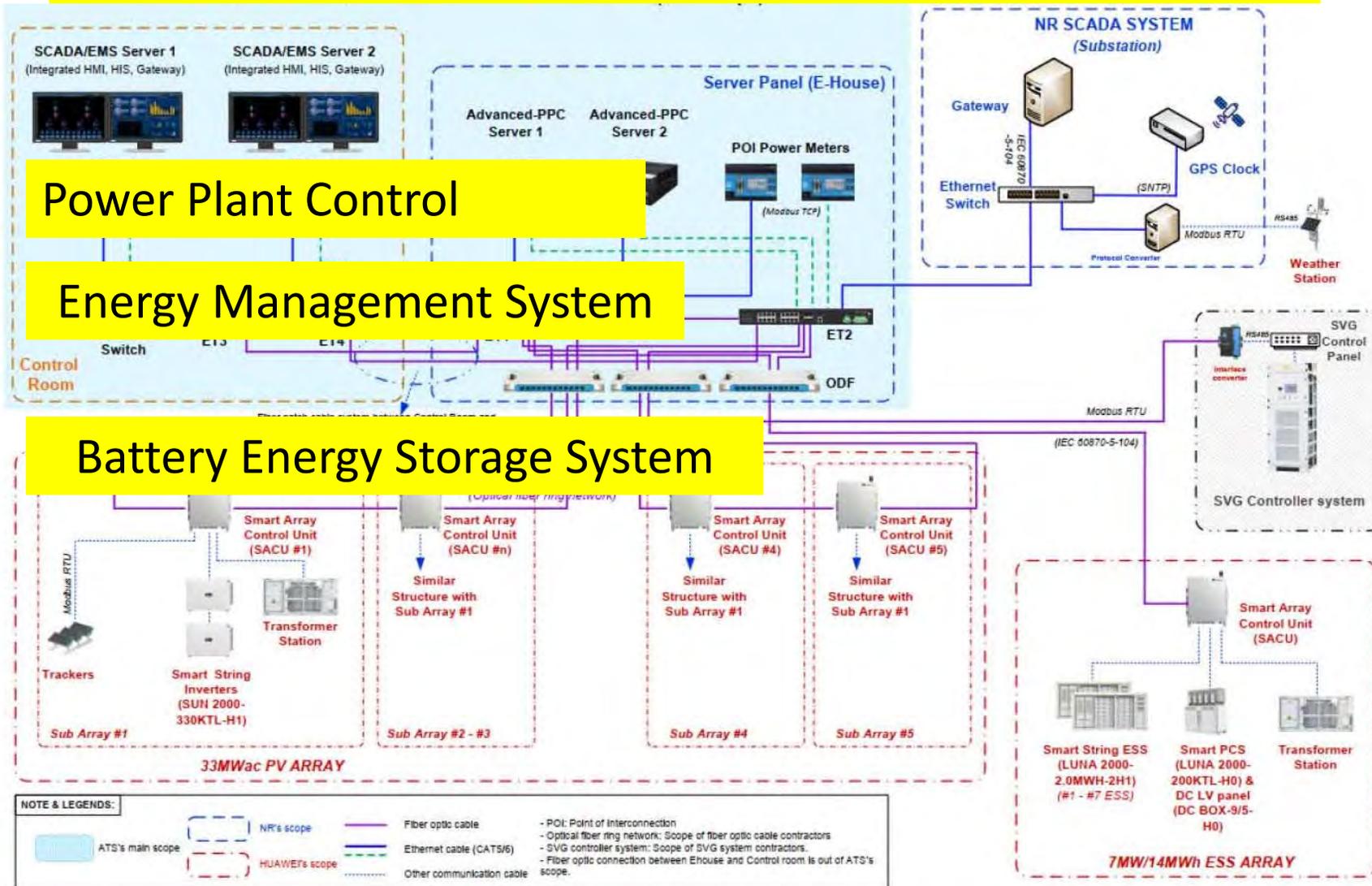
West 150°

Earth Quake 8

(21) BESS(Battery Energy Storage System)

21-1 How to Charge Solar power to storage batteries and discharging to Grid system

Over view of SCADA control system of PPC,EMS, BESS

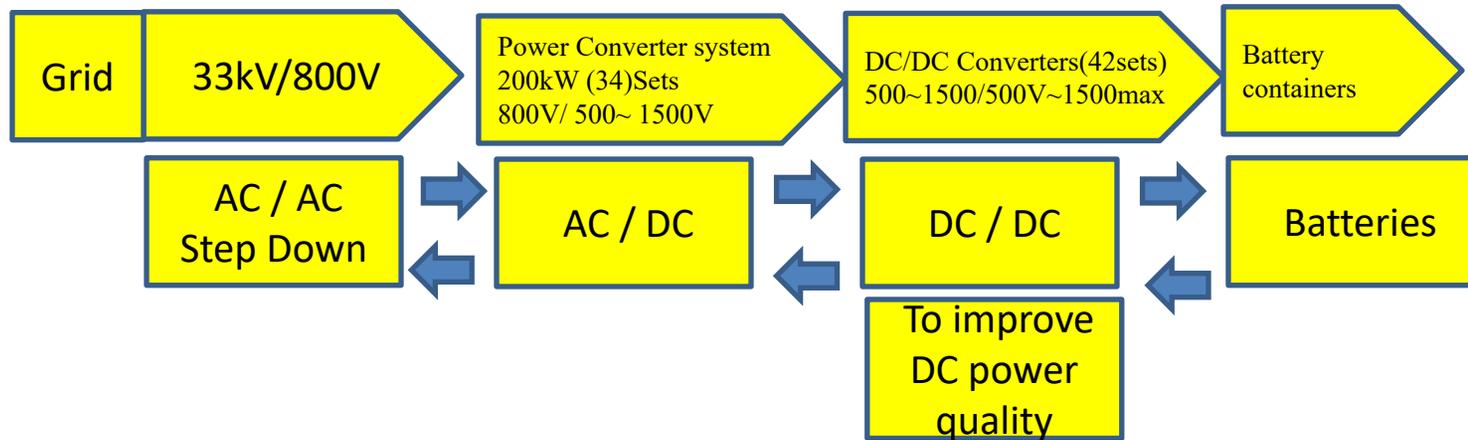


Power Plant Control

Energy Management System

Battery Energy Storage System

21.2 Battery Energy Storage System Charging & Discharging



Battery Energy Storage System Charging & Discharging Control Mode

Can Select operation requirement

Peak Shaving

Schedule

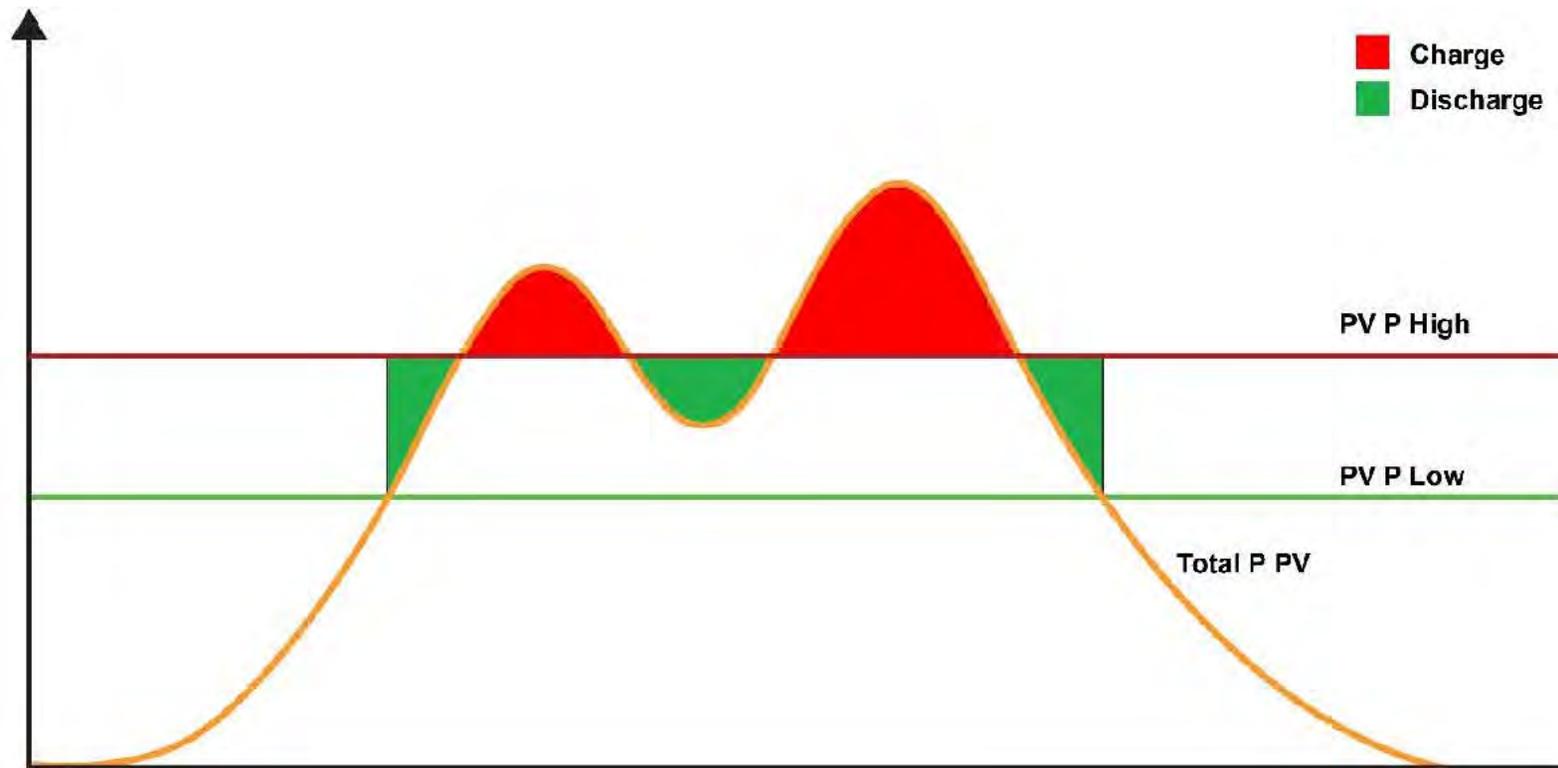
Fluctuation

Manual

Peak Shaving setting



Peak Shaving setting



Power Conversion System (PCS) control in BESS

PCS in BESS sub array: **Power conversion system AC to DC and DC to AC**

Analog Signals:

- Output AC Phase-Phase voltage, current, active power, reactive power, apparent power, power factor, frequency
- Internal temperature, etc.

Status signals:

- Operation Status: Run, Stop, Initial Standby, Emergency Stop...
- Alarm state signal: Communication fault, Low Insulation resistance, Insulation plate abnormal, fault, derating run, alarm run
- Fault state
- Device status signal: AC switch state, DC switch state, DC fuse state, etc.

Converter Monitoring unit (DC/DC converter) monitoring

CMU in BESS sub array:

Analog Signals:

- Output Energy, Fan speed, auxiliary meter
- Internal temperature, etc.

Status signals:

- Alarm: UPS alarm, Fire alarm, battery cabin door alarm, temperature alarm,

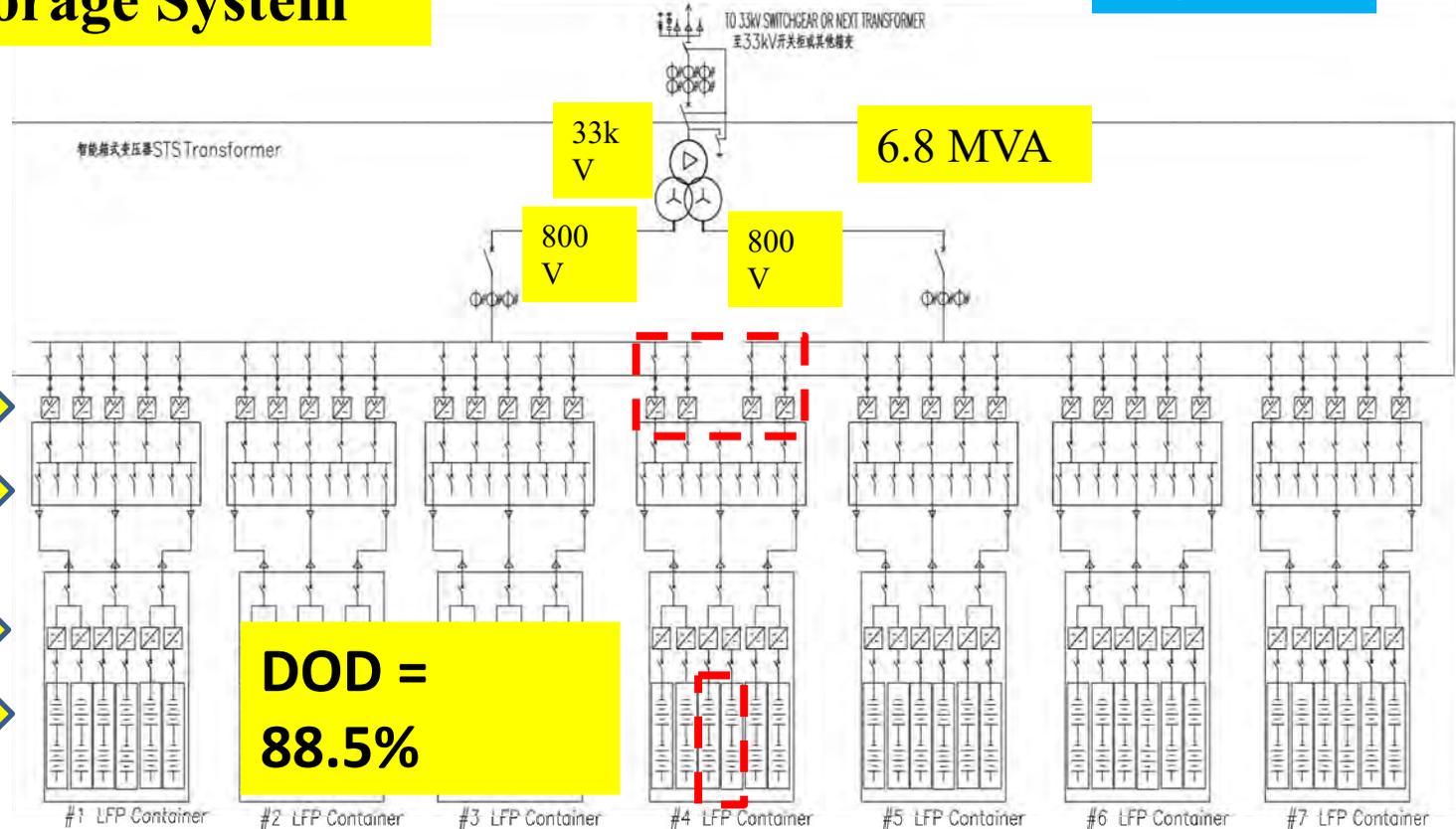
Battery Pack in BESS sub array:

Analog Signals:

- DC bus side voltage, current
- DC bat side voltage, current
- Rack 1-2 voltage, current, SOC, capacity, energy

Energy Storage System

Project 4



Power Converter system
200kW (34)Sets

DC (LV) Panel box(7 Sets)

DC/DC Converters(42 sets)

Battery containers

Battery type = LFP

1 Cell = 280Ah, 3.2V 2.032MW

1 pack = 0.896 x 18 = 16.128kWh

1 Rack = 16.128 x 21 = 338.688kWh

1 Container = 338.688 x 6 = 2.032MWh

**DOD =
88.5%**

2.032MW
h

2.032MW

1.354MW

2.032MW

2.032MW

2.032MW

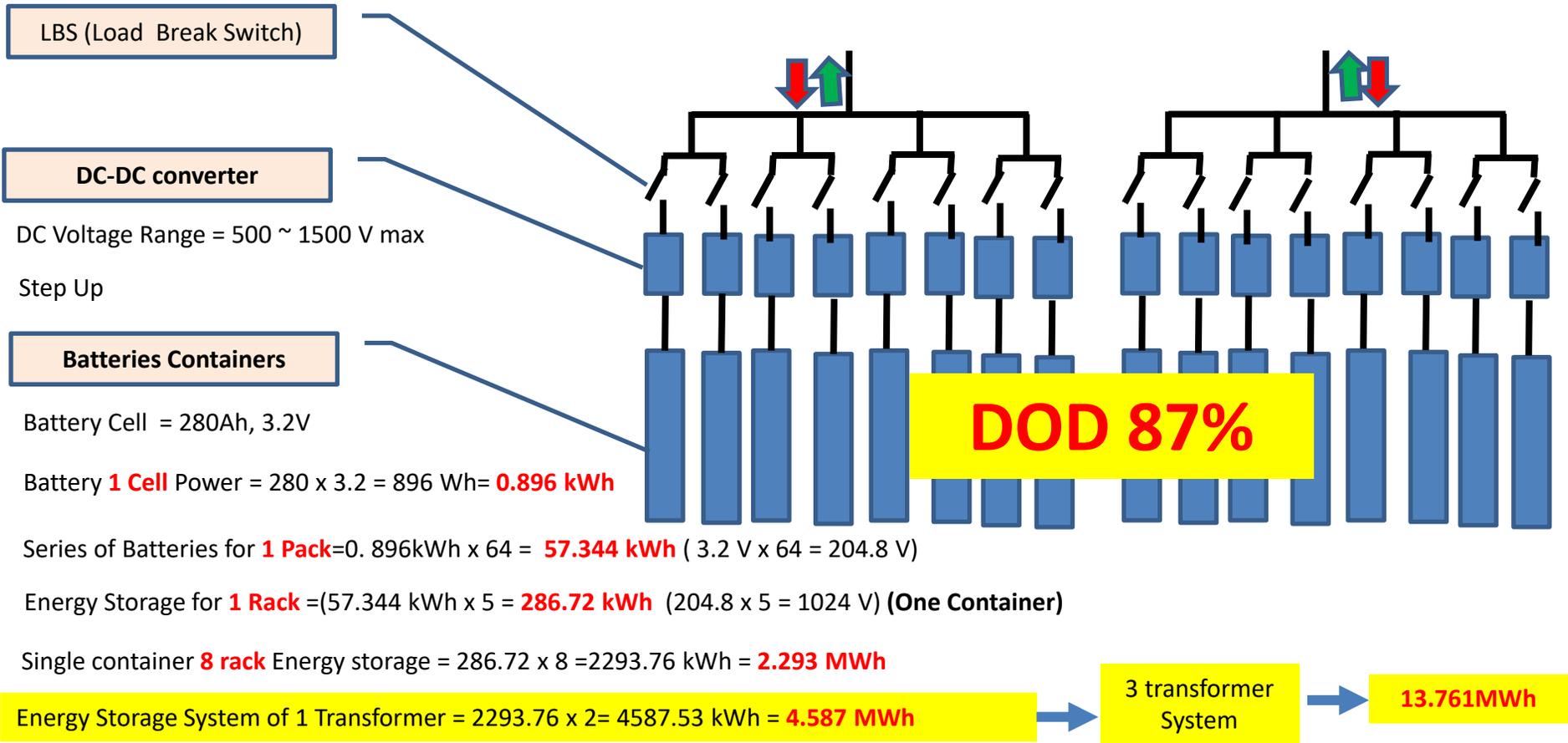
2.032MW

Total Battery storage capacity = (2.032x6 + 1.354 x1)

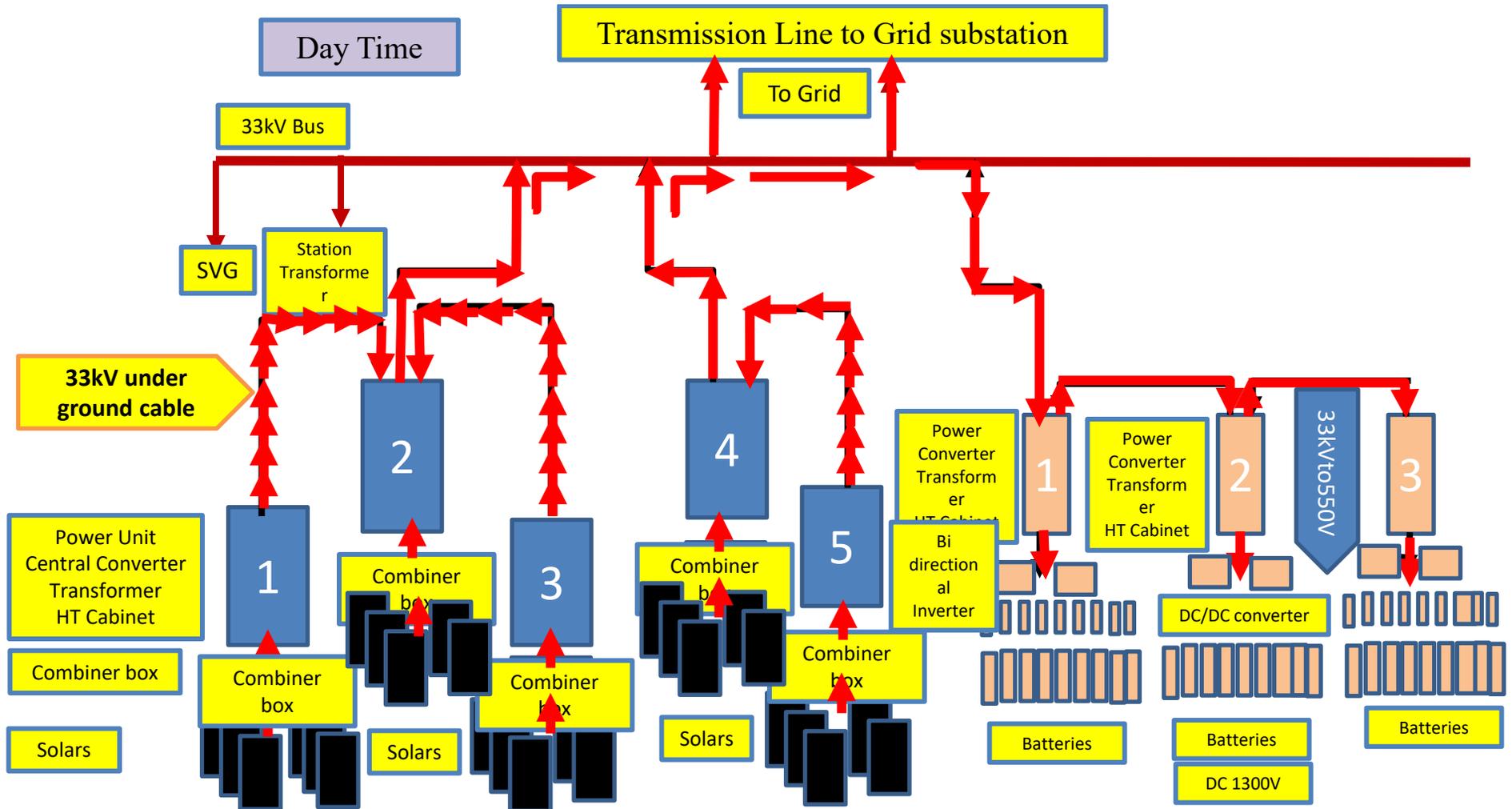
Total Battery working capacity = 13.546 MWh

Function of DC/DC Converter and LFP Batteries Container

Project 3

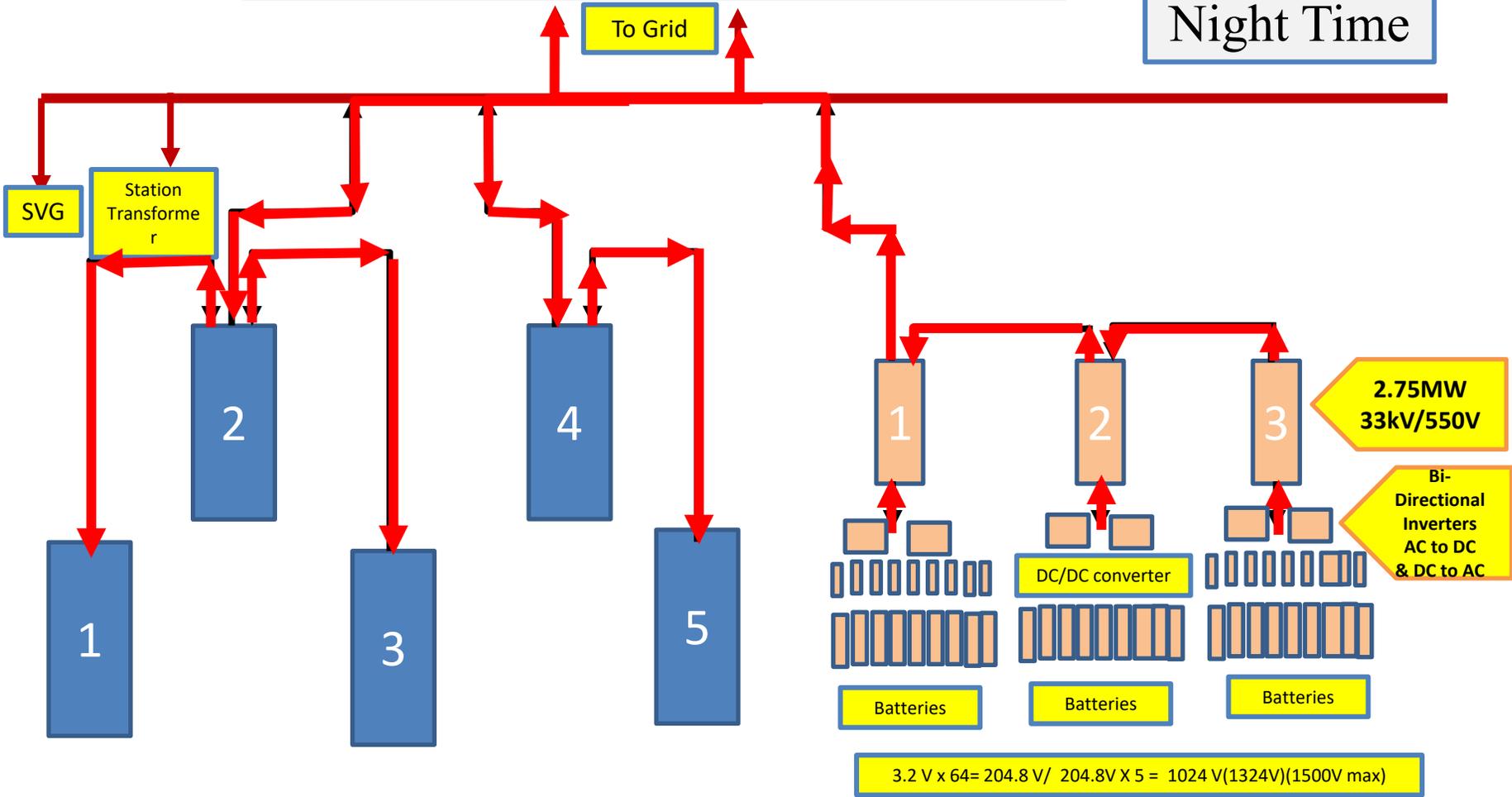


21.3 Concept of Solar power generation , Connected to Grid, battery charging and discharging



Transmission Line to Grid substation

Night Time



To Grid

SVG

Station Transformer

2

4

1

3

5

1

2

3

2.75MW
33kV/550V

Bi-Directional Inverters
AC to DC & DC to AC

DC/DC converter

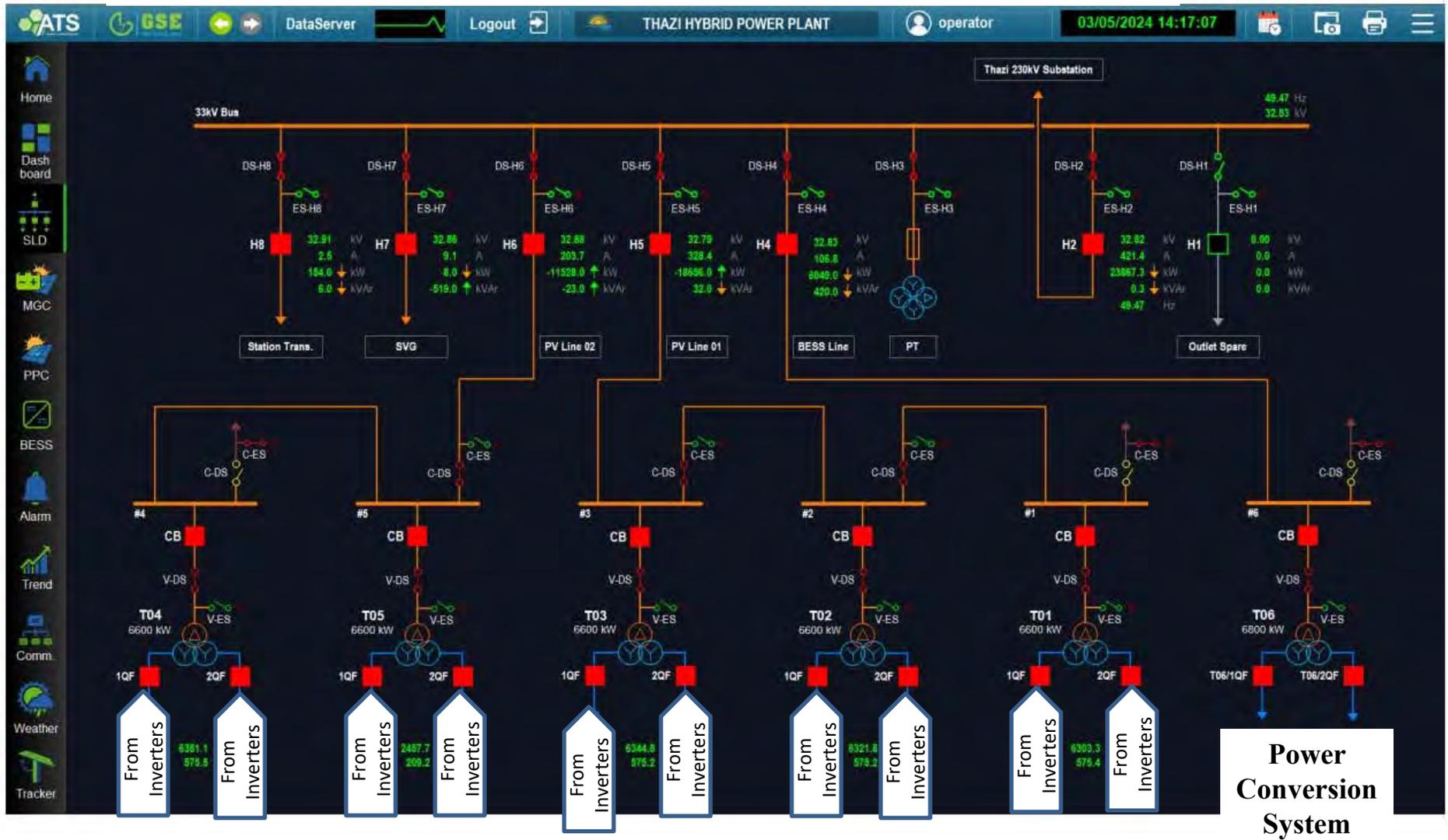
Batteries

Batteries

Batteries

$3.2V \times 64 = 204.8V / 204.8V \times 5 = 1024V (1324V) (1500V \text{ max})$

Main Single Line Diagram of Solar Power Plant



Battery status overview on SCADA Screen



#2 LFP - MONITORING

Battery status overview

BESS RMU



SOC = State of Charge(%)

DOD = Dead Of Discharge(%)

SOH = State of Health (%)

- Home
- Dash board
- SLD
- MGC
- PPC
- BESS
- Alarm
- Trend
- Comm.
- Weather
- Tracker

Battery condition ask to ChatGPT

In lithium iron phosphate (LFP) batteries, internal resistance tends to increase over time as the battery ages. This increase in internal resistance is due to various factors, including the degradation of electrode materials, the formation of solid electrolyte interphase (SEI) layers, and the accumulation of side reaction products within the cell.

Internal Resistance Comparison: New vs. Old LFP Batteries

1. New LFP Battery:

- 1. Lower Internal Resistance:** A new LFP battery typically exhibits low internal resistance because its electrodes are in pristine condition, and there is minimal buildup of degradation products. This low resistance enables efficient charge and discharge cycles with minimal energy loss.

2. Old LFP Battery:

- 1. Higher Internal Resistance:** As an LFP battery ages, the internal resistance increases. This is due to several factors such as:
 - 1. Electrode Degradation:** Over time, the active materials in the electrodes may degrade, leading to reduced conductivity and higher resistance.
 - 2. SEI Layer Formation:** The SEI layer on the anode grows thicker with each charge-discharge cycle, which increases resistance.
 - 3. Electrolyte Degradation:** The electrolyte can degrade, reducing its ionic conductivity.
 - 4. Mechanical Stress and Fatigue:** Repeated cycling can cause mechanical stress and fatigue, leading to microcracks in the electrodes and current collectors, further increasing resistance.

Implications of Increased Internal Resistance

- Reduced Performance:** Higher internal resistance in an old LFP battery leads to reduced power output and slower charging times. It can also cause more heat generation during operation, which can further accelerate degradation.
- Efficiency Loss:** Increased resistance means that more energy is lost as heat during charging and discharging, reducing the overall efficiency of the battery.
- Capacity Fade:** Alongside increased internal resistance, the battery's capacity may also fade, meaning it can hold less charge over time.

Measurement of Internal Resistance

Internal resistance can be measured using techniques such as Electrochemical Impedance Spectroscopy (EIS) or by applying a known current and measuring the voltage drop. Regular monitoring of internal resistance is crucial for understanding the health and performance of the battery over its lifecycle.

Conclusion

The internal resistance of an old LFP battery is greater than that of a new LFP battery due to the various forms of degradation that occur over time. This increased resistance negatively impacts the battery's performance, efficiency, and longevity.

The internal resistance of a new lithium iron phosphate (LFP) battery can vary depending on the specific design, quality, and manufacturer of the battery. However, for high-quality new LFP batteries, the internal resistance is typically in the range of:

Internal Resistance for New LFP Batteries

•**Typical Range:** 1 to 5 milliohms per ampere-hour ($m\Omega/Ah$)

Detailed Breakdown

1.High-Quality New LFP Batteries:

1. **Internal Resistance:** Around 1 to 3 $m\Omega/Ah$
2. **Example:** For a 50 Ah battery, this translates to an internal resistance of approximately 50 to 150 milliohms.

2.Standard New LFP Batteries:

1. **Internal Resistance:** Around 3 to 5 $m\Omega/Ah$
2. **Example:** For a 100 Ah battery, this would be about 300 to 500 milliohms.

Factors Influencing Internal Resistance

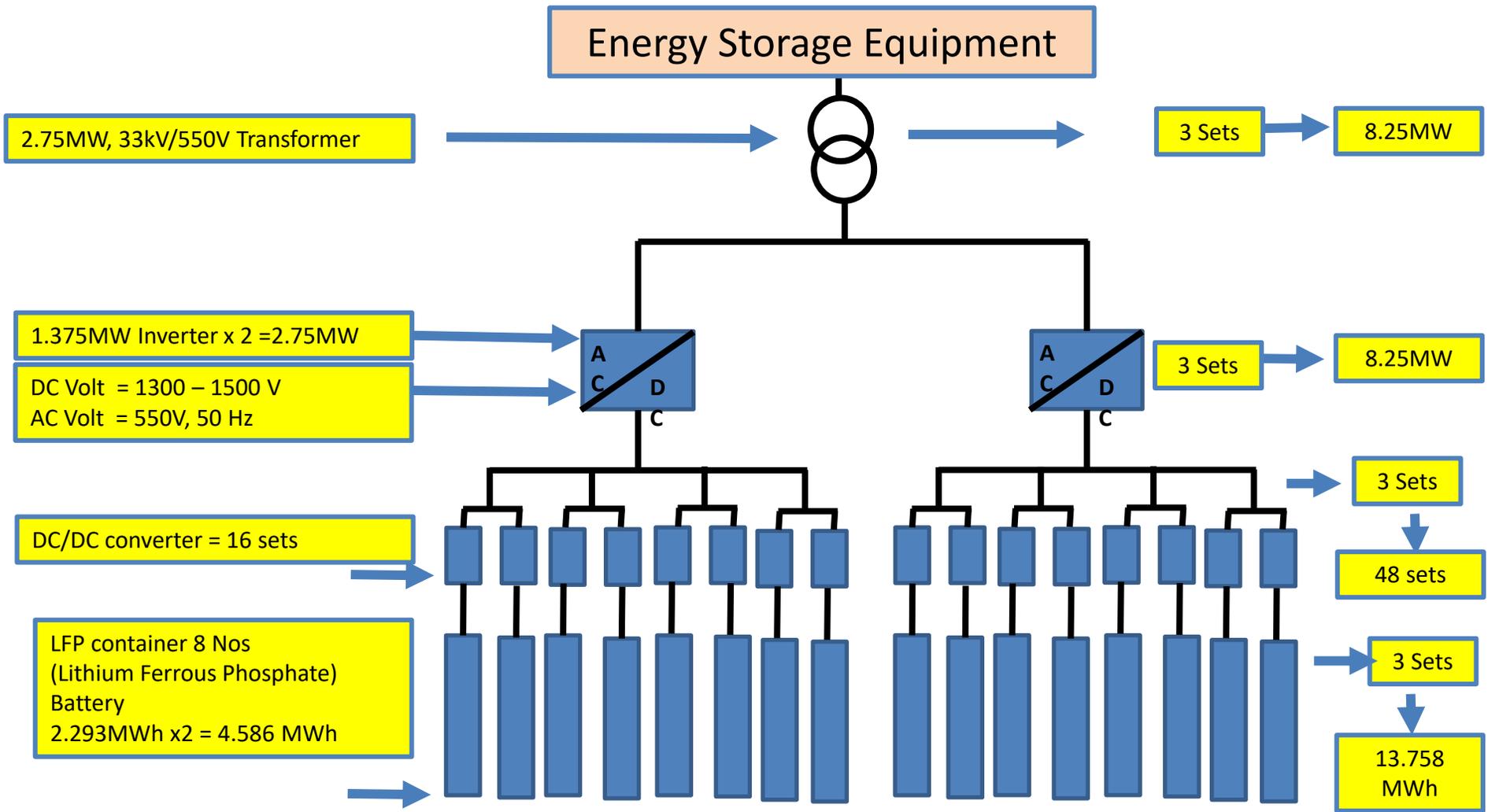
- 1. Battery Design:** Different manufacturers may use various materials and construction techniques, leading to differences in internal resistance.
- 2. Quality of Materials:** Higher quality materials typically result in lower internal resistance.
- 3. Capacity and Configuration:** The internal resistance is often lower in larger capacity cells due to the higher current-carrying capabilities.

Practical Implications

- **Efficiency:** Lower internal resistance in new batteries ensures higher efficiency with less energy lost as heat.
- **Performance:** Batteries with lower internal resistance can deliver higher power outputs and support faster charging rates.

Example Manufacturers and Specifications

- **A123 Systems:** Known for producing LFP batteries with very low internal resistance, often in the lower end of the 1-3 mΩ/Ah range.
- **BYD and CATL:** Other leading manufacturers also producing high-quality LFP batteries with competitive internal resistance values.



Concept of Charging & Discharging

Day Time Function

Night Time Function

To Grid

From Solar Farm

33kV Bus

Primary

33kV

Secondary

33kV

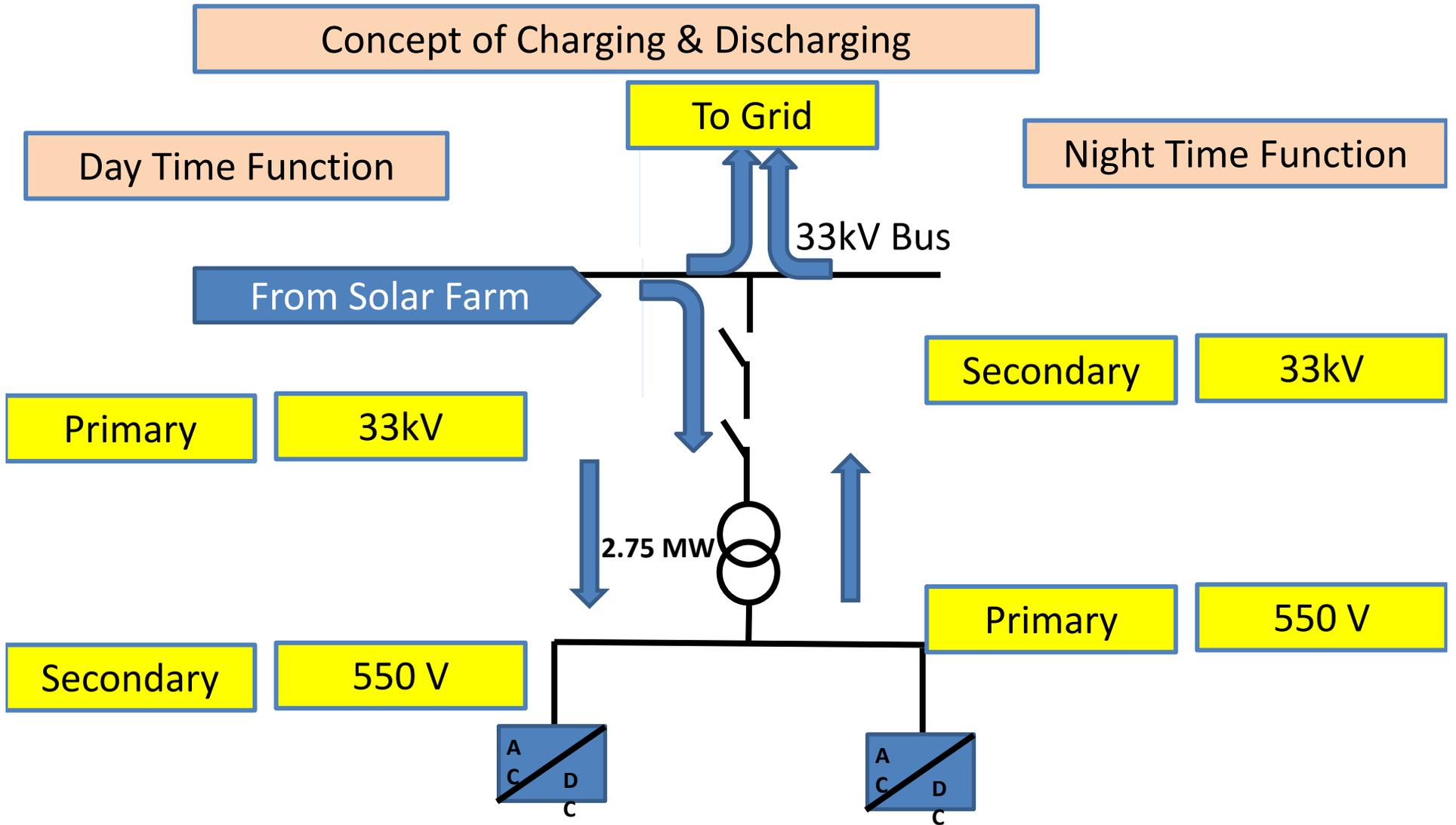
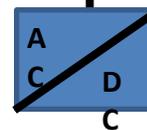
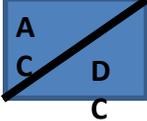
2.75 MW

Primary

550 V

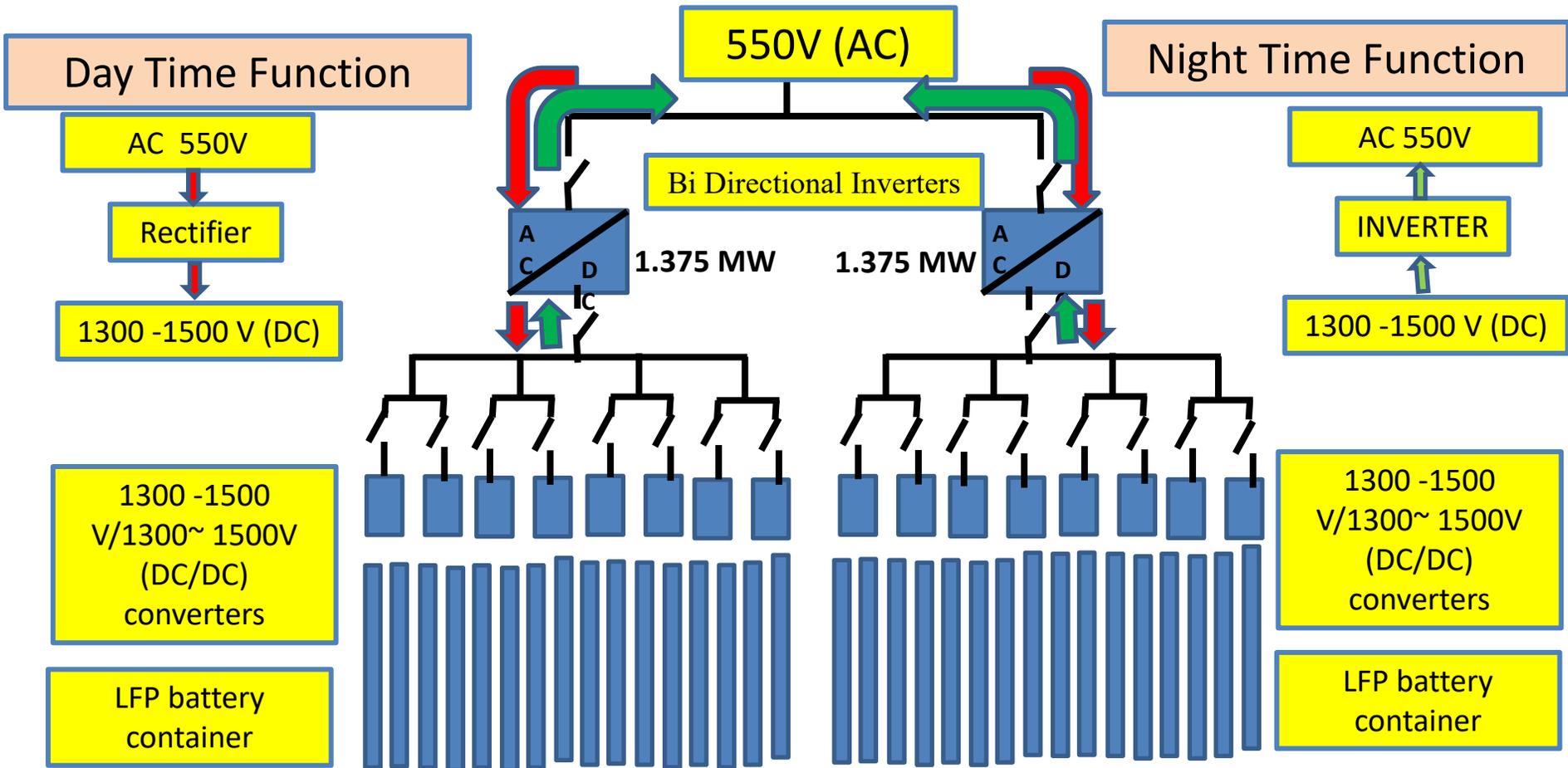
Secondary

550 V



Project 3

Function of AC/DC Equipment



Single line diagram of 1 Box Transformer

Transformer Capacity = 6.6 MW,
33/0.8 -0.8kV

Inverter Capacity = 300 kW

Inverter Quantity = 22 sets

Polysilicon bifacial solar module 550Wp

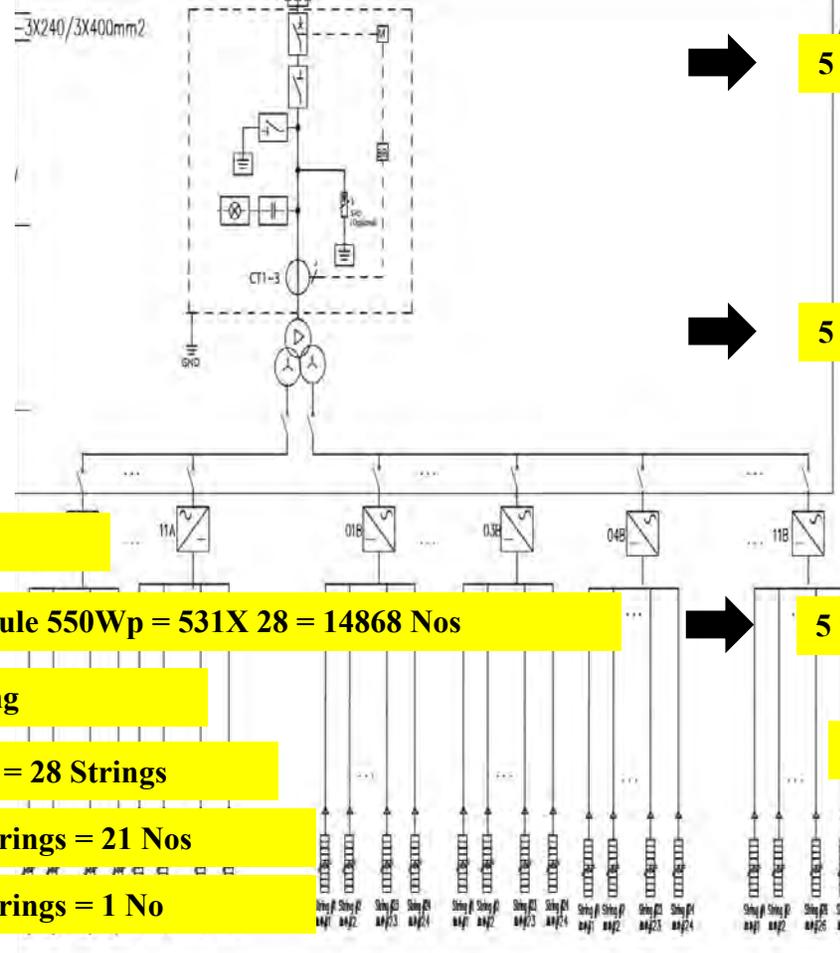
Total Nos of Polysilicon bifacial solar module 550Wp = $531 \times 28 = 14868$ Nos

Total String for 1 Transformer = 531 String

Maximum connected String for 1 Inverter = 28 Strings

Nos of Inverters that connected with 24 Strings = 21 Nos

Nos of Inverters that connected with 27 Strings = 1 No



5 Sets

33 MW

5 Sets

110 set

33 MW

5 Sets

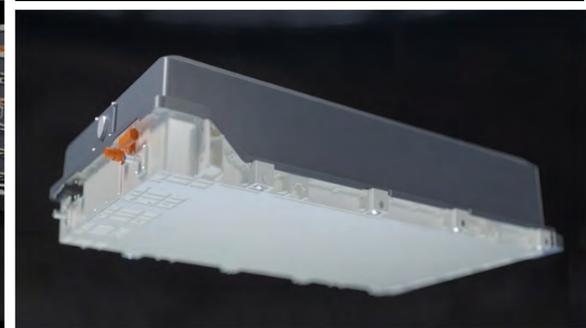
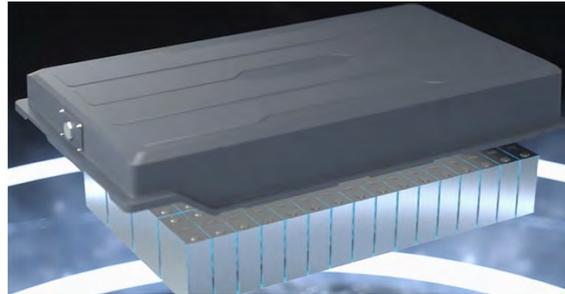
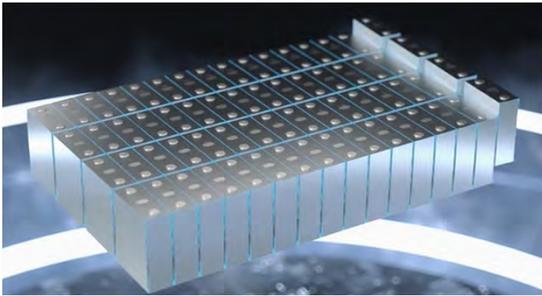
74340 Nos

DC Power = $74340 \times 550\text{Wp}$

40.887MW

(22) Battery Rack Container Construction Images

Battery Pack assembly



Container 1#လုံး#အတွက်လျှပ်စစ်သိုလှောင်စွမ်းအား

Project 3

Battery cell တစ်ခု၏# capacity နှင့်#ဗို့အား## #? **280Ah, 3.2V**
Battery Cell တစ်ခု၏သိုလှောင်လျှပ်စစ်စွမ်းအား#(280 x 3.2 = 896 Wh) = **0.896 kWh#**

Battery cell 64 ခုကို##1 Packing ထုပ်ထားသည့်###လျှပ်စစ်စွမ်းအား#
*0.896 kwh x 64) #####=**57.344kWh**
1 pack Voltage (3.2 Vx 64 nos series) #####=**204.8V#**

Battery pack 5 ခုကို##1 Rack တပ်ဆင်ထားသည့်###လျှပ်စစ်စွမ်းအား#
*57.344 kwh x 5) =**286.72kWh**
1 rack Voltage (204.8 Vx 5 nos series) = **1024V#**

Container#တစ်လုံးလျှင်#8 racks ပါရှိပြီး#စုစုပေါင်း#လျှပ်စစ်သိုလှောင်စွမ်းအားမှာ? #2.293MWh
(286.72x 8 racks= 2293.76kWh = 2.293MWh)#

Container 6#လုံး#အတွက်လျှပ်စစ်သိုလှောင်စွမ်းအား? 2.293 MWh x 6 = 13.758 MWh#

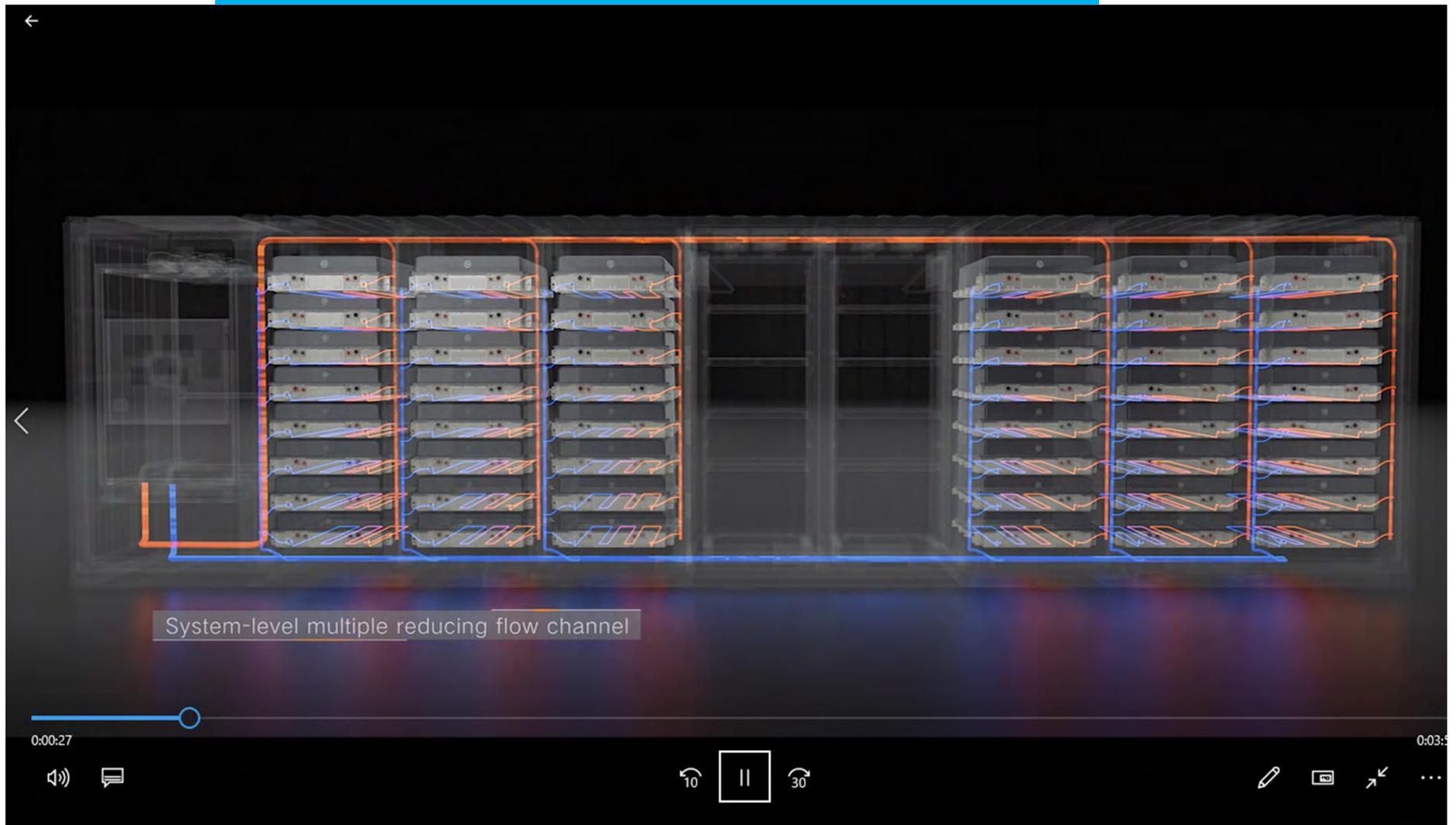
Front view of battery container



Internal view of battery container



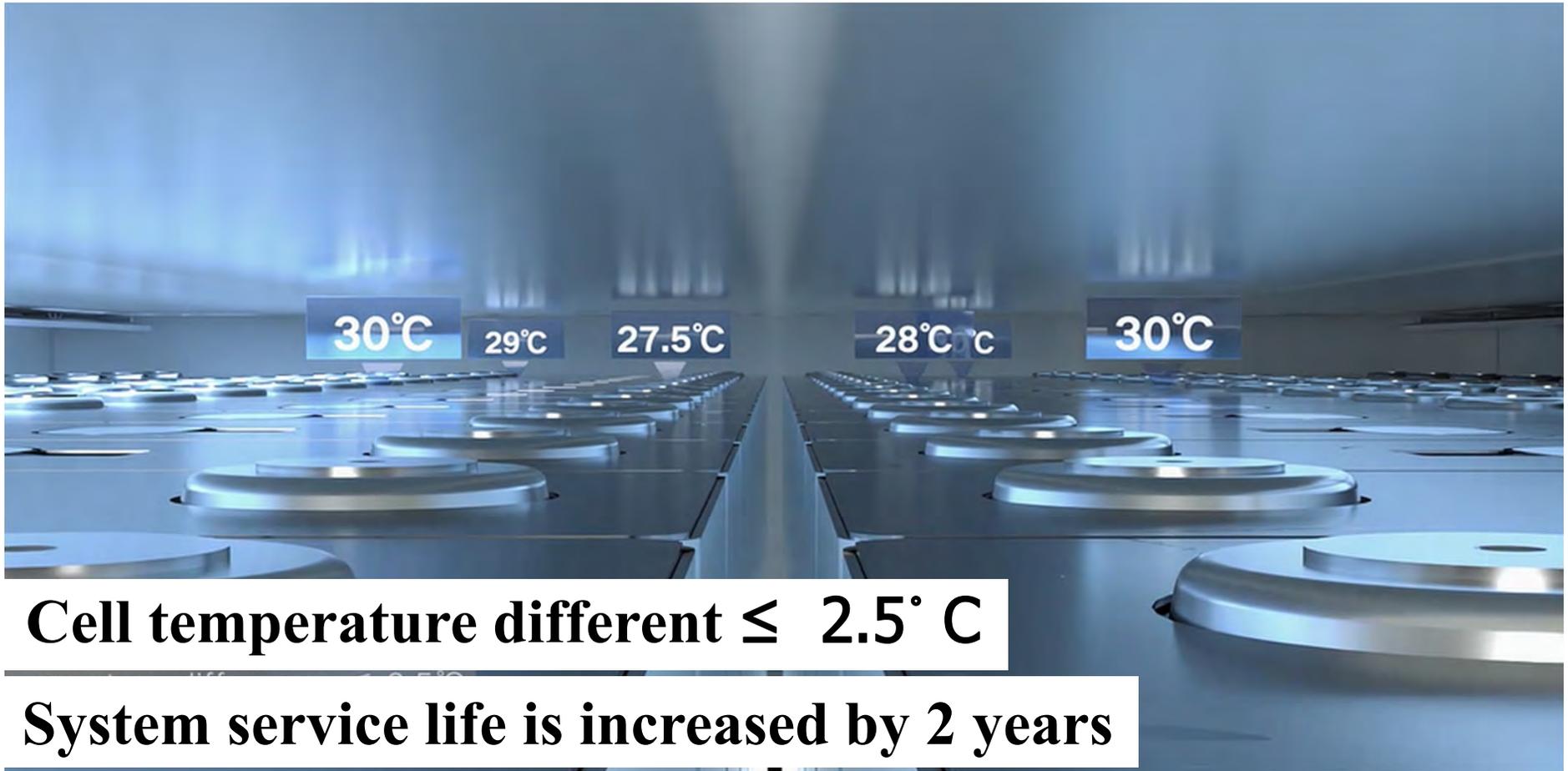
Battery pack cooling system





Cell temperature different $\leq 2.5^{\circ} \text{C}$

System service life is increased by 2 years



Cell temperature different $\leq 2.5^\circ \text{C}$

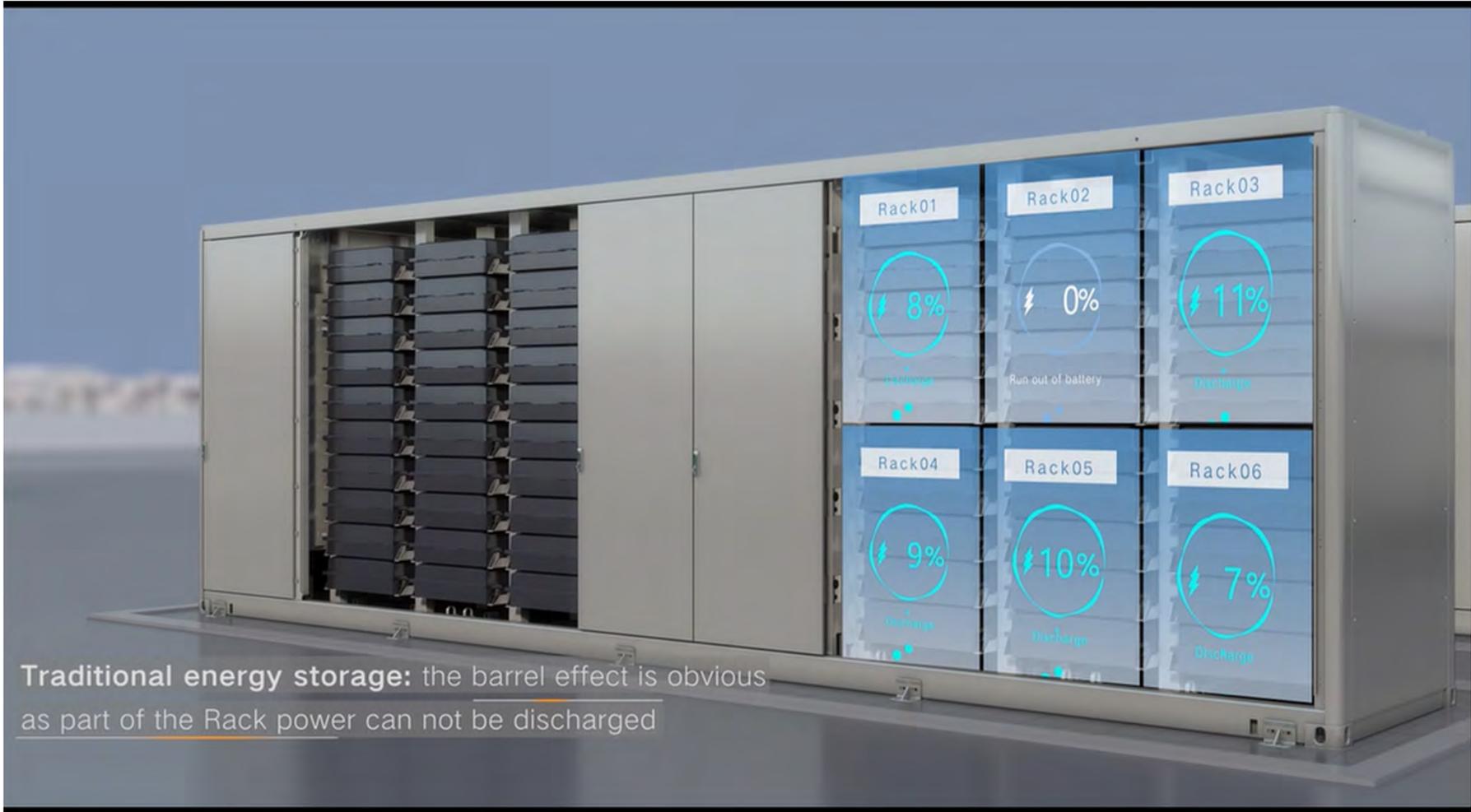
System service life is increased by 2 years



Intelligently adjust the power consumed for thermal management and reduce energy loss by 30%



Traditional energy storage: the barrel effect is obvious as part of the Rack power can not be fully charged



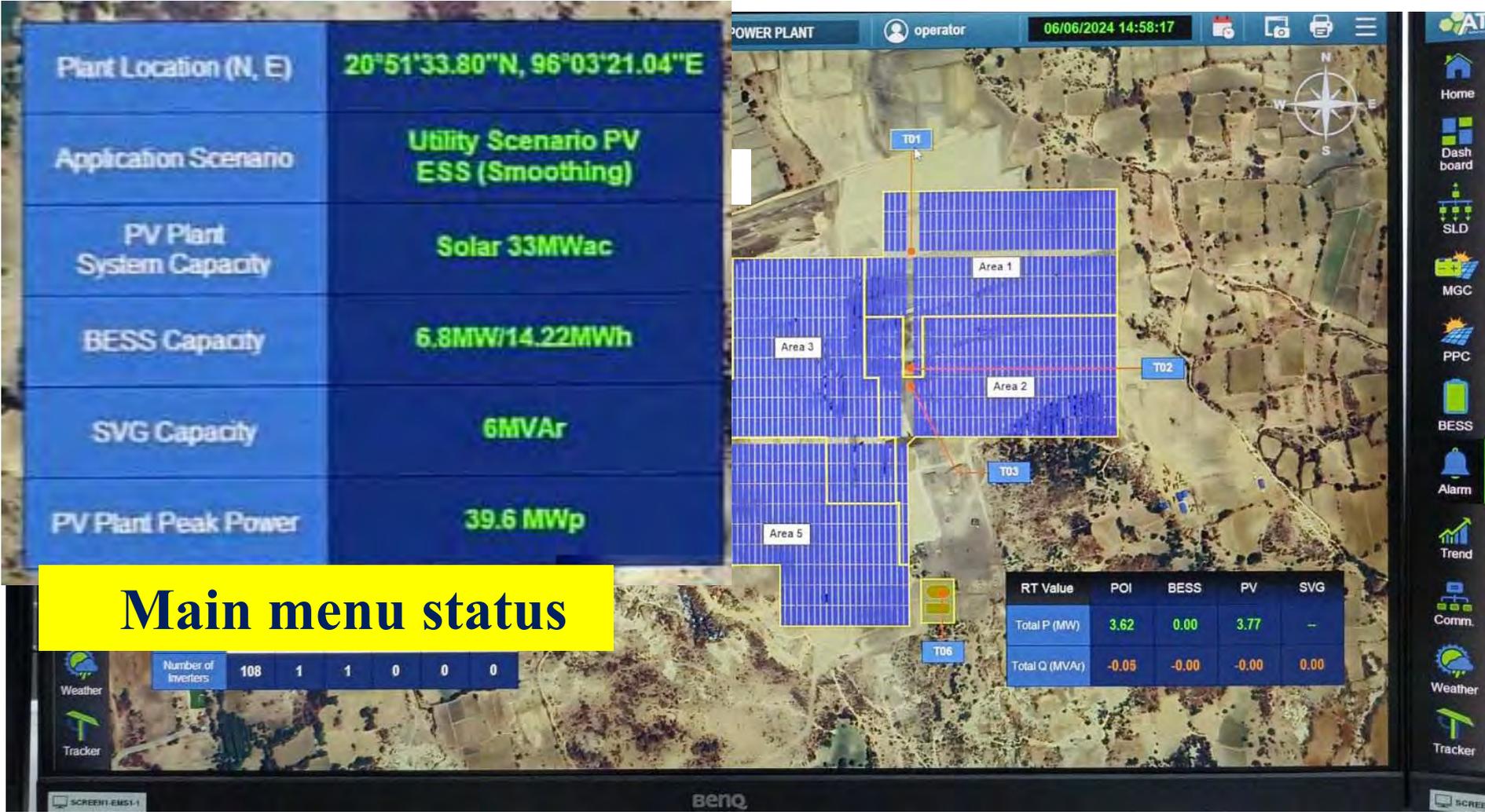
Traditional energy storage: the barrel effect is obvious as part of the Rack power can not be discharged



PowerTitan :
charging and
boosting system



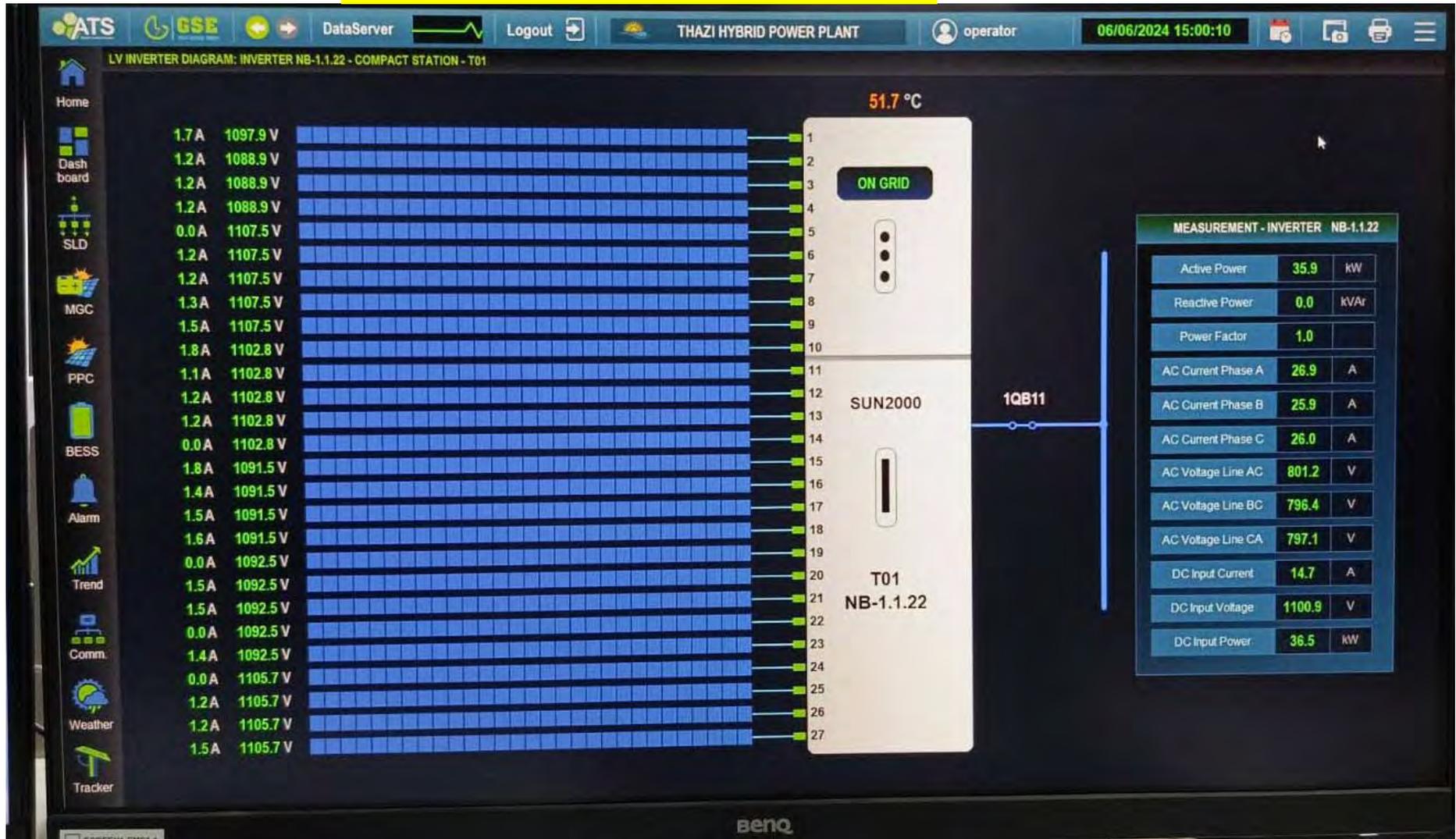
(23) SCADA Home screen and Monitoring Screens



Box type transformer Status



Solar String Status



String Inverters Status

ATS

GSE

06/06/2024 15:00:25

LV INVERTER DIAGRAM: INVERTER NB-1.1.22 - COMPACT STATION - T01

Home

Dashboard

SLD

MGC

PPC

BESS

Alarm

Trend

Comm.

Weather

Tracker

REALTIME VALUES

Cabinet Temperature	51.7	°C	Power Factor	1.00
AC Current Phase A	27.1	A	Frequency	50.05 Hz
AC Current Phase B	26.4	A	Tot. Energy Yield	70 MWh
AC Current Phase C	26.2	A	Tot. Ener. Current Day	1.378 MWh
AC Voltage Line AB	801.20	V	Tot. Ener. This Month	11.9 MWh
AC Voltage Line BC	796.40	V	Tot. Ener. This Year	70.2 MWh
AC Voltage Line CA	797.10	V	Total CO2 Reduced	70.0 Ton
AC Voltage Phase A	462.10	V	Efficiency	98.34 %
AC Voltage Phase B	460.50	V	DC Input Power	37.10 kW
AC Voltage Phase C	460.50	V	DC Input Current	14.8 A
Active Power	36.49	kW	DC Input Voltage	1106.01 V
Reactive Power	-0.02	kVAr		

REALTIME ALARM

INV. Communication Fail	Abnormal String Power	Upgrade Failed
INV. Locked	AFCI Self-Check Failure	License Expired
INV. Startup	Short Circuit Between Phase to PE	Faulty Monitor Unit
INV. Standby	Grid Loss	Faulty Power Collector
INV. On-grid	Grid Under Voltage	Active Islanding
INV. Normal Grid Connection	Grid Over Voltage	Passive Islanding
INV. Derate Due To Power Ration	Unbalanced Grid Voltage	Transient AC Overvoltage
INV. Derate Due To Internal Causes	Grid Over Frequency	Peripheral Port Short Circuit
INV. Normal Shutdown	Grid Under Frequency	Off-grid Output Overload
INV. Faulty	Grid Frequency Instability	Abnormal PV Module Config
INV. Shutdown Due To Power Ration	Output Over Current	Optimizer Fault
INV. Shutdown	Output DC Component Overhigh	Built-in PID Operation Abnormal
INV. Spot-check	Abnormal Residual Current	High Input String Voltage to Ground
High String Input Voltage	Abnormal Ground.	External Fan Abnormal
DC Arc Fault	Low Insulation Res.	Battery Reverse Connection
String Reverse Connection	Cabinet High Temperature	PV String Loss
String Current Backfeed	Device Fault	Spare

Active Power



INVERTER STATUS

ON GRID

PR: 75.9 %

HISTORY ALARM

Timestamp	Message	Value	Status
06/06/2024 05:27:53.493	#1 SUB ARRAY INV22 - INVERTER STATUS	5 (INVALID)	Active
06/06/2024 05:27:53.493	#1 SUB ARRAY INV22 - INVERTER STATUS	0 (ON GRID)	Active
06/06/2024 05:27:53.326	#1 SUB ARRAY INV22 - STARTUP	True	Active
06/06/2024 05:27:48.716	#1 SUB ARRAY INV22 - INVERTER LOCKED	False	Inactive
05/06/2024 19:02:13.650	#1 SUB ARRAY INV22 - INVERTER STATUS	1 (STANDBY)	Active
05/06/2024 19:02:13.630	#1 SUB ARRAY INV22 - INVERTER LOCKED	True	Active
05/06/2024 05:25:25.275	#1 SUB ARRAY INV22 - INVERTER STATUS	0 (ON GRID)	Active

Query Time: 17/03/2024 06:30:00 -> 01/01/2050 06:30:00 | 100 e...

Alarm Status

NR		PREVIOUS	COMMON BCU		SLD	Menu	ACK
PT_Cabinet_BCU_fal	PQM_channel_alarm	DC_rectifier_fault	DC_feeder_panel_AC_serial_4to_DC				
PT_Cabinet_BCU_Alarm	PQM_devkke_alarm	DC_monitor_fault	NVR_Alarm				
PT_Cabinet_DC_MCB_fal	PQM_DC_power_MCB_Trip	Comm_power_module_fault	Fire_alarm				
33kV_line_control_panel1_AC_MCB_Trip	PQM_AC_power_MCB_Trip	Comm_power_system_alarm	Fire_host_fault				
33kV_line_control_panel1_DC_MCB_Trip	DTR1_fal	comm_mon_and_ctrl_unit_alarm	AC_Module_Alarm				
33kV_line_control_panel1_PT_MCB_Trip	DTR1_Alarm	comm_mon_and_ctrl_unit_fault	AC_Module_fault				
33kV_line_control_panel1_DC1_power_supply_alarm	DTR1_AC_MCB_Trip	UPS_mon_and_ctrl_unit_alarm	110F_incoming_ACB_position				
33kV_line_control_panel1_F871_or_F511_device_fault	DTR2_DC_MCB_Trip	UPS_mon_and_ctrl_unit_fault	110F_incoming_ACB_position				
33kV_line_control_panel1_F801_in_ol_alarm	Energy_meter_panel_DC_MCB_Trip	UPS_inv_out	33kV_line_control_panel2_AC_MCB_Trip				
33kV_line_control_panel1_F871_Prot_Trip	Energy_meter_panel_VT_MCB_Trip	UPS_bypass_out	33kV_line_control_panel2_DC_MCB_Trip				
33kV_line_control_panel1_CB1_Auto_reclose	Energy_meter_panel_LAC_MCB_Trip	UPS_AC_in_fault	33kV_line_control_panel2_PT_MCB_Trip				
33kV_line_control_panel1_DTT_Trip	Power_aquisition_device_AC_fal	UPS_DC_fault	33kV_line_control_panel2_DC1_power_supply_alarm				
33kV_line_control_panel1_508F_T2_trip	Power_aquisition_device_DC_fal	UPS_overload	33kV_line_control_panel2_F871_or_F511_device_fault				
33kV_line_control_panel1_F511_Prot_Trip	Power_aquisition_device_fal	UPS_inv_fault	33kV_line_control_panel2_K861_relay_operated				
33kV_line_control_panel1_F501_device_fault	DC_module_fault	AC_feeder_panel_AC_fault	33kV_line_control_panel2_F871_Prot_Trip				
Gateway_fal	DC_insulation_fault	AC_feeder_panel_DC_fault	33kV_line_control_panel2_CB1_Auto_reclose				
Gateway_fal	DC_charger_panel_DC_fault	Inverter_fault	33kV_line_control_panel2_DTT_Trip				
Clock_fal	DC_chager_panel_AC_fault	AC_feeder_panel_Overload	33kV_line_control_panel2_508F_T2_trip				
Clock_sync_alarm	Battery_fault	DC_feeder_panel_insulation_device_failure	33kV_line_control_panel2_F511_Prot_Trip				
Gateway_panel_DC_MCB_Trip	System_fault	DC_feeder_panel_Isolation_error	33kV_line_control_panel2_F501_device_fault				
Gateway_panel_AC_MCB_Trip	Monitor_fault	DC_feeder_panel_voltage_error					

(24) Other System in Solar plants

Fire Protection System, Fire Alarm system

CCTV and security System

Station Communication (OPGW)

Protection Relay System

(25) Implementations and Construction Process

1. Consider of land Area requirement
2. Organization and Resources collection
3. Site clearing , Survey
4. Access road construction to site
5. Soil Testing
6. Enviromental Management Plan(EMP)
7. Construction Plans and Schedules.
8. Design Drawing Study and Implementation.
9. Grading earth work, Drilling, pile foundations, construction
10. Drainage and Fence construction
11. Material Delivery and Receiving
12. Solar PV panel support columns , tracker motor and brackets installation
13. Solar panels (photovoltaic (PV)) installation and allignment test
14. 33kV Overhead Line and OPGW Construction and installation from Solar plant to main Grid Power

15. Grid Power Station and receiving site switchyard installation and testing
16. Combine grounding system for entire solar plant area and LA system
17. AC (LT, HT) , DC, Communication cable laying
18. Inverters & Box typed transformers installation
19. Cables & wires testing and Terminations
20. High Voltage panels, control and monitoring system installation and wire connection.
21. Central control inside the power House.
22. Final testing of new transmission line and float charge test.
23. Individual final inspection and testing by supplier expert.
24. Power connecting with Grid
25. Combine test with both supplier and power authority inspectors
26. Combine COC Test (Contracted Operation Characteristics)
27. Operation and Training
28. Problems and Solving
29. Regular maintenance
30. General Study

Consider of Land Area Requirement

Basically land requirement for PV panel = 1kW/ 6 m²

For 1MW requirement is 6000 m² = about **1.5 Acre**

Consider for row by row space for 1 MW = 1.5x 2 = **3 Acre**

Consider for Access road, Fence, Parameter road, Site inspection road, Space for Inverters, space for Box type transformer, Drainage system, Fire protection space inside the fences , staff quarters and plant offices; etc **added 1.5 Acre**

For 1MW solar plant = 4 ~ 4.5 acre

For Thapyaywa 30MW = 4.5 x 30 = 135 Acre (Present land **133.4 Acre)**

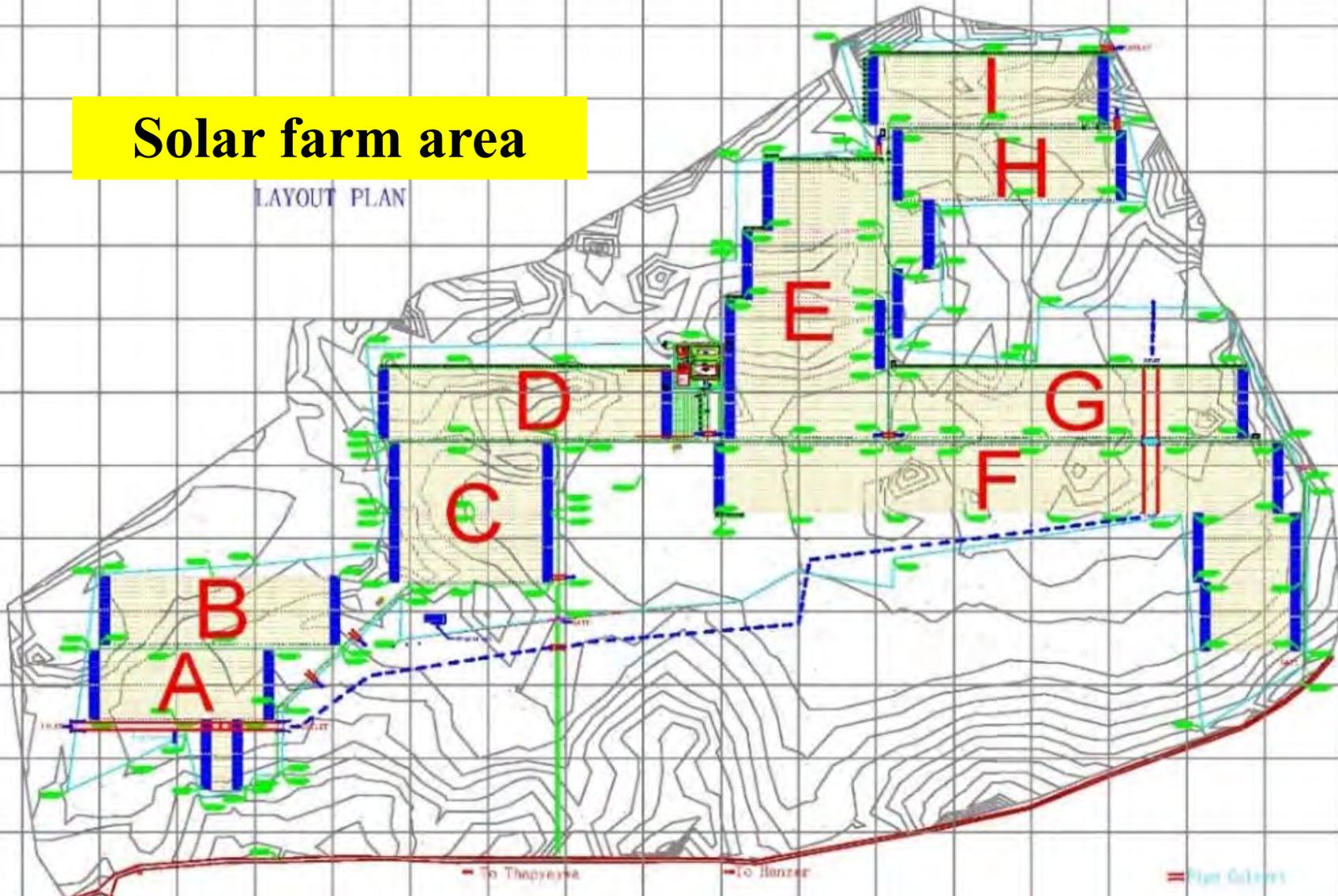
For Taung Taw Gwin 20MW = 4 x 20 = 80 Acre (Present land **80 Acre)**

Solar farm area Requirement

Particular	Project 1	Project 2	Project3	Project 4
Project Capacity	30MW	20MW	30MW 13.758MWh (BESS)	30MW 13.761MWh (BESS)
Land use	133.5 Acre	80 Acre	115 acre	115 acre
For 1MW	4.45	4.0 Acre	4 acre	4 acre

Solar farm area

LAYOUT PLAN



1. Site cleanning, Survey



2. Organization and Resources collection

ROYAL VICTORY ENGINEERING SERVICES CO., LTD



Total Vehicle and Machinery (493) units.

**New generation Human Resources
of
Solar Power Energy**



Manpower and Machinery at site

MANPOWER AND MACHINERIES



TOTAL MANPOWER- 550



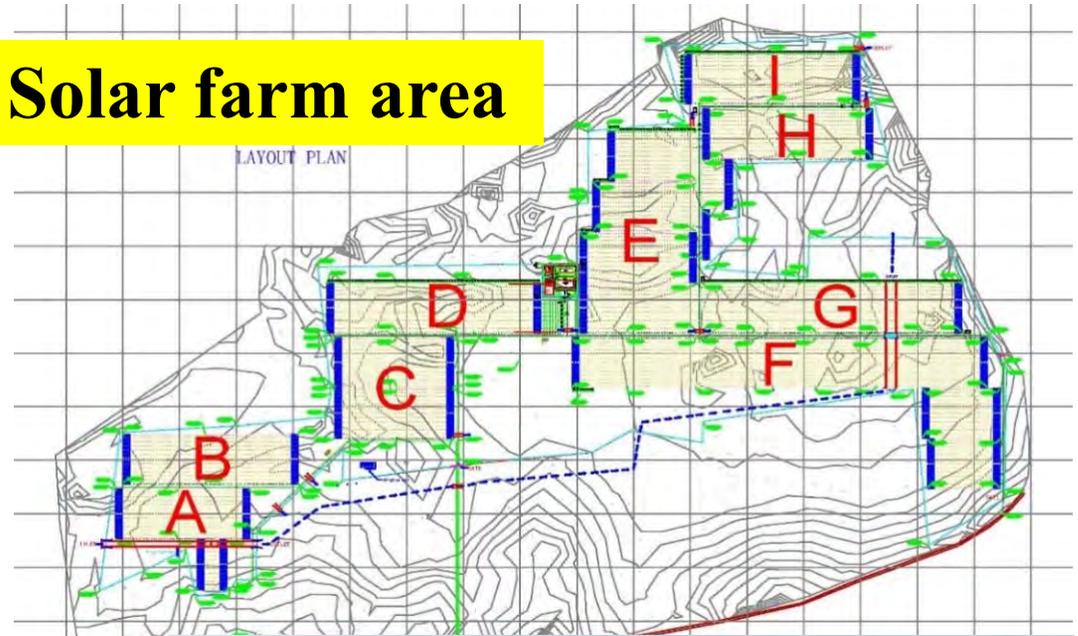
A TOTAL OF (60) VEHICLES
AND
MACHINERIES



3. Site cleaning, Survey



Solar farm area



Before Project Start



Site cleaning



4. Access road to project construction site

Access Road to Project Site



Access Road to Project site



Inspection Roads of Solar Projects



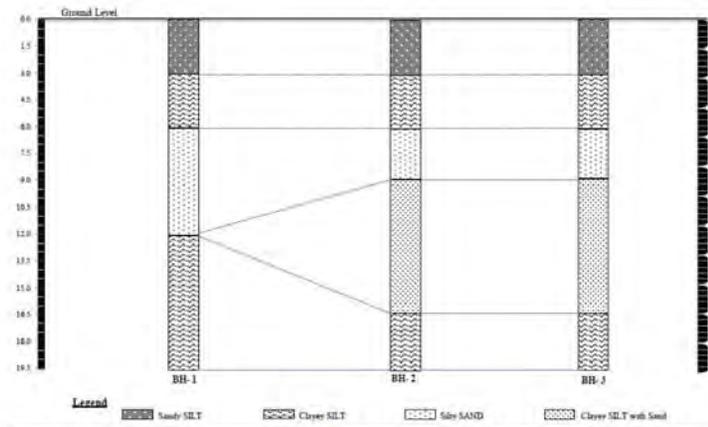
5. Soil testing



Drilling



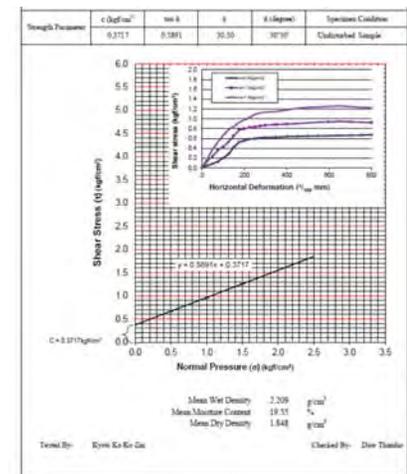
Core Sample



Cross Section Profile and Layout Plan of Bore Holes



Atterberg Limit test



Strength Parameter

Soil test Report

Disturbed Sample

SR. NO.	DEPTH m	GRAIN SIZE DISTRIBUTION				ATTERBERG'S LIMIT			SP. GR.	DENSITY g/cm ³		MOISTURE %	SOIL TYPE
		Clay %	Silt %	Sand %	Gravel %	LL %	PL %	PI %		Wet	Dry		
1	0.0 ~ 3.45	19.00	58.00	23.00	0.00	37.50	22.01	15.49	2.67	2.00	1.71	16.75	Sandy SILT
2	4.5 ~ 6.45	27.00	68.00	5.00	0.00	49.80	24.69	25.11	2.67	2.20	1.91	15.11	Clayey SILT
3	7.5 ~ 9.45	30.50		69.50	0.00	NP			2.66	2.20	1.80	21.95	Silty SAND
4	10.5 ~ 12.45	15.00		85.00	0.00	NP			2.66	2.00	1.81	10.36	Silty SAND
5	13.5 ~ 16.95	38.50	54.50	7.00	0.00	50.20	22.03	28.17	2.69	2.00	1.64	21.76	Clayey SILT
6	18.0 ~ 19.95	38.00	52.00	10.00	0.00	48.50	21.00	27.50	2.69	2.00	1.64	22.30	Clayey SILT

Undisturbed Sample

SR. NO.	DEPTH m	GRAIN SIZE DISTRIBUTION				ATTERBERG'S LIMIT			SP. GR.	DENSITY g/cm ³		DIRECT SHEAR		MOISTURE %	SOIL TYPE
		Clay %	Silt %	Sand %	Gravel %	LL %	PL %	PI %		Wet	Dry	C	Φ		
												Kgf/cm ²	Degree		
1	4.0 ~ 4.5	34.00	36.00	30.00	0.00	39.80	20.14	19.66	2.68	2.20	1.84	0.3717	30° 30'	19.55	Clayey SILT
2	10.0 ~ 10.5	11.50		88.50	0.00	NP			2.66	2.00	1.69	0.0937	38° 57'	18.52	Silty SAND

6. Environmental Management Plan(EMP)



Public consultation meeting held on 7.1.2021 at MyoGyiKone Village.



Questions, Comments and Suggestions from the Attendees



Air Quality Monitoring



On-site Water Quality Measurement and Water Sampling



Noise Level Monitoring at Source and Receptor

7. Construction Plans and Schedules.

Date: 13-May-22

Item No.	Description	2022							Progress (%)
		March	April	May	June	July	August	September	
1	Governmental Approvals								
	(1) MIC Permit	■	■	■					100%
	(2) ESIA Report	■	■	■	■				35%
	(3) PPA	■	■	■	■	■	■	■	
2	Preliminary Survey	■	■						100%
3	Soil Investigation	■	■						100%
4	Machine Mobilization	■							100%
5	Site Clearing	■							100%
6	Levelling	■							100%
7	Fencing	■	■	■	■				90%
8	Fabrication and Shipping	■	■	■	■	■	■		65%
9	Transportation of Equipment to Project Site		■	■	■	■	■		28%
10	Civil Works								
	(1) Box Transformer Foundation	■	■	■	■				100%
	(2) Solar Power Station Building	■	■	■	■	■	■		78%
	(3) Outdoor Equipment Foundation	■	■	■					100%
	(4) Multi-Use Building	■	■	■	■				100%
11	33KV New Transmission Facility Installation	■	■	■	■	■			40%
12	Switch Bay		■	■	■	■			90%
13	Drainage System	■	■	■	■	■			47%
14	Equipment installation		■	■	■	■	■		3%
15	New Transmission Facility Handing over						■	■	
16	Energization						■	■	
17	Testing for Commercial Operation						■	■	
18	Commercial Operation Date							■	
	Schedule								56%
	Achieve								

8. Design Drawing Study and Implementation.

CIVIL DRAWING LIST

1. Box transformer foundation construction drawing.
2. Grounding and Station Transformer foundation construction drawing.
3. Construction drawing of Tracker foundation.
4. Distribution room structure construction drawing.

ELECTRICAL DRAWING LIST

1. Electrical Main Equipment List
2. Overview PV Plant
3. 33kV Power Distribution device wiring and layout
4. Grounding X'mer wiring and layout
5. 400V Power single line diagram
6. Cable laying and Fire protection in Switchyard Area
7. PV Module Installation and Wire diagram
8. Principle and Installation drawing of string inverter
9. Box Transformer diagram
10. Cable layout of PV area
11. The lightning protection and earthing
12. List of power cable
13. Lighting of Switchyard
14. Electrical diagram of 33kV expansion of Thapyaywa station

Local Design Drawing for Projects

Supporting Facility Works At 30MW Thapyaywa & 20MW Taungtawgwin Solar

- (1) Project Area Fencing (Thapyaywa & Taungtawgwin)
- (2) Site Inspection Road (Thapyaywa & Taungtawgwin)
- (3) Construction of Bridge Myogyi Main Canal (1) (Taungtawgwin)
- (4) Drainage System
 - a. Intake Structure (Thapyaywa)
 - b. 7 Opening Box Culvert (Thapyaywa)
 - c. 7 Opening Pipe Culvert (Thapyaywa)
 - d. Side Drain of Inspection Road (Taungtawgwin)
 - e. Main Drain Work (Thapyaywa)
 - f. Outlet Gate Structure (Taungtawgwin)
 - g. Retaining Wall Between Panel Blocks (Taungtawgwin)

9. Grading earth work, Drilling, pile foundations, construction

❑ In accordance with the designed requirement, it's mainly emphasized-measure on Leveling.

❑ It's being implemented to withstand the earthquake magnitude scale – 8

Target days - 60 days

Drilling, Concreting, Footing Processing Days 50 Days



Footing



Levelling

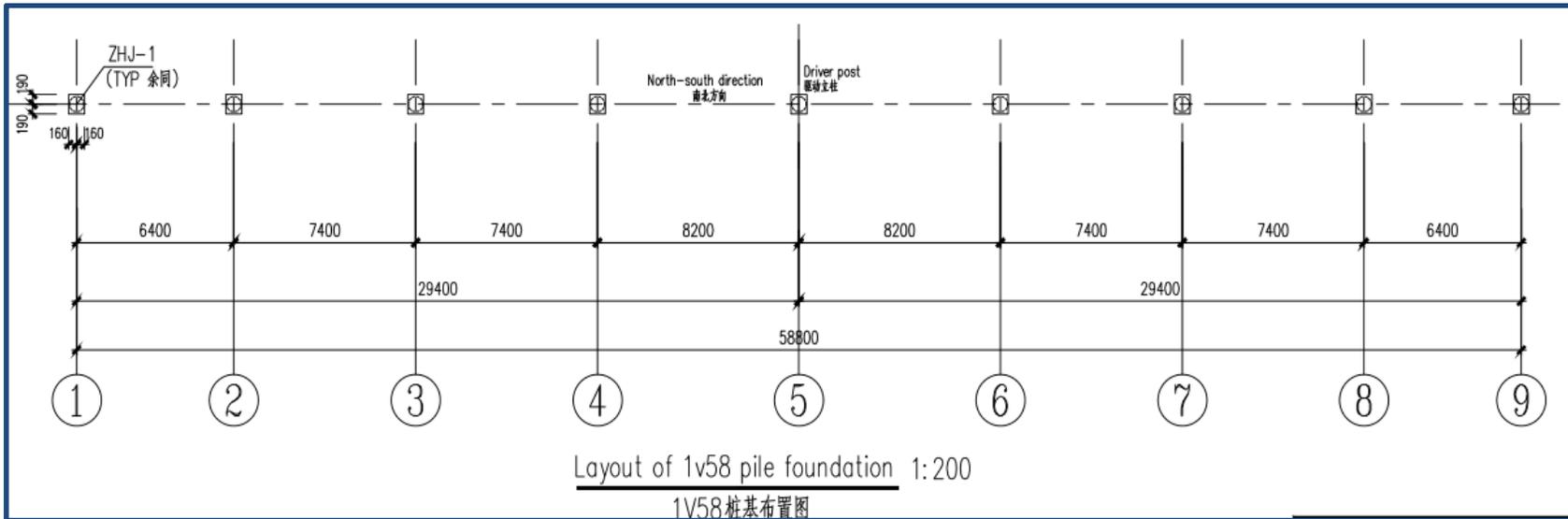


Schedule



: 12,518 nos.

Spacing of tracker supporting column



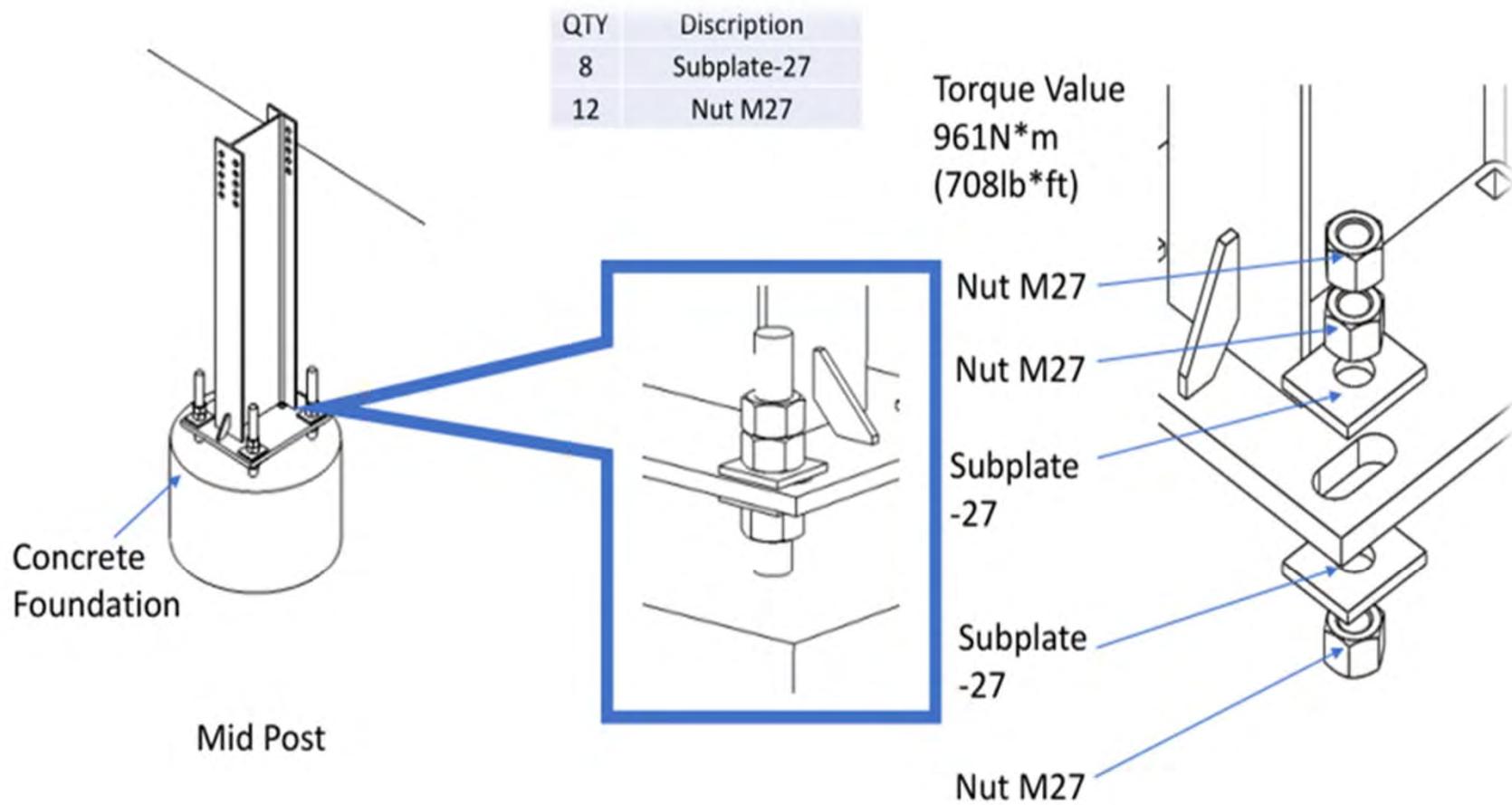
Type	Quantity	Schedule (pcs.)	Finished#(pcs.)	Balance#(pcs.)	Progress (%)
1V58 / 10 set	10 x 58	580	580	-	100
1V87 / 956 set	956 x 87	83,172	83,172	/	100
Total Quantity (PV Module)		83,752	83,752	/	100%

Solar Module supporting columns inside the water drainage canal



❑ In accordance with the designed requirement, it's mainly emphasized-measure on Leveling.

❑ It's being implemented to withstand the earthquake magnitude scale – 8



10 Drainage and Fence Construction



Drainage System Implementation Work



Fence Installation Work (Length 18,248 ft.)



Project (1)



Project Area fencing Work



Iron Mesh Fencing(Project 1)



Iron Mesh Fencing(Project 2)

Inspection Road in the Project Area



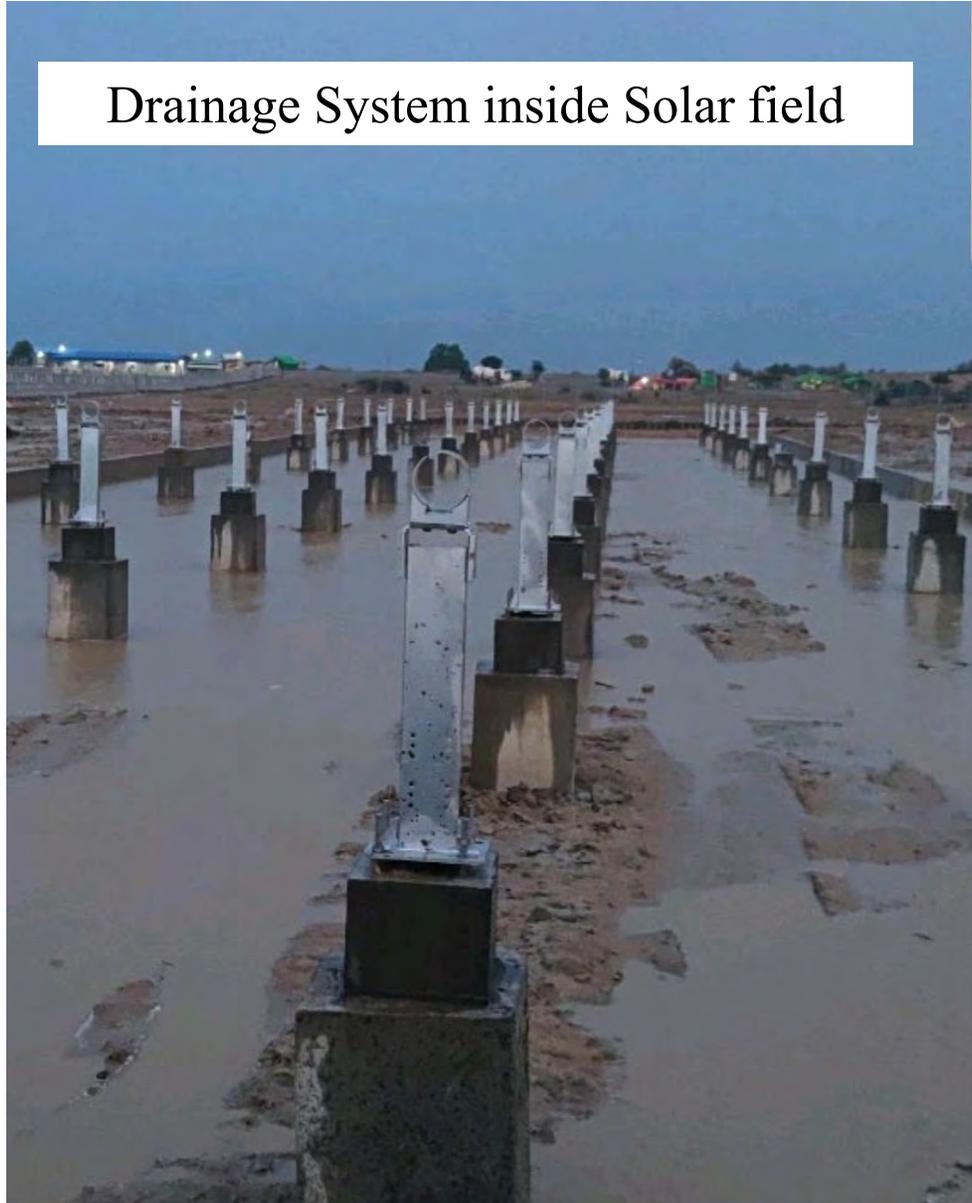
30MW project



20MW Project

Drainage System Pipe Culvert(7 Openings)





Water flow during construction period



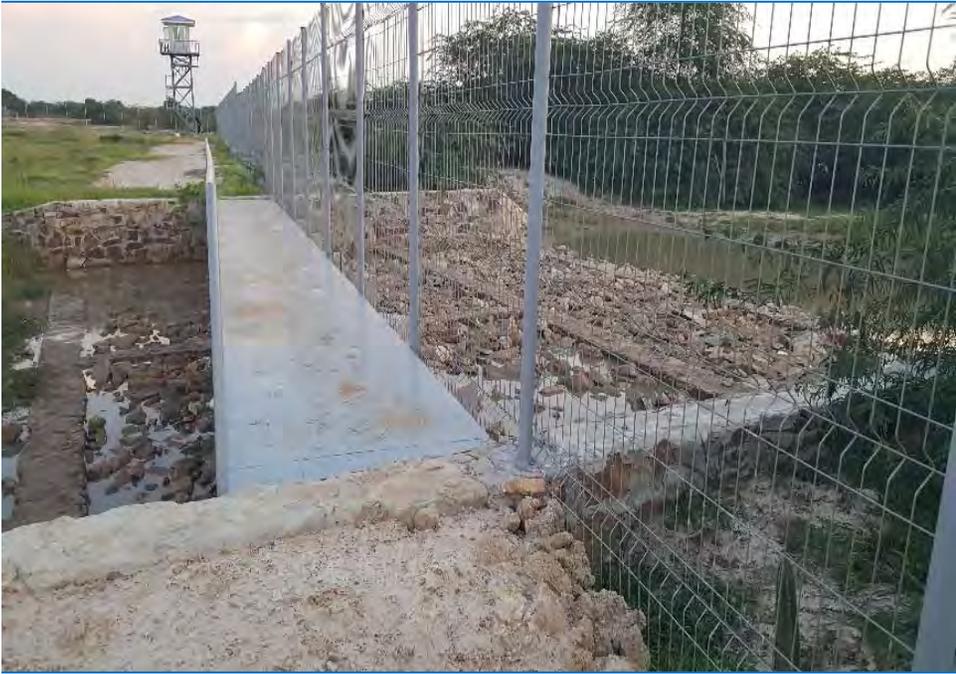
Construction of Bridge Across Myogyi Main Canal(1)

Project (2)



Drainage Intake

Project (1)



11 Material Delivery and Receiving



Facing difficulties because of epidemic Covid -19



Material Receiving at Thapyaywa project site



LOGISTIC OF IMPORT MATERIALS OF TAUNG TAW GWIN PROJECT



Transport by railway (from Shanghai to Linchan)



Cross-Chin Shwe Haw Border

Particular	Quantity
Nos. of Container (Estimate)	134 Nos.
Arrived at Chin Shwe Haw	75 Nos.
Arrived at Project Site	39 Nos.



Unloading at Chin Shwe Haw



Kunlon Bridge Crossing



Unloading at Taung Daw Gwin Project Site

Early March 2022 in China, many provinces and cities stopped production of factories, and logistics were interrupted due to happen a sudden and severe epidemic (including the factories that's produced the equipment for our Taungdawgwin project).

As the result, the production of equipment was inability to complete as planned and it cannot also shipped the equipment already completed production from Shanghai port in time due to the closure of Shanghai.

Lead to delay in delivery and affect on-site construction period, due to the domestic epidemic prevention and control measures and there is the time uncertainty from transportation between provinces to customs declaration at ports.

Box-Type Transformer Arrival on Site



12 Solar (PV) panel support columns, Tracker motor and Bracket Installation

HORIZON SINGLE AXIS TRACKING BRACKET

- ❑ Tracker/Bracket involves motor drive system which automatically rotate backward and forward in accordance with the sun's position by control-setting.

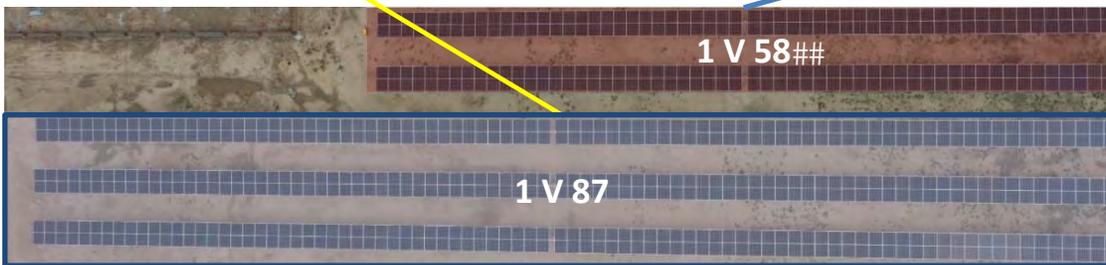
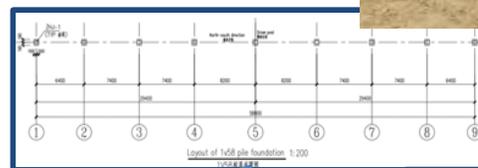
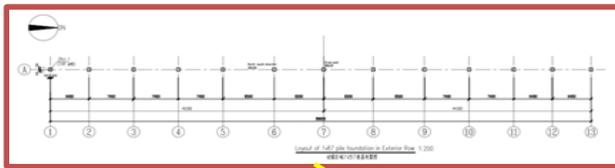


Solar Tracking System - 966 set



13 Solar (PV) panels Installation

□ In solar installation, it involves 10 Lines of 1V/58 which is PV panels 58 pcs in one line and 956 lines of 1V87 which is PV panel 87 pcs in one line as per project designed.



Type	Quantity	Schedule (pcs.)	Finished# (pcs.)	Balance# (pcs.)	Progress (%)
1V58 / 10 set	10 x 58	580	580	-	100
1V87 / 956 set	956 x 87	83,172	83,172	/	100
Total Quantity (PV Module)		83,752	83,752	/	100%

14 33kV Overhead Line and OPGW Construction and installation from Solar plant to main Grid Power

- ❑ Total Length of 3.91 Miles
- ❑ ACSR 605MCM, Single bundle, double Circuit
- ❑ Projected Timeline 60 Days of Works
- ❑ **Completed Within 35 DAYS**



Record photo of 33kV overhead Transmission Line

Project (1)



Record photo of 33kV overhead Transmission Line

Project (2)



15. Grid Power Station and receiving site switchyard installation and Testing

Project 2 Main Power station(Grid)

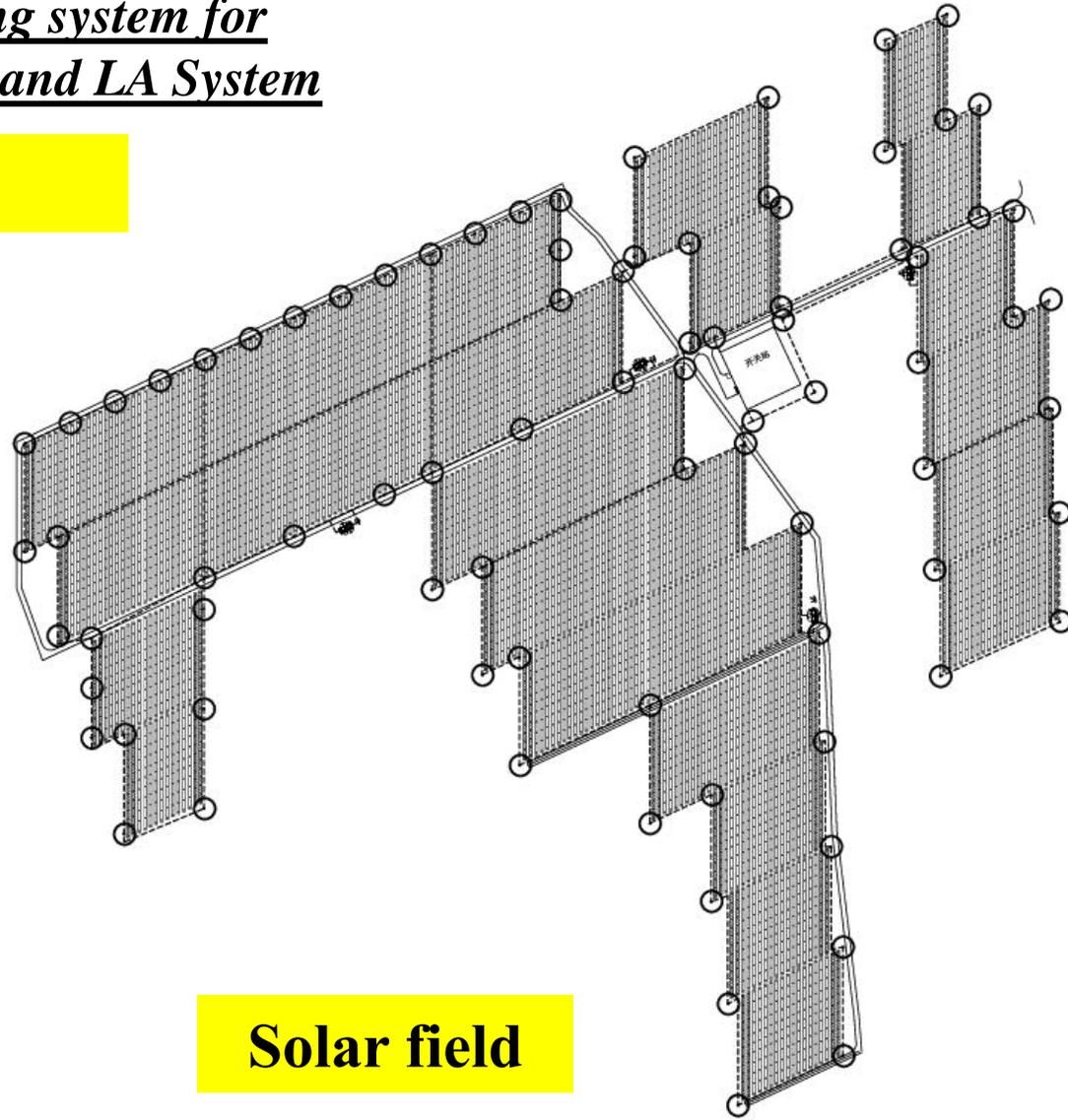
Foundation (Switch Bay)

**Finished (Switch Bay) at
Receiving Grid Substation**



**16. Combine grounding system for
entire solar plant area and LA System**

Project (2)



Solar field

Record photos of Grounding Installation works



Grounding conductor Installation Work



Earthing Installation Work



Earthing Connection Installation Work



Lightning pole Installation

Lightning Pole Installation



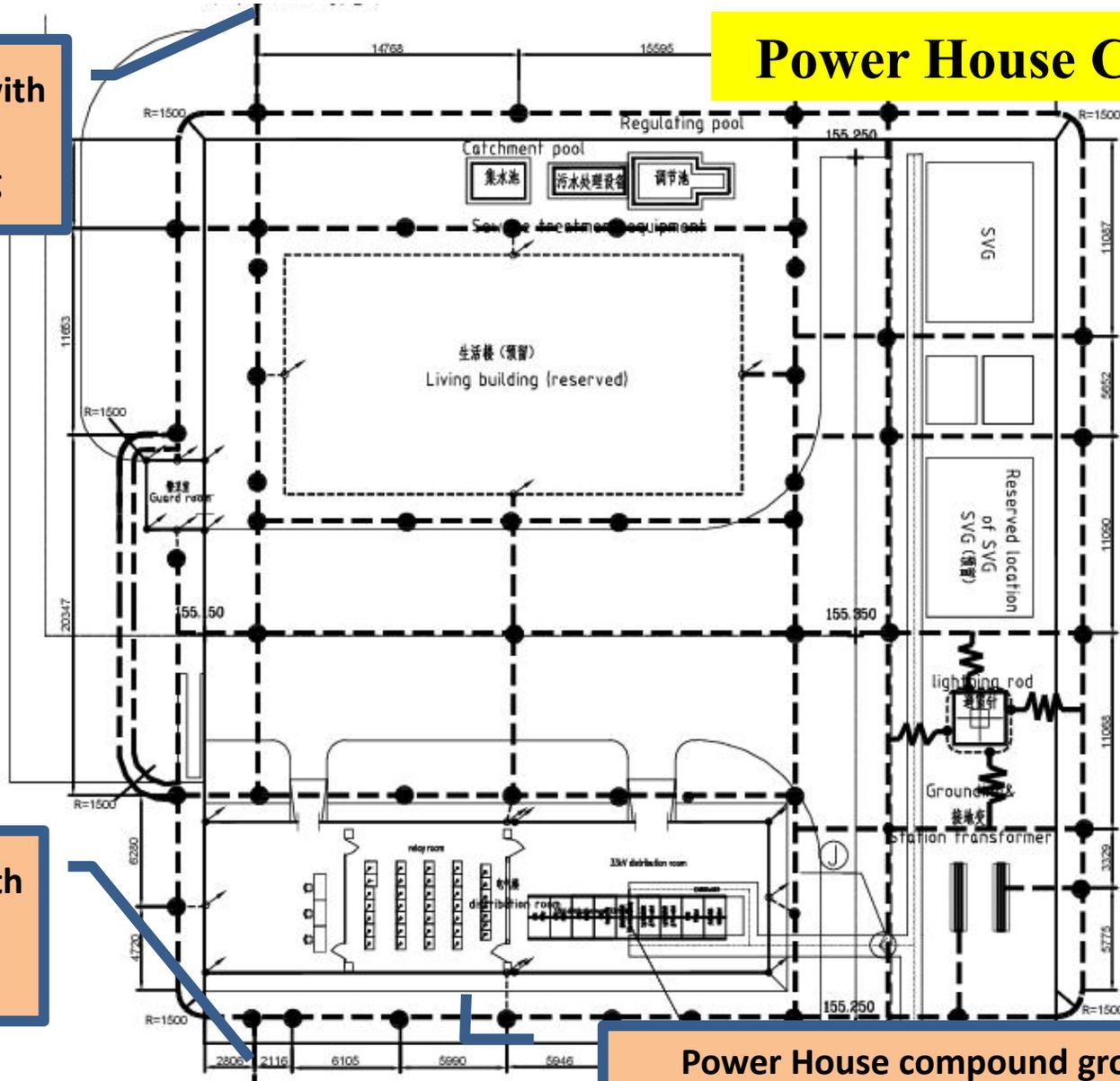
16. Earthing & Lightning Protection Design



Power House Compound

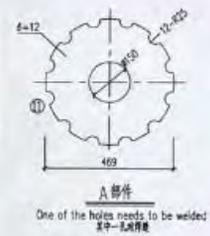
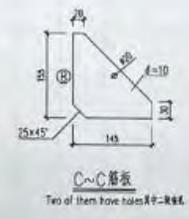
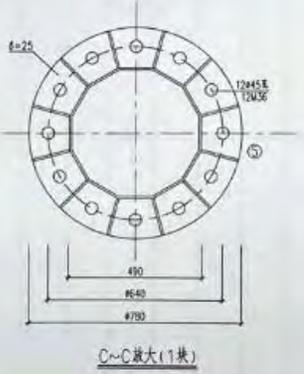
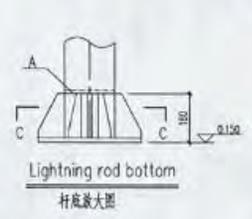
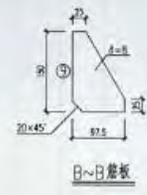
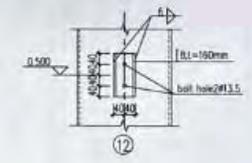
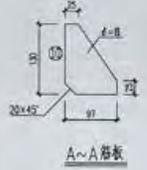
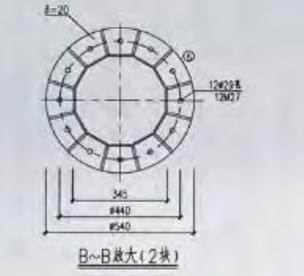
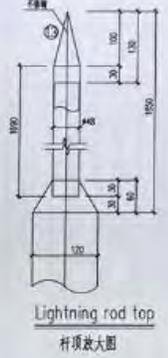
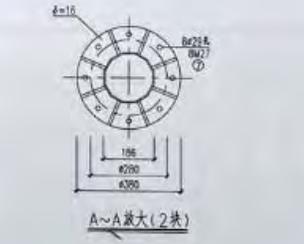
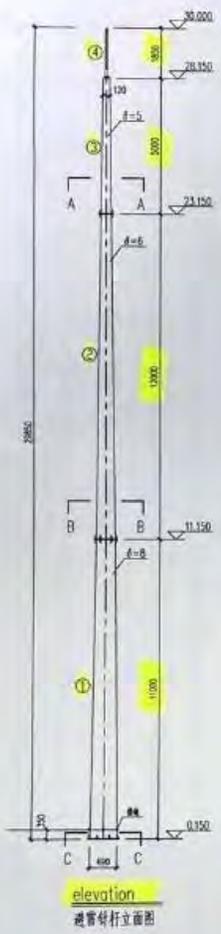
Connected with
PV field
grounding

Connected with
PV field
grounding



Power House compound grounding Design

Lightning Arrester Detail Design



Total Height of Lightning Arrester Pole = 30meter

17. AC (HT, LT), DC Cable laying works

Specification of Cables

PV to Inverter 1 x 4 mm²

- DC Cable

Inverter to Box Transformer

1.8/3kV, 3 x 150 mm²

1.8/3kV, 3 x 185 mm²

1.8/3kV, 3 x 240 mm²



- AC Medium Voltage

Box Transformer to Sub-Station

26/35kV, 3 x 120 mm²

26/35kV, 3 x 150 mm²

26/35kV, 3 x 240 mm²



- AC High Voltage

Sub-Station

0.6/1kV, 4 x 6 mm²

0.6/1kV, 4 x 10 mm²

0.6/1kV, 3 x 25 mm² + 1 x 16 mm²

0.6/1kV, 3 x 185 mm² + 1 x 95 mm²

0.6/1kV, 3 x 50 mm² + 1 x 25 mm²



- AC Low Voltage

Note!

LT side voltage is 800 V .

DC cable Installation



PVC pipe Installation Work for PV Cable Supporting



Y Termination Work



Communication Box Cable installation and Piping Laying Work



Inverter Side PV Cable Termination Work

DC cable Installation



AC cable Installation



AC cable laying Work



Cable trenches for Cable laying works



Box transformer underground pipe water proof mud Installation Work

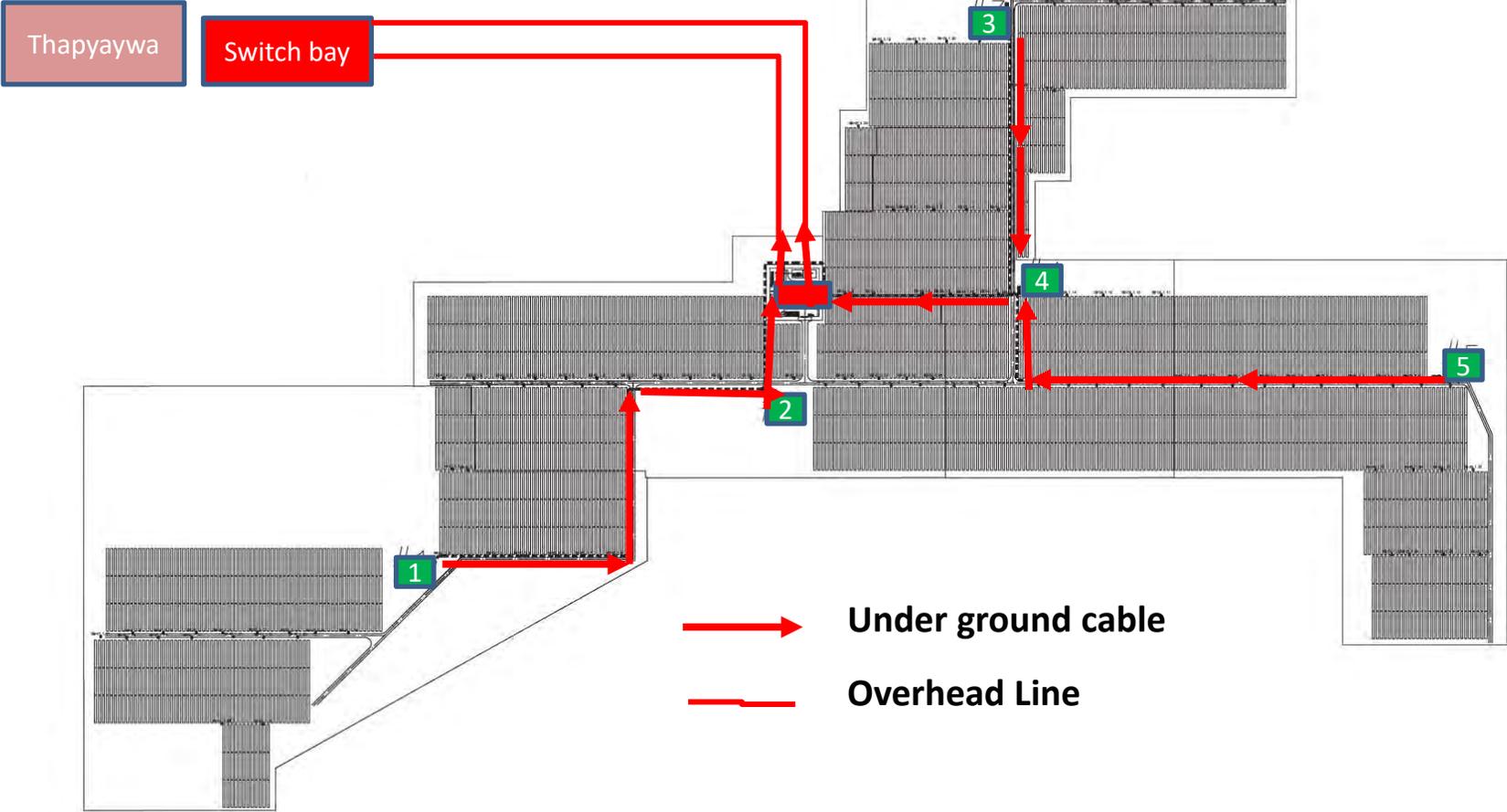


cable supporting Work

Under ground conduit provision works



HT Cable Laying



Cable Laying works



18. Inverters & Box typed transformers installation

Inverter Installation



Box-Typed Transformer Foundation work



Note that Need to check Pipe sleeves position (Civil foundation drawing and Electrical drawing)

Box – Type Transformer Placing and Installation

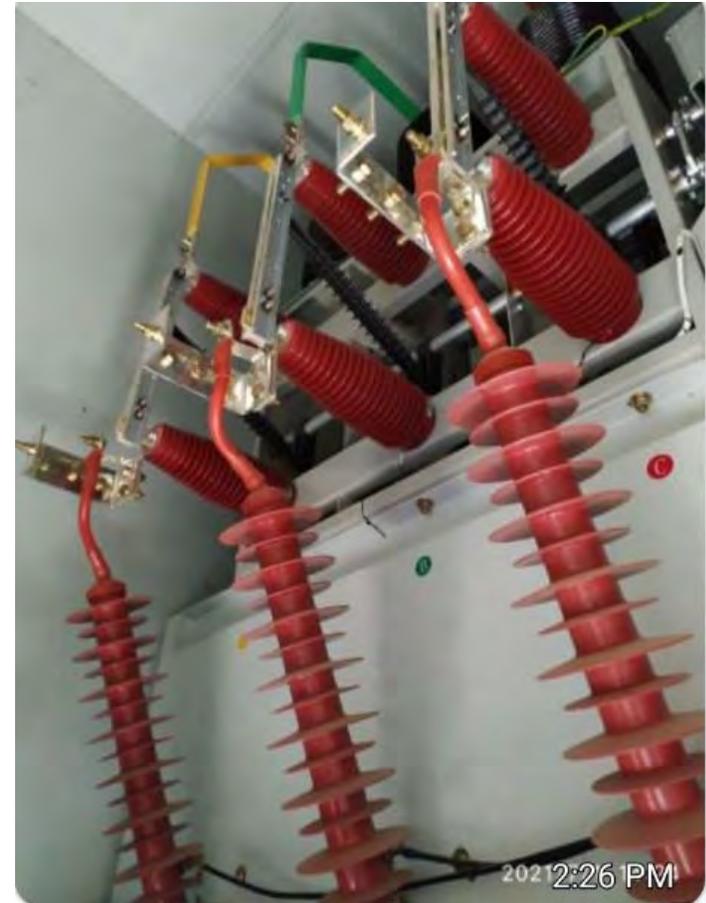
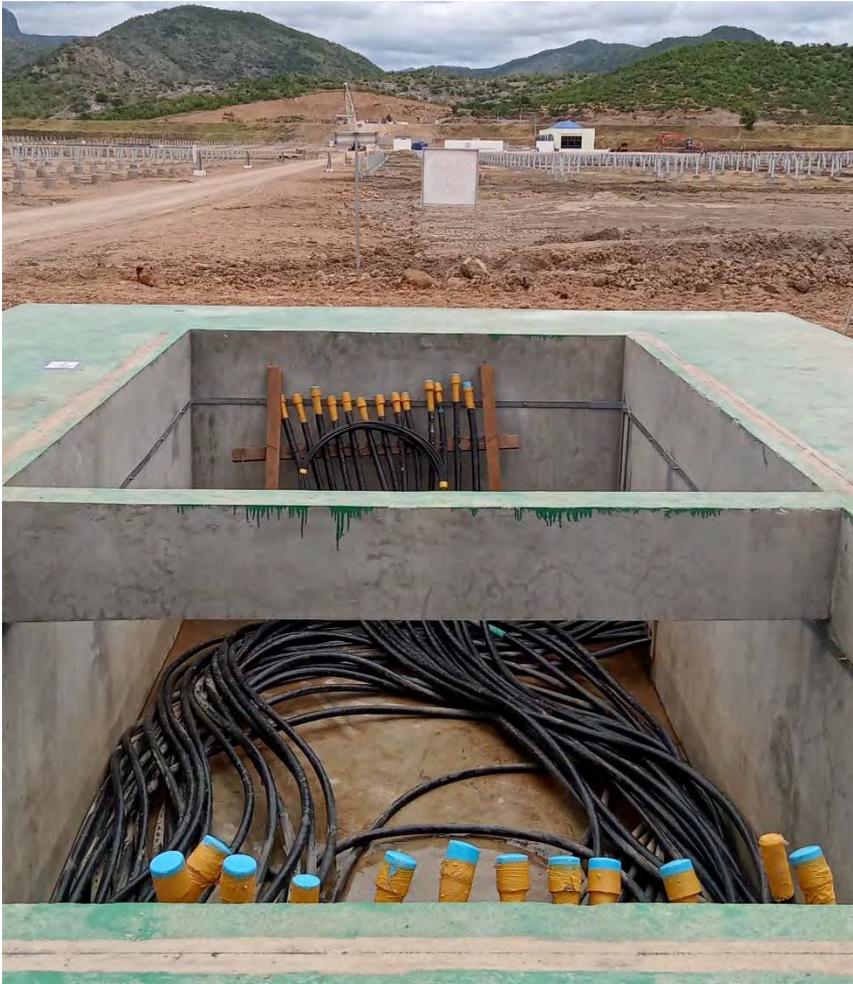


Prefabrication of suitable lifting attachment to avoid unnecessary damages.

Box – Type Transformer unloading from transporter



19. Cables & wires testing and Terminations



20. High Voltage panels, control and monitoring system panels installation and wire connection.

Sr. No	Control Panel Name
1	AGC/AVC System Control Panel (GDSE 8000)
2	GYC 8000 Prediction System Panel
3	GKE 6400 Electricity Collection Panel
4	GATS-3100 GPS Timing System Panel
5	GCK 851 C-G-12 Common Control Panel
6	GYC 811-121 RTU Panel
7	GSE 8000-21 Integrated Application Server Panel
8	GXH3A-121 33KV Line Protection & Control Panel
9	Power System Dynamic Recording Device
10	GTW-8000 Photovoltaic Area Room Network Panel
11	GPQ F335 Power Quantity Monitoring Panel
12	Video Security System Panel
13	230V AC Feed Panel
14	400V AC Incoming Panel
15	220V DC Feeder Panel
16	230V AC UPS Power Panel
17	220V DC Charging Panel
18	220V DC Battery Panel-1
19	220V DC Battery Panel-2
20	PABX System
21	Optical Communication system
22	Aircon Indoor & Outdoor Fan Checking
23	Weather System Panel

Raise floor inside Power House



Control Panel Layouts to quick placing

**Control and Power Cables Supporting System
And
Termination works**



21. Central control inside Power House



33kV Switchgear inside Power House



Control panels inside Power House



Control panels inside Power House



Five Preventor input/exit

33kV Thapyaywa 30MW The main wiring diagram

- Measurement and control 1
- Network diagram
- DC System
- QXZ
- Communication box
- Measure & Control Devices
- Bracket axle control
- 33kV Line curve
- 33kV Line Real time
- Wathour meter
- Box Transformer alarm

Eliminate flash 33kV line

F	50.42	Hz
F	50.40	Hz
UAB	32.26	kV
UBC	32.45	kV
UCA	32.15	kV

IA	449.80	A
UAB	32.20	kV
P	24.85	MW
Q	-3.77	Mvar
COS	-0.99	



Inverter

Inverter control

Output area	
Tag	Occurrenc
<input type="checkbox"/>	2023-05-
<input type="checkbox"/>	2023-05-



33kV PT

1#Into the line

2#Into the line

Grounding Transformer

IA	174.39	A
UAB	32.25	kV
P	-9.64	MW
Q	1.45	Mvar
COS	-0.99	

IA	276.64	A
UAB	32.21	kV
P	15.29	MW
Q	2.34	Mvar
COS	0.99	

IA	1.05	A
UAB	31.41	kV
P	0.07	MW
Q	-0.00	Mvar
COS	0.99	

P1 4700.57 kW P2 4099.16 kW

6#Start/Stop	6#Start/Stop	6#Start/Stop	6#Start/Stop	6#Start/Stop	All
7#Start/Stop	7#Start/Stop	7#Start/Stop	7#Start/Stop	7#Start/Stop	Tab Occurrence
8#Start/Stop	8#Start/Stop	8#Start/Stop	8#Start/Stop	8#Start/Stop	2023-01-05

P3 3062.18 kW P4 4390.67 kW

17#Start/Stop	17#Start/Stop	17#Start/Stop	17#Start/Stop	17#Start/Stop	17#Start/Stop
18#Start/Stop	18#Sta	18#Sta	18#Sta	18#Sta	18#Start/Stop
19#Start/Stop	19#Sta	19#Sta	19#Sta	19#Sta	19#Start/Stop
20#Start/Stop	20#Sta	20#Sta	20#Sta	20#Sta	20#Start/Stop
21#Start/Stop	21#Sta	21#Sta	21#Sta	21#Sta	21#Start/Stop
22#Start/Stop	22#Sta	22#Sta	22#Sta	22#Sta	22#Start/Stop
23#Start/Stop	23#Sta	23#Sta	23#Sta	23#Sta	23#Start/Stop
24#Start/Stop	24#Sta	24#Sta	24#Sta	24#Sta	24#Start/Stop
25#Start/Stop	25#Start/Stop	25#Start/Stop	25#Start/Stop	25#Start/Stop	25#Start/Stop
	26#Start/Stop				26#Start/Stop

P5 4496.70 kW

P1 4700.57 kW P2 4099.16 kW P3 3062.18 kW P4 4390.67 kW P5 4496.70 kW

Five Preventior input/exit 

33kV Thapyaywa 30MW The main wiring diagram

Returns the main wiring diagram

1 Communication box

1#YC	2#YC	3#YC	4#YC	5#YC
6#YC	1#YX	2#YX	3#YX	4#YX
5#YX	6#YX	7#YX	8#YX	9#YX
10#YX	11#YX	12#YX		

2 Communication box

1#YC	2#YC	3#YC	4#YC	5#YC
6#YC	1#YX	2#YX	3#YX	4#YX
5#YX	6#YX	7#YX	8#YX	9#YX
10#YX	11#YX	12#YX		

3 Communication box

1#YC	2#YC	3#YC	4#YC	5#YC
6#YC	7#YC	1#YX	2#YX	3#YX
4#YX	5#YX	6#YX	7#YX	8#YX
9#YX	10#YX	11#YX	12#YX	

4 Communication box

1#YC	2#YC	3#YC	4#YC	5#YC
6#YC	7#YC	1#YX	2#YX	3#YX
4#YX	5#YX	6#YX	7#YX	8#YX
9#YX	10#YX	11#YX	12#YX	

5 Communication box

1#YC	2#YC	3#YC	4#YC	5#YC
6#YC	7#YC	1#YX	2#YX	3#YX
4#YX	5#YX	6#YX	7#YX	8#YX
9#YX	10#YX	11#YX	12#YX	

Output area  

Tag	Occurrence
<input type="checkbox"/>	2023-06-
<input type="checkbox"/>	2023-06-

Returns the main wiring diagram

simulate (Run)

Bracket axle control

1#measure & control
Device

2#measure & control
Device

3#measure & control
Device

4#measure & control
Device

5#measure & control
Device

1#The wind model									
1#Automatic mode		1#Automatic mode		1#Automatic mode		1#Automatic mode		1#Automatic mode	
1#Manual Angle mode		1#Manual Angle mode		1#Manual Angle mode		1#Manual Angle mode		1#Manual Angle mode	
1#Cleaning mode		1#Cleaning mode		1#Cleaning mode		1#Cleaning mode		1#Cleaning mode	
2#The wind model		2#The wind model		2#The wind model		2#The wind model		2#The wind model	
2#Automatic mode		2#Automatic mode		2#Automatic mode		2#Automatic mode		2#Automatic mode	
2#Manual Angle mode		2#Manual Angle mode		2#Manual Angle mode		2#Manual Angle mode		2#Manual Angle mode	
2#Cleaning mode		2#Cleaning mode		2#Cleaning mode		2#Cleaning mode		2#Cleaning mode	

Output area

All

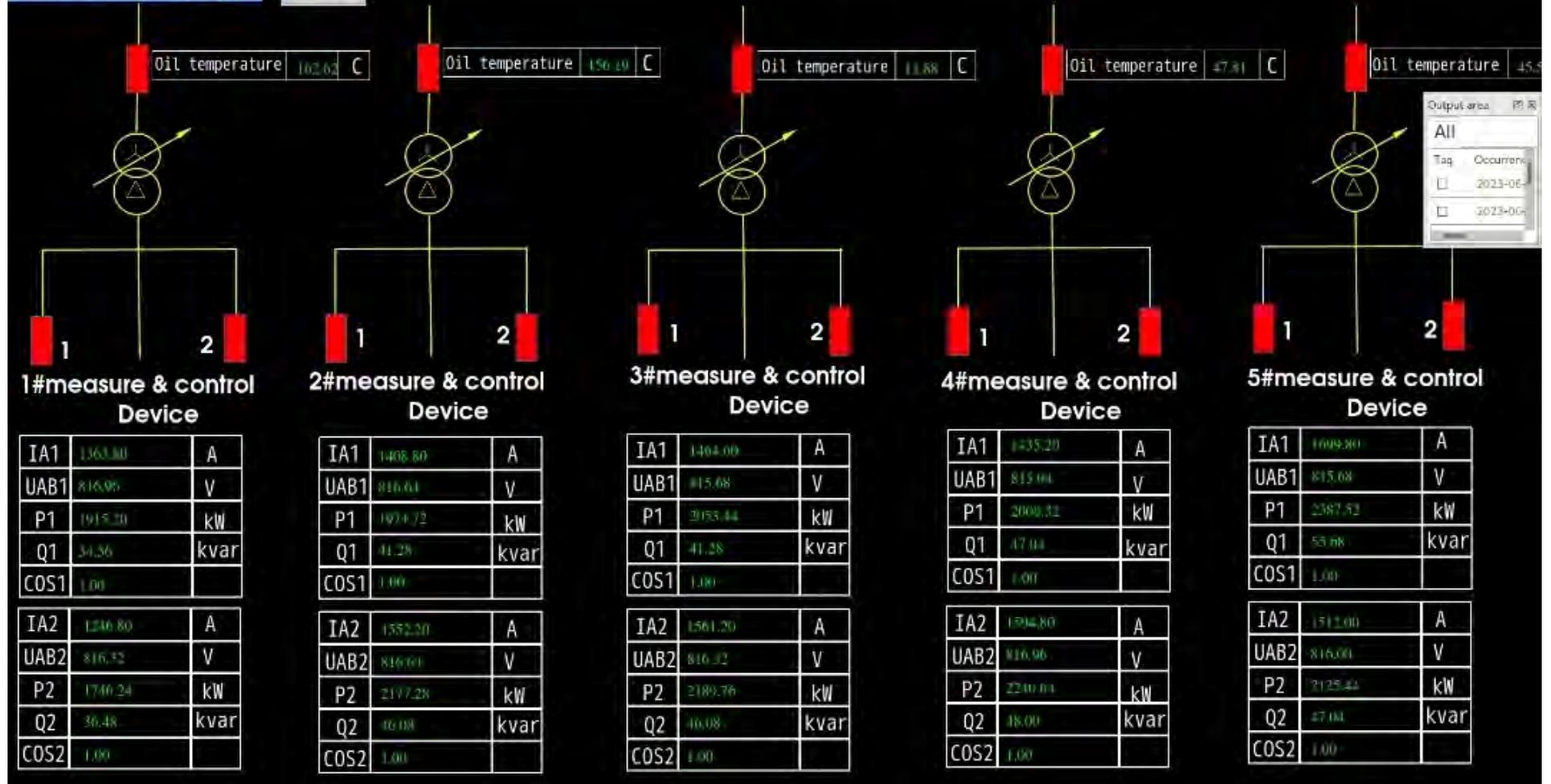
Tag Occamery

2025-06

2025-06

Returns the main wiring diagram

Eliminate flash



Monitoring of PV generation KWH Records

1#Into line

1#Into line Positive active	1100.22	kWh
1#Into line Positive reactive	-01.58	kvar
1#Into line Reverse reactive	000.20	kvar
1#Into line Reverse active	1.28	kWh

2#Into line

2#Into line Positive active	2002.11	kWh
2#Into line Positive reactive	00.23	kvar
2#Into line Reverse reactive	000.11	kvar
2#Into line Reverse active	0.15	kWh

Grounding Transformer

Transformer Positive active	55.01	kWh
Transformer Positive reactive	1.01	kvar
Transformer Reverse reactive	2.10	kvar
Transformer Reverse active	0.00	kWh

Box transformer Status

Returns the main wiring diagram

1#measure & control Device	2#measure & control Device	3#measure & control Device
1XBTransformer trip over high temperature	2XBTransformer trip over high temperature	3XBTransformer trip over high temperature
1XBTransformer high Temperature alarm	2XBTransformer high Temperature alarm	3XBTransformer high Temperature alarm
1XBSwitch gas relay alarm	2XBSwitch gas relay alarm	3XBSwitch gas relay alarm
1XBSwitching gas relay trip	2XBSwitching gas relay trip	3XBSwitching gas relay trip
1XBHigh voltage load switch alignment	2XBHigh voltage load switch alignment	3XBHigh voltage load switch alignment
1XBHigh voltage load switch loci	2XBHigh voltage load switch loci	3XBHigh voltage load switch loci
1XB1# low voltage circuit breaker is closed	2XB1# low voltage circuit breaker is closed	3XB1# low voltage circuit breaker is closed
1XB1# low voltage circuit breaker switching	2XB1# low voltage circuit breaker switching	3XB1# low voltage circuit breaker switching
1XB2# low pressure side synapse	2XB2# low pressure side synapse	3XB2# low pressure side synapse
1XB2# low pressure lateral loci	2XB2# low pressure lateral loci	3XB2# low pressure lateral loci
1XBThe 1# low-voltage circuit breaker is faulty	2XBThe 1# low-voltage circuit breaker is faulty	3XBThe 1# low-voltage circuit breaker is faulty
1XBThe 2# low-voltage circuit breaker is faulty	2XBThe 2# low-voltage circuit breaker is faulty	3XBThe 2# low-voltage circuit breaker is faulty
1XBThe disconnecting switch closes	2XBThe disconnecting switch closes	3XBThe disconnecting switch closes
1XBThe ground switch is turned on	2XBThe ground switch is turned on	3XBThe ground switch is turned on
1XBNo storage of circuit breaker	2XBNo storage of circuit breaker	3XBNo storage of circuit breaker
1XBHigh-pressure chamber door status	2XBHigh-pressure chamber door status	3XBHigh-pressure chamber door status
1XBLow pressure chamber personnel in and out of the state	2XBLow pressure chamber personnel in and out of the state	3XBLow pressure chamber personnel in and out of the state
1XBMaintenance door status of low pressure chamber	2XBMaintenance door status of low pressure chamber	3XBMaintenance door status of low pressure chamber
1XBSmoke alarm status	2XBSmoke alarm status	3XBSmoke alarm status
1XBIn remote control	2XBIn remote control	3XBIn remote control
1XBRepair clamp	2XBRepair clamp	3XBRepair clamp
1XBAir sensor 1 is faulty	2XBAir sensor 1 is faulty	3XBAir sensor 1 is faulty
1XBirradiator 1 is faulty	2XBirradiator 1 is faulty	3XBirradiator 1 is faulty
1XBirradiator 2 is faulty	2XBirradiator 2 is faulty	3XBirradiator 2 is faulty
1XBirradiator 3 is faulty	2XBirradiator 3 is faulty	3XBirradiator 3 is faulty

Output area

All

Tag

Documents

8021-00

8021-00

DC System Status

returns the main wiring diagram

DC System

Ac 1 channel A-phase voltage	253.90	V	Dc bus voltage	253.90	V	#4 rectifier module temperature	29.00	C	UPS1 AC input voltage	231.80
Ac 1 channel B-phase voltage	240.20	V	Female forward to ground resistance	600.00		Insulated bus 1 positive voltage to ground	116.90		Incoming line 1 way A phase voltage	233.80
Ac 1 channel C-phase voltage	230.40	V	#1 Rectifier module operating status	2457.60		Insulated bus 1 negative to ground voltage	117.30	V	Incoming line 1 way B phase voltage	230.70
Ac 2 channel A-phase voltage	233.90	V	#1 rectifier module voltage	253.90	V	Resistance of insulated bus 1 to ground	600.00		Incoming line 1 way C phase voltage	229.30
Ac 2 channel B-phase voltage	240.30	V	#1 rectifier module current	1.20	A	Insulated bus 1 negative resistance to ground	600.00		Incoming line 1 way AB line voltage	402.00
Ac 2 channel C-phase voltage	250.00	V	#1 rectifier module temperature	26.00	C	Resistance of insulated bus 2 to ground	600.00		Incoming line 1 way BC line voltage	300.00
Charging device output voltage	233.90	V	#2 Rectifier module operating status	2457.60		Insulated bus 2 negative resistance to ground	600.00		Incoming line 1 way CA line voltage	400.00
The rectifier outputs the total current	5.09	A	#2 rectifier module voltage	253.90	V				Incoming line 1 way A phase current	73.00
			#2 rectifier module current	0.90	A				Incoming line 1 way B phase current	60.00
			#2 rectifier module temperature	26.00	C				Incoming line 1 way C phase current	60.00
			#3 Rectifier module operating status	2457.60					Incoming line 2 way A phase voltage	17.20
			#3 rectifier module voltage	234.30	V				Incoming line 2 way B phase voltage	17.40
			#3 rectifier module current	1.50					Incoming line 2 way C phase voltage	16.00
			#3 rectifier module temperature	27.00	A				Incoming line 2 way AB line voltage	23.80
			#4 Rectifier module operating status	2457.60					Incoming line 2 way BC line voltage	29.70
			#4 rectifier module voltage	233.90	V				Incoming line 2 way CA line voltage	25.80
			#4 rectifier module current	1.30	A					0.00

Output area

All

Tag Occurrence

-0021 03

0023 05

Configuration of row by row Tracking Control Boxes



22. Final testing of new transmission line and float charge test.



OPGW Cable combines the functions of grounding and communications



Station and box transformer communication joining



23. Individual final inspection and testing by supplier expert.



24. Power connecting with Grid

SVG (Static Var Generator)

SVG (Static Var Generator) is the modern solution for power factor correction.

SVG is a power electronics-based device connected in parallel with the load that requires harmonics mitigation.



25. Combine test with both supplier and power authority inspectors



**Power Station HT
Switch gear panel
testing**



26. Combine COC Test

(Contracted Operation Characteristics)

COC Test procedures

I. Contracted Operating Characteristics(CoC) test

1. Active power capability
2. Minimum generation
- 3, Reactive power capability
 - 3.1 Leading 0.95 in POI at 1.0 p.u. (**Point of Interest**) (**per unit**)
 - 3.2Lagging 0,95 in POI at 1.0 p.u
- 4.Loading/De-loading rate
5. Start up and Shutdown Time
 1. Start- up from all the plant switch off
 2. Start-up from power and inverter transformers already energized
 3. Shut-down

COC Test procedures

II. Net Capacity Test

1. Two consecutive days test result
2. Attachment (Maximum Active Power Export, Data log)

III. Reliability Test

a).Day#1 Test

1. Inverter Communication Test
2. PLC Communication Test
3. Power Analyzer Communication Test
4. SCADA Communication Test
5. Operation mode Test
 - 5.1 Active Power Curtailment at AGC
 - 5.2 Ramp Rate Control at AGC
 - 5.3 On Demand Q at Logger
 - 5.4 Power Factor Control at Logger

COC Test procedures

b).Day#2 Test

1. Inverter Communication Test
2. PLC Communication Test
3. Power Analyzer Communication Test
4. SCADA Communication Test
5. Operation mode Test
 - 5.1 Active Power Curtailment at AGC (Automatic Generating Control)
 - 5.2 Ramp Rate Control at AGC
 - 5.3 On Demand Q at Logger
 - 5.4 Power Factor Control at Logger
 - 5.5 Reactive Power limitation as a function of Active Power

- 33kV Line main
- Measurement and control 1
- Network diagram
- DC System
- QXZ
- 1 Communication box
- 2 Communication box
- 3 Communication box
- 4 Communication box
- 5 Communication box
- Measure & Control Devices
- Bracket axle control
- 33kV Line curve
- 33kV Line Real time
- Wallbour meter
- Box Transformer alarm

F	50.37	Hz
F	50.01	Hz
UAB	32.78	kV
UBC	33.08	kV
UCA	32.76	kV

IA	427.25	A
UAB	32.76	kV
P	24.17	MW
Q	-2.84	Mvar
COS	0.99	

24.17 MW

- 1 Inverter
- 1-1 Inverter
- 2 Inverter
- 2-1 Inverter
- 3 Inverter
- 3-1 Inverter
- 4 Inverter
- 4-1 Inverter
- 5 Inverter
- 5-1 Inverter
- Inverter control

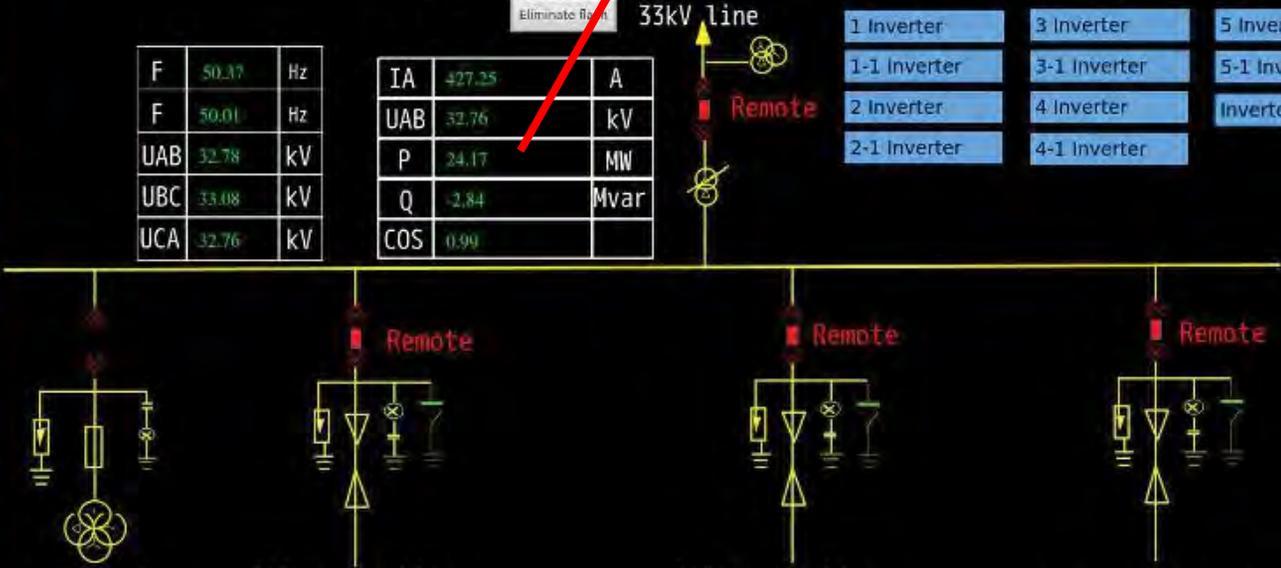
Output area

All

Receive time

2023/12/18 09:40:00

2023/12/18 09:40:00



33kV PT

1#Into the line

2#Into the line

Grounding Transformer

IA	169.71	A
UAB	32.76	kV
P	-9.58	MW
Q	1.33	Mvar
COS	-0.99	

IA	258.25	A
UAB	32.77	kV
P	-14.61	MW
Q	1.53	Mvar
COS	-0.99	

IA	0.18	A
UAB	31.95	kV
P	-0.01	MW
Q	0.00	Mvar
COS	0.00	

Actual available power at POI = 24.17MW

9:40hr

1. Active Power Capability

Date and Time (YY/MM/DD) 2021/12/13 (hh:mm:ss)	Actual available power at POI (MW)	Test value as fraction of available power (p.u)	Test value input from SCADA Set point (MW)	Active Power measured (MW)	Passed (Yes/No)	Note
09:40:00	24.17	1.00	24.17	→ 24.17	Yes	(<+/- 10%) Include reading error is acceptable value.
09:41:00	24.17	0.75	18.11	→ 18.52	Yes	
09:43:00	18.52	0.50	12.16	→ 12.45	Yes	
09:46:00	12.45	0.25	6.08	→ 5.85	Yes	
09:49:10	5.85	0 *	0	→ -0.02	Yes	
09:50:25	-0.02	0.25	6.08	→ 5.81	Yes	
09:53:33	5.81	0.50	12.16	→ 11.92	Yes	
09:54:35	11.92	0.75	18.11	→ 17.88	Yes	
09:56:08	17.88	1	24.32	→ 24.17	Yes	

(*) when decreasing the power to zero, the inverter will automatically stop. When giving the new set point for increasing active power injection, wait for the inverters normal start-up.

Notes and comments;

- 1) 1st day Testing Max Power - 25.88MW./ 24.11.2021 Max Power – 29.73 MW

2. Minimum Generation

Day no.	Date and Time (YY/MM/DD)	Data Logger /Live (D/L)	Irradiance Reading from Weather Station (W/m ²)	Temperature at PV Module (° C)	Measured output power (Min) (MW)	Passed (Yes/No)	Note
1	2021/12/13 06:45:30	Live	31	18.0	0.25	Yes	
2	2021/12/14 06:45:12	Live	8	16.3	0.17	Yes	

Notes and comments;

Irradiance reading to check the Instantaneous value of total radiation 1.

- 1) The Minimum generation, the measured output power as mentioned above the table is recorded in morning time.
- 2) According to PV module Specification is 100W/m² per I-V Curves.

3. Reactive Power Capability Test (Reactive and Active Power Restriction Test)

3.1 Leading 0.95 in POI at 1.0 p.u

Date and Time (YY/MM/DD) (hh:mm:ss)	Active Power Available (MW)	Active Power Set Point (MW)	Power Factor Set Point (PF)	Reactive Power Measured (MVar)	Power Measured (MW)	Passed (Yes/No)	Note ** Include reading error is acceptable value
2021/12/13 10:36:32	24.83	30	0.9	-14.66	0.86	Yes	(<+/- 10%)
10:47:50	24.28	30	0.95	-10.77	0.92	Yes	
10:56:20	25.39	30	1	-2.21	1	Yes	

Notes and comments;

- 1) Nominal reactive plant power Max/Min +/- 18.9MVar at AGC.

3.2 Lagging 0.95 in POI at 1.0 p.u

Date and Time (YY/MM/DD) 2021/12/13 (hh:mm:ss)	Active Power Available (MW)	Active Power Set Point (MW)	Power Factor Set Point (PF)	Reactive Power Measured (MVar)	Power Measured (MW)	Passed (Yes/No)	Note ** Include reading error is acceptable value
11:37:20	25.98	30	1.0	-2.16	1	Yes	(<+/- 10%)
11:15:33	25.12	30	-0.95	6.63	0.97	Yes	
11:24:50	24.88	30	-0.9	10.52	0.86	Yes	

Notes and comments;

- 1) Nominal reactive plant power Max/Min +/- 18.9MVar at AGC.

4. Loading /De Loading rate

Date and Time (YY/MM/DD) 2021/12/13 (hh:mm:ss)	Active Power Available (MW)	Active Power Set Point (MW)	Active Power Measured (MW)	Response Time (mm:ss)	Passed (Yes/No)	Note Include reading error is acceptable value
11:54:20	24.95	24.95	24.95	11:54:22	Yes	(<+/- 10%)
11:55:10	24.93	18.70	18.44	11:56:30	Yes	
11:57:23	18.47	12.46	12.97	11:58:46	Yes	
11:58:50	12.87	0	-0.02	11:59:00	Yes	
11:59:12	-0.02	24.95	24.72	12:04:40	Yes	
12:05:10	24.72	12.46	12.45	12:06:25	Yes	
12:07:00	12.45	18.70	18.52	12:08:20	Yes	
12:10:21	18.65	24.72	24.75	12:11:22	Yes	

5. Start-up and Shutdown time

5.1 Start-up from all the plant switch off

Power Starting condition	Starting Time	Power final condition	Final Time	Duration	Passed
(MW)	(YY/MM/DD) (hh:mm:ss)	(MW)	(hh:mm:ss)	(minute/Sec)	(Yes/No)
0	13:25:00	24.09	13:35:00	10 min	Yes

5.2 Start-up from power and inverter transformers already energized

Power Starting condition	Starting Time	Power final condition	Final Time	Duration	Passed
(MW)	(YY/MM/DD) (hh:mm:ss)	(MW)	(hh:mm:ss)	(minute/Sec)	(Yes/No)
0	12:25:00	24.53	12:30:00	5min	Yes

5.3 Shut-down (Normal)

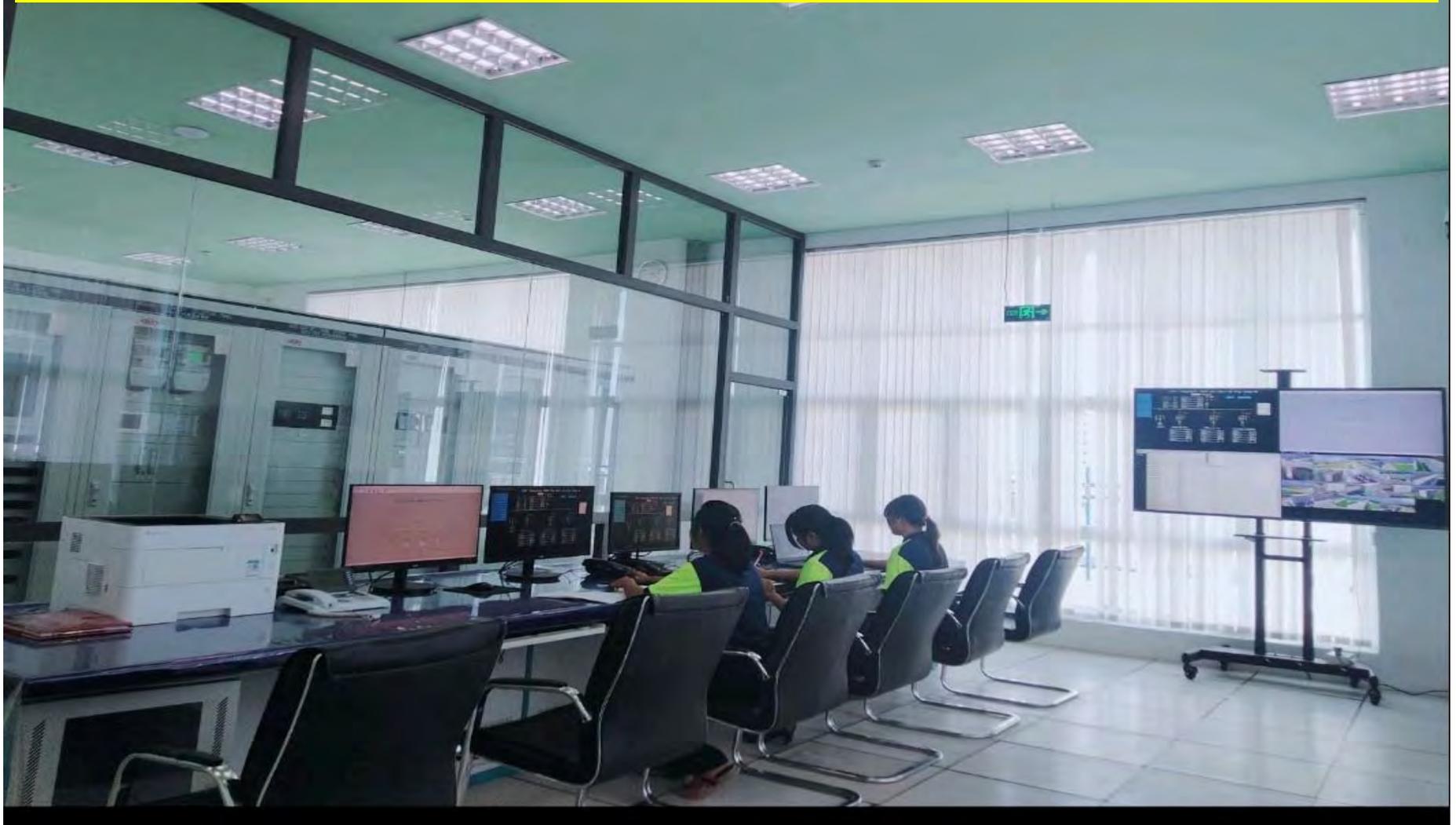
Power Starting condition	Starting Time	Power final condition	Final Time	Duration	Passed
(MW)	(YY/MM/DD) (hh:mm:ss)	(MW)	(hh:mm:ss)	(minute/Sec)	(Yes/No)
24.95	12:23:19	0	12:23:25	6 sec	Yes

6.4 Shut-down (Break-down)

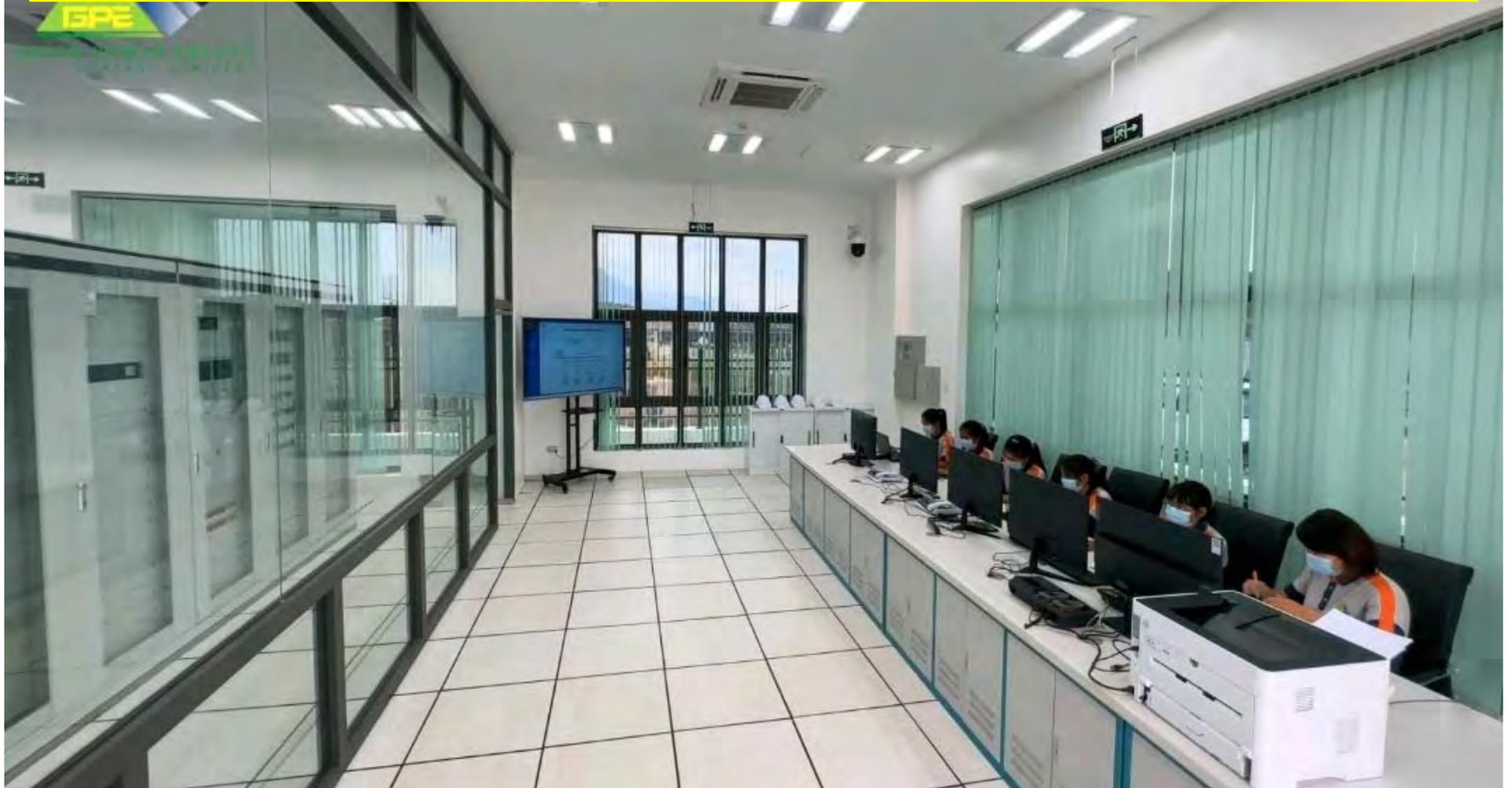
Power Starting condition	Starting Time	Power final condition	Final Time	Duration	Passed
(MW)	(YY/MM/DD) (hh:mm:ss)	(MW)	(hh:mm:ss)	(minute/Sec)	(Yes/No)
24.93	13:07:34	0	13:07:34	0 sec	Yes

27. Operation
and
Training

Operation Control Centre(Thapyaywa)



Operation Control Centre (Taung Taw Gwin)





Duty Engineers



Operation Energy Meters

Energy Meters



Ilgd#Khfnlqj#r#Hghuj|#P hwhw#
 vhdng#l#wkds|d|z d Vxe0#wdtrq#r#g#
 Qryhp ehuk/#5354

Polarity Test P_1 is Bus side, P_2 is Line side

(a) Current Transformer

Sr. No	Phase	Battery Polarity with Respect to CT Primary Markings	DC Ammeter Polarity with Respect to kWh Meter Term	Ammeter Deflection	Remark
1	R	P1	S1	S2	Forwarded
2	Y	P1	S1	S2	Forwarded
3	B	P1	S1	S2	Forwarded

(b) Load Test

(i) Main Meter: W/P 025607, 33000/110, 600/5, Makin: CEWE, Type: 3PAW, Sr. No., VT Ratio:, CT Ratio:, Serial No.: ME3C 1047201, Imp/kWh:, MF:, DTISC No. YS-70599, Serial No.: ME3C 1047201, ME3C 1047202, ME3C 1047205, ESE 2408427, ESE 2408428

(ii) Auxiliary Supply: V1 () V2 () V3 ()

(iii) Measured Current: I1 () A, I2 () A, I3 () A

(iv) Calculated Time for () Imp at P.F. ()

(v) Measured Time for () Imp

(vi) Check Meter Initial Reading: Final Reading:, Unit:

(vii) Existing Meter Initial Reading: MF-1-33 MF Final Reading:, Unit:

(b) Back Up Meter: W/P 025608, 33000/110, 600/5, Makin: CEWE, Type: 3PAW, Sr. No., VT Ratio:, CT Ratio:, Serial No.: ME3C 1047204, Imp/kWh:, MF:, DTISC No. YS-70598, Serial No.: ME3C 1047204, ME3C 1047205, ME3C 1047206, ESE 2408429, ESE 2408430

(ii) Auxiliary Supply: V1 () V2 () V3 ()

(iii) Measured Voltage: V1 () V, V2 () V, V3 () V

(iv) Measured Current: I1 () A, I2 () A, I3 () A

(v) Calculated Time for () Imp at P.F. ()

(vi) Measured Time for () Imp

(vii) Check Meter Initial Reading: Final Reading:, Unit:

(viii) Existing Meter Initial Reading: MF-1-33 MF Final Reading:, Unit:

Signature: *[Handwritten Signature]* Date: *[Handwritten Date]*

Checked by: *[Handwritten Name]* Date: *[Handwritten Date]*

Clear Power Energy Co., Ltd.

Uhfngj#r#Hghuj|#P hwhw#
 Uhdgljv#wkds|d|z d Vxe0
 Vwdtrq



Ilgd#Khfnlqj#r#Hghuj|#P hwhw#
 Vhdng#l#wkds|d|z d Vxe0#Y#S0lq
 rg#Qryhp ehuk/#5354

Meter and Instrument Transformer of Site Test Result

Place of Test: 30 MW CPE Solow Road (250 KV Tharaywa Substation)
 Equipment under Test: Current and Voltage Transformer
 Type of Test: Ratio and Polarity Test

(i) Ratio Test

(a) Current Transformer
 Type: LB-35
 Maker: CHINT
 Serial no:

R Phase: YHG21070003,
 Y Phase: YHG21020002,
 B Phase: YHG21020001,
 CT Ratio: 600/5

Sr. No	Phase	Applied Primary Current (A)	Secondary Current Measure at kWh Meter Terminal						Remark
			R		Y		B		
			Main Meter	Back Up Meter	Main Meter	Back Up Meter	Main Meter	Back Up Meter	
1	R	240.37	2.4095	2.5004	-	-	-	-	
2	Y	240.92	-	-	2.4091	2.4099	-	-	
3	B	240.94	-	-	-	-	2.4091	2.4091	

(b) Voltage Transformer
 Type: TDY-83
 Maker: CHINT
 Serial no:

R Phase: -
 Y Phase: -
 B Phase: -
 VT Ratio: 33000/110/5

Sr. No	R-Y R-N	Applied Primary Voltage (V)	Secondary Current Measure at kWh Meter Terminal					
			R-Y		Y-B		B-R	
			Main Meter	Back Up Meter	Main Meter	Back Up Meter	Main Meter	Back Up Meter
1	1999.26	1996.61	6.6143	6.6193	-	-	-	-
2		1999.33	-	-	6.6616	6.6636	-	-
3			-	-	-	-	6.6158	6.6158

Meter Panel Seal - ESE 2408420

Uhfngj#r#Hghuj|#P hwhw#
 Uhdgljv#wkds|d|z d Vxe0#Y#S0lq
 rg#Qryhp ehuk/#5354

MONTHLY POWER GENERATION & PPA ENERGY

Sr. no	Month	PPA Energy	Sent out Energy	% of PPA	Remark
	For Year 2022,				
1	January	6,214,000	5,709,440	92%	
2	February	5,658,000	6,042,240	107%	
3	March	6,565,000	5,974,410	91%	
4	April	6,162,000	6,564,920	107%	
5	May	6,514,000	6,475,270	99%	
6	June	6,037,000	6,121,990	101%	
7	July	5,700,000	6,221,960	109%	
8	August	4,854,000	5,672,120	117%	
9	September	5,438,000	5,280,990	97%	
10	October	5,791,000	6,083,360	105%	
11	November	5,730,000	5,641,930	98%	
12	December	5,934,000	4,795,050	81%	
	Total	70,597,000	70,583,680	100%	

**Comparison status of
Fix- Type and Tracker -Type**

Tracking system is 30% more production than Fixed-type solar system

And

Peak Sun Hour of Fix Type solar is a range of 4 ~ 5.75 Hr

(Search From Web- Site)

Analyze on practical

Fix Type solar system's average per day Peak Sun Hour = **6.265 Hr**

Tracking Type solar system's average per day Peak Sun Hour = **8.035 Hr**

In Practically found that = $8.035/6.265 = 1.28$ (Mean 28% more)

We can confirm:

Solar Tracking System is 28% more efficiency than Fixed-Type Solar System

Training

This training is intended for professional technicians who are responsible for the installation, operation, and maintenance of MV grid-connected inverters. The professional technician is required to meet the following requirements:

Know electronic, electrical wiring, and mechanical expertise, and be familiar with electrical and mechanical schematics.

Should be familiar with the composition and working principles of the PV system and its front- and rear-level equipment.

Have received professional training related to the installation and commissioning of electrical equipment.

Be able to quickly respond to hazards or emergencies that occur during installation and commissioning.

Be familiar with the relevant standards and specifications of the country/region where the project is located.

Training



Training



Training



Electrical safety (Part-1)

Presentation by

U Shwe

PE0063 (Electrical)(Building Services)

ACPE, National Counterpart

EI Certificate, (Ahtoo Ka/266)

Consultant

Triple Shwe Engineering Co., Ltd.

Contact: Mobile Ph (+95)

095007162, 09799949720

20-10-2020

Electrical Control Systems

Presentation By U Shwe

21- 3-2018





Meeting with Local Fire Fighting Authority



28) Problems and Solving

INVERTER OVERHEATING

**BOX_TRANSFORMER BUSBAR CUBICLE
OVERHEATING**

Problems of Inverter overheating



Possible causes of Inverter overheating

1. Electronic components are come out heat by itself while it is running with full function operation.
2. Temperature sensor that built in electronic circuits compartment has reached to setpoint temperature (about 40 ° C) cooling fan start running to cool down for electronic compartment.
3. But the cooling air can not enough cool down to internal electronic circuit boards with built in aluminium heat -sink. Then air exhaust as a hot air about 70° C. It can become overheat caused by cooling fan clogged with dust.
4. Long time operation, internal electronic circuits are raising more temperature and become overheat an may be burnt the inverter.
5. Inverter have included protection itself by de-rating mode when internal temperature reach 65 ° C

Supplier Instruction

Pay attention to these points in the maintenance of the inverter in summer,
suitable temperature,
humidity,
ventilation,
no dust and no interference,
and clean the inverter inside and outside.

Solving the Problems

Request Supplier' advise.

Cleaning the inverter cooling fan
regular checking and cleaning



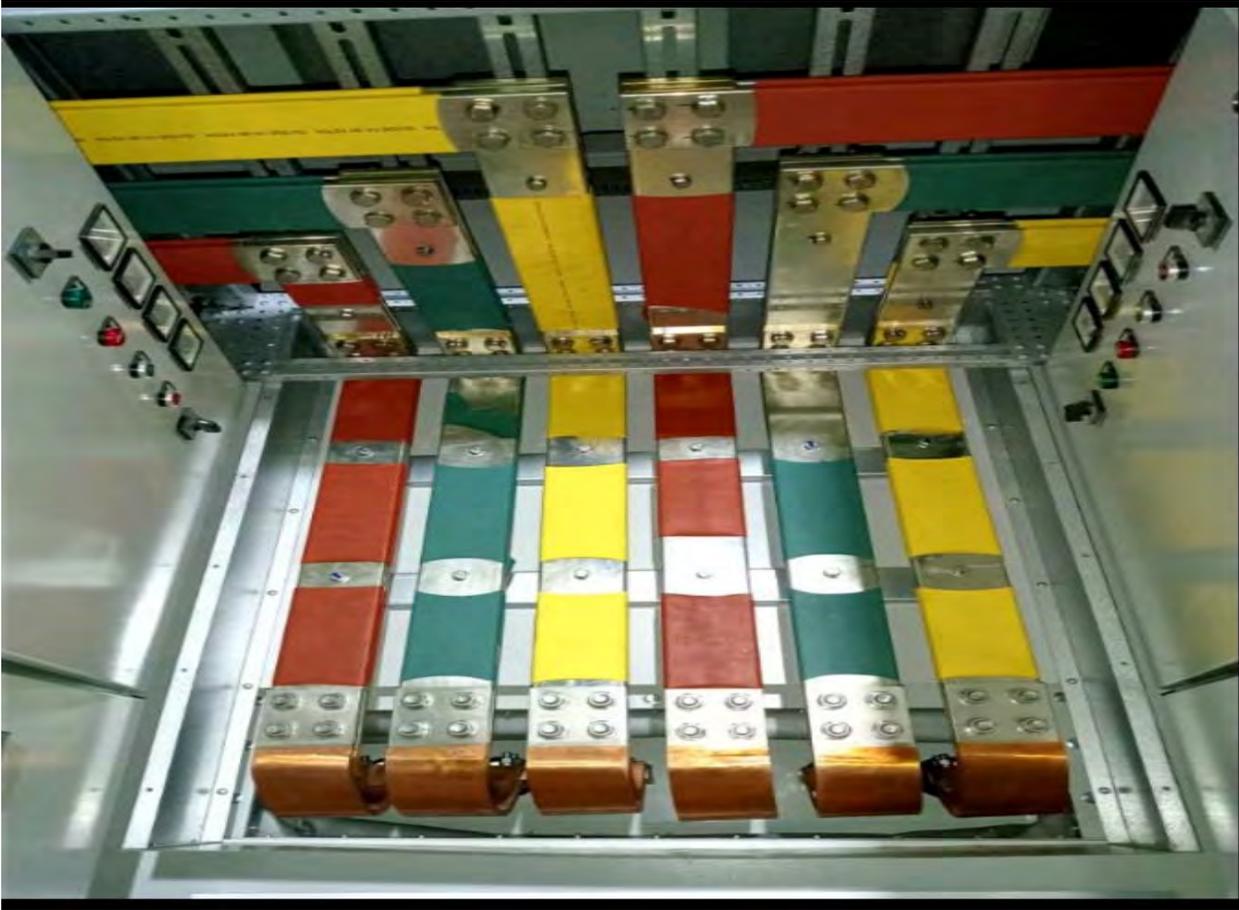
Discuss with designer to place
inverter orientation because
direct sunlight on inverter front
face is more hot.



Construct additional roof on
inverter to protect direct sunlight.



Overheat inside the busbar Chamber



BOX_TRANSFORMER BUSBAR CUBICLE OVERHEATING

Main causes of busbar chamber is loosing bolt and nuts at busbar joints

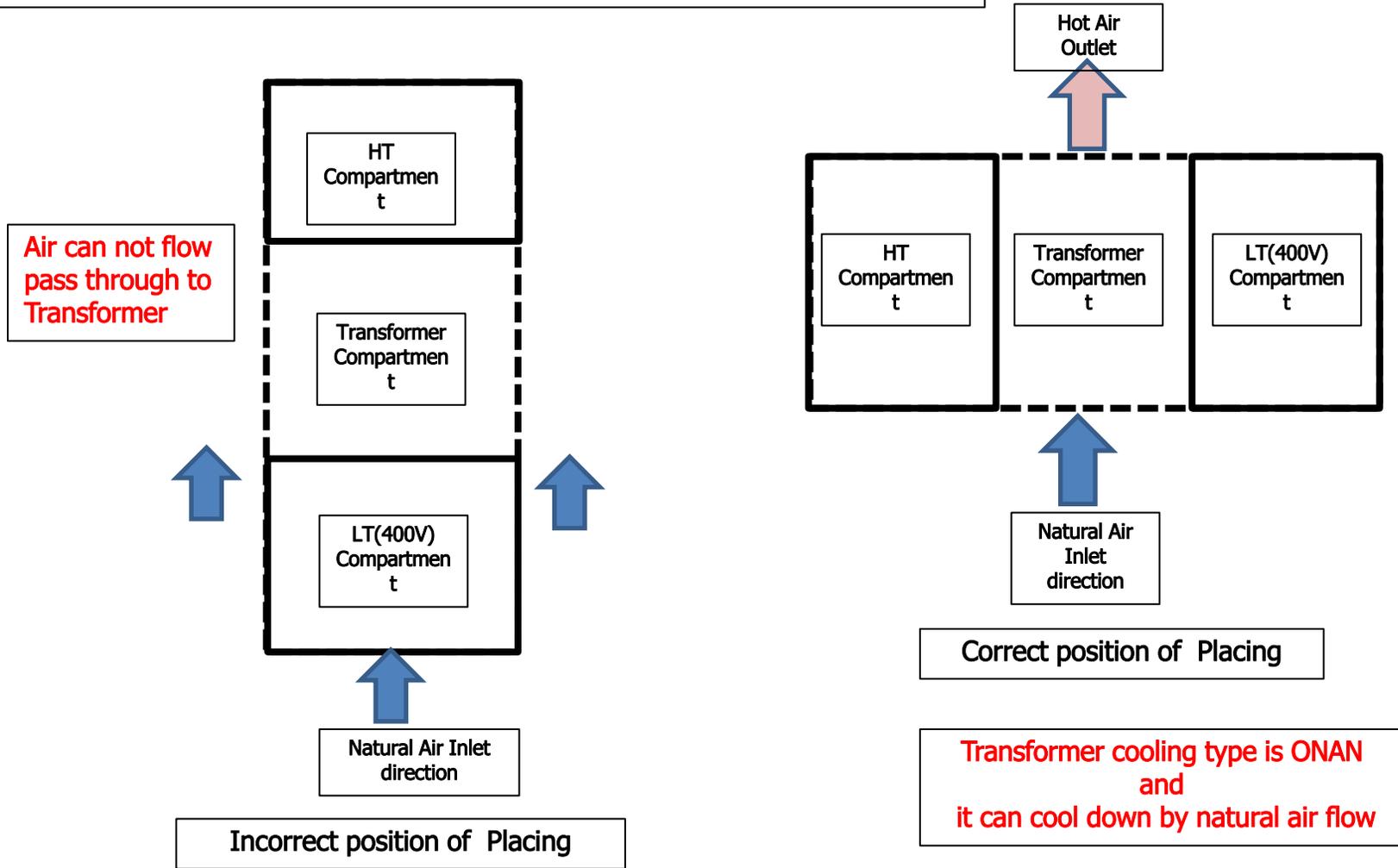
Termination Joints

Not enough cooling fan and exhaust fan.

Orientation of transformer position.

Checking the suitable size of busbar.

Orientation Of Box type Transformer placing .



Solving Problems

Re-tiding of all joint after permission from supplier

Add Cooling and Exhaust fan with adequate size.

For the next project pre checking and tide bolts and nuts before start operation.

29. Regular maintenance

Inverter Checking & Cleaning



Box Transformer Checking



Solar Tracking function checking



Solar Panel Cleaning



PV Modules Cleaning



Mowing Grass Between Solar Rows



(30) General Study

What is the different between this 2 photo's appearance.?



**Before Cleaning of
solar panels**

**After Cleaning of
solar panels**



Study of Solar Panel Cleaning work

Sr No	Box X'Inver-1 (kWh)	Box X'Inver-2 (kWh)	Box X'Inver-3 (kWh)	Box X'Inver-4 (kWh)
1	1350.4	1329.8	1317.2	1313.5
2	1355.3	1328.5	1317.2	1313.5
3	1321.9	1322.6	1321.3	1321.3
4	1317.2	1336.7	1321.3	1321.3
5	1317.3	1343.5	1321.3	1321.3
6	1315.1	1329.9	1310.6	1310.6
7	1309.6	1347.8	1321.3	1321.3
8	1313.0	1317.9	1321.3	1321.3
9	1325.4	1429.9	1319.2	1319.2
10	1312.5	1437.7	1321.3	1321.3
11	1326.8	1404.6	1310.5	1310.5
12	1319.9	1320.9	1321.3	1321.3
13	1317.9	1421.6	1411.2	1411.2
14	1322.4	1315.5	1313.5	1313.5
15	1335.6	1303.9	1313.5	1313.5
16	1323.1	1323.3	1321.3	1321.3
17	1404.4	1321.9	1321.3	1321.3
18	1423.3	1407.8	1321.3	1321.3
19	1327.6	1324.3	1321.3	1321.3
20	1319.2	1400.8	1321.3	1321.3
21	1445.9	1337	1426.4	1426.4
22	1432.4	1418.9	1421.3	1421.3
23	1321.3	1324.3	1421.3	1421.3
24	1319.2	1345.4	1417.6	1417.6
25	1323.9	1323.9	1423.9	1423.9
TOTAL	31832.6	33522.2	30680.4	21438.9

Average PV Module Cleaning Finished Each Inverter	1,340.79	1,342.09	1,424.35	1,328.93
Average PV Module Cleaning Not Finished Each Inverter	1,167.60	-	1,161.10	-
Total Average Cleaning Finished Inverter	1,361.79 kWh			
Total Average Cleaning Not Finished Inverter	1,164.35 kWh			
	197.44 kWh			

Sr No	PV Module Cleaning Inverter Box X'mer-1 (kWh)	PV Module Cleaning Inverter Box X'mer-2 (kWh)	PV Module Cleaning Inverter Box X'mer-3 (kWh)	PV Module Cleaning Inverter Box X'mer-4 (kWh)
1	1379.6	1379.6	1379.6	1379.6
2	1384.6	1375.5	1394.1	1394.1
3	1374.7	1374.9	1382.2	1366.6
4	1367.6	1384.5	1382.2	1371.6
5	1367.9	1400.5	1371.7	1343.3
6	1367.2	1366.9	1366.9	1366.9
7	1350.9	1358.7	1346.2	1378.9
8	1365.2	1354.9	1331.3	1372.6
9	1374	1357.4	1321.3	1362.6
10	1361.9	1424.9	1361.9	1376.6
11	1376.6	1458.3	1374.7	1355.1
12	1369.9	1370.1	1381	1343.3
13	1360.9	1425.4	1361.9	1403.3
14	1371.1	1364.3	1361.9	1467.1
15	1366.4	1354.9	1361.9	1469.9
16	1362.1	1322.2	1361.9	1469.4
17	1456.7	1370.4	1361.9	1469.4
18	1476.7	1402.2	1402.4	1469.4
19	1372.6	1376.4	1361.9	1469.4
20	1371.8	1424.6	1361.9	1469.4
21	1366.7	1366.2	1361.9	1469.4
22	1484.8	1473.9	1361.9	1469.4
23	1361.9	1369.9	1361.9	1469.4
24	1361.9	1469.9	1469.9	1469.4
25	1361.9	1469.9	1469.9	1469.4
TOTAL	33022.5	34782.5	32268.5	22233.5

Average PV Module Cleaning Finished Each Inverter	1,391.02	1,391.30	1,452.61	1,369.39
Average PV Module Cleaning Not Finished Each Inverter	1,210.05	-	1,234.46	-
Total Average Cleaning Finished Inverter	1,406.13 kWh			
Total Average Cleaning Not Finished Inverter	1,217.25 kWh			
	188.88 kWh			

Green Power Energy Co., Ltd Solar Power Plant Project (Taung Taw Gwin) Comparison of Inverter Data (PV Module Cleaning)

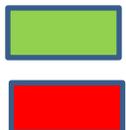
Sr No	PV Module Cleaning Inverter Box X'mer-1 (kWh)	PV Module Cleaning Inverter Box X'mer-2 (kWh)	PV Module Cleaning Inverter Box X'mer-3 (kWh)	PV Module Cleaning Inverter Box X'mer-4 (kWh)
1	1594	1594.5	1594	1593.5
2	1590	1577.2	1590	1593.7
3	1594.7	1575.6	1590	1590
4	1597.6	1598.7	1590	1592.1
5	1587.2	1594.7	1590	1598.2
6	1586.1	1597.4	1590	1595.4
7	1585.7	1590.4	1571.1	1579.9
8	1585.6	1597.1	1571.9	1574
9	1579	1526.6	1562	1568.3
10	1560.1	1502.5	1589.6	1577
11	1592.9	1674.6	1562	1562.7
12	1571.7	1598.9	1611.7	1543.1
13	1569	1661	1562	1677.6
14	1577.3	1560.6	1466.4	1629.9
15	1572.2	1594.1	1562	1621.5
16	1587.5	1570.6	1562	1621.5
17	1591.4	1591.4	1562	1591.4
18	1574	1570.1	1562	1574
19	1592	1679.1	1562	1574
20	1598.9	1570.7	1562	1574
21	1596.7	1686.4	1441.2	1574
22	1598.6	1582	1716.3	1574
23	1702.6	1690.3	1599.9	1574
24	1592.4	1622.4	1721.2	1574
25	1460	1708.7	1574	1574
TOTAL	37866.5	39874.2	37506.7	25493.7

Average PV Module Cleaning Finished Each Inverter	1,594.99	1,694.97	1,604.43	1,593.36
Average PV Module Cleaning Not Finished Each Inverter	1,388.35	-	1,387.43	-
Total Average Cleaning Finished Inverter	1,596.94 kWh			
Total Average Cleaning Not Finished Inverter	1,387.89 kWh			
	209.05 kWh			

TAUNG TAW GWIN

Sr No	Cleaning Inverter Box X'mer-1 (kWh)	Cleaning Inverter Box X'mer-2 (kWh)	Cleaning Inverter Box X'mer-3 (kWh)	Cleaning Inverter Box X'mer-4 (kWh)
1	1472.7	1484	1484	1503.9
2	1481.1	1478.4	1484	1503.1
3	1466.5	1477.9	1484	1506
4	1469.2	1467.5	1484	1523.1
5	1469.2	1495.6	1484	1536.3
6	1457.6	1473.5	1484	1555.4
7	1448.7	1494	1476.9	1576.4
8	1454.5	1489.7	1484.1	1574
9	1472.3	1510.9	1484	1568.2
10	1482.3	1588.3	1484	1577
11	1472.6	1485.9	1484	1554.7
12	1461.9	1461.1	1484	1541.1
13	1463.5	1581	1484	1677.8
14	1468.8	1451.2	1484	1682.3
15	1467.6	1432.6	1484	1682.1
16	1483	1461.5	1484	1684.4
17	1691.2	1427.4	1484	1684.4
18	1678.2	1569.6	1629.7	1684.4
19	1467.7	1477.3	1484	1684.4
20	1671.6	1529.9	1659	1684.4
21	1484.5	1483.5	1484	1684.4
22	1589.9	1678.9	1484	1684.4
23	1484.1	1345	1484	1684.4
24	1584.7	1587.9	1484	1684.4
25	1585.8	1585.8	1484	1684.4
TOTAL	35293.3	37297.4	35737.9	25493.7

Average PV Module Cleaning Finished Each Inverter	1,486.30	1,491.90	1,548.40	1,593.36
Average PV Module Cleaning Not Finished Each Inverter	1,267.30	-	1,300.63	-
Total Average Cleaning Finished Inverter	1,530.01 kWh			
Total Average Cleaning Not Finished Inverter	1,298.97 kWh			
	231.04 kWh			



After Cleaning
Before Cleaning

Total Average Cleaning Finished Inverter

1,361.79 kWh
1,164.35 kWh
197.44 kWh

Total Average Cleaning Not Finished Inverter

Total Average Cleaning Finished Inverter

1,406.13 kWh
1,217.25 kWh
188.88 kWh

Total Average Cleaning Not Finished Inverter

Total Average Cleaning Finished Inverter

1,596.94 kWh
1,387.89 kWh
209.05 kWh

Total Average Cleaning Not Finished Inverter

Total Average Cleaning Finished Inverter

1,530.01 kWh
1,298.97 kWh
231.04 kWh

Total Average Cleaning Not Finished Inverter

**Green Power Energy Co.,Ltd
20MW Solar Power Plant Project (Taung Taw Gwin)
Comparsion of Inverter (kWh Output)**

Sr No	Date	After Cleaning of Solar Panel Average Output/Inverters (kWh)	Before Cleaning of Solar Panel Average Output/Inverters (kWh)	Average More Production of Inverters (kWh)	Clean of Solar Panel for Inverters/Total Inverters	Clean of Solar Panel for Inverters/Total Inverters (%)
1	13.2.2023	1361.79	1164.35	197.44	(67/90)	74.4%
2	14.2.2023	1406.13	1217.25	188.88	(70/90)	77.8%
3	15.2.2023	1596.94	1387.69	209.05	(76/90)	84.4%
4	16.2.2023	1530.31	1298.97	231.34	(76/90)	84.4%

Green Power
20MW Solar Power Plant Project (Taung Taw Gwin)
Comparison of Inverter Data (PV Module Cleaning)

15.3.2023

Green Power Energy Co.,Ltd
20MW Solar Power Plant Project (Taung Taw Gwin)
Comparison of Inverter Data (PV Module Cleaning)

14.3.2023

Sr No	PV Module Cleaning Inverter Box X'mer-1 (kWh)	PV Module Cleaning Inverter Box X'mer-2 (kWh)	PV Module Cleaning Inverter Box X'mer-3 (kWh)	PV Module Cleaning Inverter Box X'mer-4 (kWh)	Total Inv; 90Nos (kWh)
1	1349	1416.9	1382.3	1395.3	5544
2	1315.6	1412.8	1358.7	1405	5492
3	1302.7	1414.1	1348.1	1403.4	5468
4	1292.9	1429.1	1348.8	1405.5	5476
5	1296.8	1323.9	1353.2	1391.2	5365
6	1292.3	1406.1	1399.7	1394.2	5492
7	1285.5	1323.9	1417.3	1398.5	5425
8	1287	1405.5	1392.1	1397.5	5482
9	1419.5	1430.8	1404.8	1394.4	5650
10	1282.3	1411.2	1369.5	1409.1	5472
11	1415.7	1402.2	1401.3	1387.4	5607
12	1287.1	1413.6	1322.5	1387.4	5411
13	1413.3	1395.4	1398.7	1504.9	5712
14	1286.1	1403.9	1333.3	1500	5523
15	1416.3	1298.2	1330.6	1514.4	5560
16	1423.1	1412.8	1321.9	1523.8	5682
17	1520.3	1407.5	1337.4		4265
18	1520.3	1398.8	1510.9		4430
19	1311.7	1407.3	1340		4059
20	1503.6	1395.7	1460.8		4360
21	1339.5	1413.9	1502		4255
22	1524.9	1388.6	1496.4		4410
23	1524.4	1318.7	1516.2		4359
24	1249.4	1445.2	1492.1		4187
25		1456.7	1500.8		2958
TOTAL	32859.3	34932.8	35039.4	22812.0	125643.5
Average PV Module Cleaning Finished Each Inverter	1,468.14	1,411.96	1,463.39	1,425.75	
Average PV Module Cleaning Not Finished Each Inverter	1,298.42	1,383.79	1,360.37	-	

Total Average Cleaning Finished Inverter 1,442.31 kWh
 Total Average Cleaning Not Finished Inverter 1,347.53 kWh
94.78 kWh

PV Module Cleaning Finished
 PV Module Cleaning Not Finished

Remark: Today is Sunny.
 (14.3.2023) Max Total Radiation = 724 W/m²

Sr No	PV Module Cleaning Inverter Box X'mer-1 (kWh)	PV Module Cleaning Inverter Box X'mer-2 (kWh)	PV Module Cleaning Inverter Box X'mer-3 (kWh)	PV Module Cleaning Inverter Box X'mer-4 (kWh)	Total Inv; 90Nos (kWh)
1	1424	1490.7	1457.5	1467.2	5839
2	1387.6	1484.5	1426.1	1474.7	5773
3	1374.7	1485.3	1416.3	1471.9	5748
4	1364.4	1502.4	1452.6	1471.8	5791
5	1368.6	1397.6	1479.8	1457.1	5703
6	1364.8	1476.7	1483.4	1458.7	5784
7	1357.5	1396.3	1503.1	1466.6	5724
8	1360.6	1476.7	1478.1	1465	5780
9	1498.8	1509.4	1492.9	1461.8	5963
10	1356.5	1489	1470.2	1476.2	5792
11	1495	1471.8	1489	1455.7	5912
12	1362.9	1490.5	1477.4	1455.8	5787
13	1492	1465.5	1491.8	1579.2	6029
14	1362.3	1481.7	1488.9	1577.1	5910
15	1495	1364.4	1483.1	1587.6	5930
16	1502.3	1492	1473.5	1598.7	6067
17	1605.6	1486.3	1485.9		4578
18	1606.3	1470.4	1602		4679
19	1381.7	1486.7	1422.1		4291
20	1589.3	1468.8	1548.9		4607
21	1414.5	1494.7	1592.6		4502
22	1610.3	1470.2	1585.5		4666
23	1608.4	1409.5	1606.9		4625
24	1315.7	1594.1	1575		4485
25		1605.1	1586.1		3191
TOTAL	34698.8	36960.3	37568.7	23925.1	133152.9
Average PV Module Cleaning Finished Each Inverter	1,550.30	1,503.39	1,520.30	1,495.32	
Average PV Module Cleaning Not Finished Each Inverter	1,371.13	1,446.63	1,457.61	-	

Total Average Cleaning Finished Inverter 1,517.33 kWh
 Total Average Cleaning Not Finished Inverter 1,425.12 kWh
92.20 kWh

PV Module Cleaning Finished
 PV Module Cleaning Not Finished

Remark: Today is Sunny.
 (14.3.2023) Max Total Radiation = 723 W/m²

TAUNG TAW GWIN

(kWh)
1424
1387.6
1374.7
1364.4
1368.6
1364.8
1357.5
1360.6
1498.8
1356.5
1495
1362.9
1492
1362.3
1495
1502.3
1605.6
1606.3
1381.7
1589.3
1414.5
1610.3
1608.4
1315.7

1,517.33 kWh
1,425.12 kWh
92.20 kWh

THAPYAYWA

Thapyaya Solar Power Station Inverters Data Record							8.3.2023	
Sr No	Inverter No	Box X'mer-1 kWh	Box X'mer-2 kWh	Box X'mer-3 kWh	Box X'mer-4 kWh	Box X'mer-5 kWh	Total Inv 126 nos (kWh)	Remark
1	1	1577.0	1517.9	1460.3	1452.3	1425.2		
2	2	1524.3	1509.1	1494.1	1444	1400.1		
3	3	1467.8	1512.8	1421.9	1437.5	1443.9		
4	4	1542.9	1513	1461.6	1451.6	1450.9		
5	5	1531.1	1513.3	1467.4	1448.9	1442.2		
6	6	1531.1	1516.4	1454.9	1427	1461.8		
7	7	1518.9	1504.6	1454.8	1448.9	1454.9		
8	8	1505	1503.5	1443.6	1440.9	1457.4		
9	9	1464.4	1486.1	1433.8	1429.8	1458.7		
10	10	1456.9	1496.3	1528.5	1486.6	1406.9		
11	11	1464.1	1476.1	1538.9	1435.3	1446.7		
12	12	1465.6	1502.3	1473.6	1372.7	1449.7		
13	13	1399.7	1510.8	1464.5	1500.2	1454.2		
14	14	1460.7	1514.6	1454	1326.7	1448		
15	15	1451.8	1519.6	1445.4	1315.3	1441.9		
16	16	1449.3	1492.6	1433.4	1520.3	1446		
17	17	1465.1	1503.6	1434.1	1522.2	1421.3		
18	18	1451.9	1502.3	1462	1469.6	1435.6		
19	19	1450.6	1507	1447.1	1494.5	1430.7		
20	20	1467	1505.4	1486.2	1414.8	1419.6		
21	21	1419.8	1507.3	1522.4	1414.6	1477.6		
22	22	1418.2	1388.7	1522.6	1426.1	1431.4		
23	23	1445.6	1402.6	1541.8	1439.9	1436.5		
24	24	1413.4	1404.2	1474	1445	1454.8		
25	25	1443.4	1400.8	1556.3	1449.3	1464.9		
26	26					1433.4		
Total (kWh)	36831.8	37221.7	36861.1	36494.8	37479.3	164888.8	184.89	
Average PV Module Cleaning Finished Each Inverter	1,528.95	1,505.97	-	1,507.66	-			
Average PV Module Cleaning Not Finished Each Inverter	1,447.07	1,399.08	1,474.44	1,441.18	1,441.01			
Total Average Cleaning Finished Inverter				1,514.19		kWh		
Total Average Cleaning Not Finished Inverter				1,440.66		kWh		

Thapyaya Solar Power Station Inverters Data Record							14.3.2023	
Sr No	Inverter No	Box X'mer-1 kWh	Box X'mer-2 kWh	Box X'mer-3 kWh	Box X'mer-4 kWh	Box X'mer-5 kWh	Total Inv 126 nos (kWh)	Remark
1	1	1546.7	1521.6	1548.9	1545.2	1433.3		
2	2	1481.9	1469.9	1548.9	1522.3	1422.9		
3	3	1467.5	1494.9	1555.8	1527.5	1417.8		
4	4	1518.4	1495.1	1548.8	1548.7	1422.8		
5	5	1498.4	1494.4	1527.5	1544.4	1410.2		
6	6	1490.3	1411.1	1546	1499.2	1425		
7	7	1460.3	1466.6	1551.4	1521.3	1413		
8	8	1466.3	1487	1545.6	1523.2	1407		
9	9	1521.4	1476.9	1540.2	1526	1424.5		
10	10	1520.8	1469.8	1519.8	1503.4	1466.4		
11	11	1511.5	1472.4	1514.1	1523.6	1524.6		
12	12	1437.4	1482.2	1549.9	1481.4	1526.7		
13	13	1376.4	1466.6	1546.2	1497.2	1501.6		
14	14	1439.2	1401.4	1539.6	1503.9	1523.9		
15	15	1429.2	1466.6	1526.7	1496.7	1520.1		
16	16	1425	1413.1	1529.3	1499.4	1511.8		
17	17	1501.8	1483.7	1526.2	1496.4	1498.6		
18	18	1517.4	1492.2	1501.8	1480.8	1499.8		
19	19	1522	1396.9	1542.7	1444.6	1417.2		
20	20	1525.5	1482.2	1561.4	1497.4	1387.3		
21	21	1492.8	1396.9	1572.1	1501.2	1371.5		
22	22	1484.4	1484.4	1510.8	1526.2	1510.9		
23	23	1514.4	1431.6	1529.3	1512.1	1498.3		
24	24	1414.9	1404.4	1568	1516	1422		
25	25	1412.9	1484.1	1539.8	1516.8	1440.7		
26	26					1376.6		
Total (kWh)	37077.8	36350.4	39121.5	37771.6	37638.4	187886.7	187.86	
Average PV Module Cleaning Finished Each Inverter	1,507.93	1,454.02	1,564.86	1,510.86	1,464.06			
Average PV Module Cleaning Not Finished Each Inverter	1,419.29	-	-	-	1,396.25			
Total Average Cleaning Finished Inverter				1,500.35		kWh		
Total Average Cleaning Not Finished Inverter				1,408.77		kWh		
				91.58		kWh		

Sr No	Inverter No	Box X'mer-1 kWh	Box X'mer-2 kWh	Box X'mer-3 kWh	Box X'mer-4 kWh	Box X'mer-5 kWh	Total Inv 126 nos (kWh)	Remark
1	1	1714.7	1655.6	1710.9	1721.4	1624.5		
2	2	1676.6	1665.7	1710.7	1702.3	1580.2		
3	3	1708.8	1648	1726.5	1703.3	1588.7		
4	4	1701.1	1649.6	1715.9	1718.4	1594.1		
5	5	1692.2	1642.1	1728.9	1717	1583.3		
6	6	1691.4	1651.9	1716.4	1688.9	1597.6		
7	7	1694.6	1644	1721.4	1700.6	1589.9		
8	8	1684.3	1645.2	1715	1702.3	1577		
9	9	1685.4	1639.9	1713.6	1706.3	1574.1		
10	10	1681.8	1650.5	1706	1674.7	1643.9		
11	11	1692.2	1639.6	1704	1704.4	1707.9		
12	12	1686.3	1647.5	1705.2	1654.4	1714.4		
13	13	1620.7	1652.4	1727	1665.9	1715.5		
14	14	1684.2	1655.9	1722.4	1674.4	1686.4		
15	15	1676.6	1660.3	1715.5	1662.9	1720.1		
16	16	1675.3	1670	1710.2	1673.7	1696.6		
17	17	1716.7	1638	1718.9	1672.7	1661.8		
18	18	1682.8	1638.2	1717.4	1657.9	1671.2		
19	19	1682.7	1638.9	1708.1	1653.6	1594.4		
20	20	1681.6	1638.6	1734.6	1669.8	1558.5		
21	21	1684.1	1641.1	1780.9	1664.8	1548.4		
22	22	1656.8	1662.4	1788.5	1680.6	1548.8		
23	23	1678.9	1657.2	1802.6	1691.1	1588.3		
24	24	1636.2	1659.3	1744.3	1694.2	1602.9		
25	25	1676.5	1654	1816.8	1698.8	1582.2		
26	26					1553.9		
Total (kWh)	42025.9	41231.3	43465.6	42154.2	42086.6	219955.6	210.96	
Average PV Module Cleaning Finished Each Inverter	1,681.04	1,649.25	1,736.22	1,686.17	1,639.07			
Average PV Module Cleaning Not Finished Each Inverter	-	-	-	-	1,573.18			
Total Average Cleaning Finished Inverter				1,678.75		kWh		
Total Average Cleaning Not Finished Inverter				1,573.18		kWh		
				105.57		kWh		

Total Average Cleaning Finished Inverter

Total Average Cleaning Not Finished Inverter

1,514.19 kWh

1,440.66 kWh

73.54 kWh

Total Average Cleaning Finished Inverter

Total Average Cleaning Not Finished Inverter

1,500.35 kWh

1,408.77 kWh

91.58 kWh

Total Average Cleaning Finished Inverter

Total Average Cleaning Not Finished Inverter

1,678.75 kWh

1,573.18 kWh

105.57 kWh

Creation of Solar Panel Cleaning Tools



Heavy

Can not cleaning Long Time

Motor is 24V DC , Supply is 230V AC

By using AC to DC adaptor

Water Bowser are followed behind



Modify to Single Brush

Provided DC power from Batteries.

**Created Water bucket and
water spray pump instead of
water bowser.**





**Creating of Thread brush with
compressed air for day time
cleaning**

Creating of Thread brush with blower air for day time cleaning



Care must be taken

Mowing Grass Between Solar Rows



Solar Panel may crack due to mowing machine.

**Solar panel cleaning with water at the day time
(Power Generation Time)**



**Inverter may automatically shutdown by changes
resistance of solar panel if water leakage into
panel.**

**Every connection joint must be re-tiding
after energizing**



**Connection joint can loose cause by electric
maganetizing effect (Become overheat)**

**Take glove while checking solar panel
and string connected wires**



**DC voltage is about 1500V, danger for electrical
Hazards**

**Wait about 15 minutes when prepare to
do maintenance of INVERTERs**



**Capacitance voltage will remain on electronic
circuit cards**

**Bird dropping can become hot spot of
solar Module**



Daily checking and cleaning

Periodic cleaning of solar modules



Dirty solar panel can reduce power generation

Benefits of Solar Power

1. Location of this area is good irradiation from Sunlight in Myanmar.
2. We can use land from waste un-agriculture to become valuable.
3. These power plant are the Green & Clean Power Plants
4. Support to the development of that region and job opportunity for the people of that township.
5. Zero Carbon emission.



BEFORE



30MW solar power Plant

AFTER



BEFORE



20MW solar power plant

AFTER



Yesterday



Today



Yesterday



Today





Control Room

Primary Electrical(33KV)

Secondary Electrical
Supply power(AC,DC) &
Control Panels)

Transformers

Power Converters

Series containers

Opening Ceremony

Project 2



**Site Visit and advised of Myanmar Engineering Council
members and
Federation of Myanmar Engineering Society.**



New two projects site visit



Solar power Plant Site Study Engineering Group



Corporate Social Responsibility(CSR)



Donated the construction of school and provided lighting to the village of Myo Gyi Gone



Donated 45 Lakhs for Htam Kan Village Lighting

**Records of New Solar power generating plant
with BESS (2) project**

Solar power generating plants Status

၂၀၂၄ ခုနှစ် ၊ ဧပြီ လ ၊ ၄ ရက်

စဉ်	စက်ရုံအမည်	တပ်ဆင် အင်အား (MW)	ထုတ်လုပ်မှု စုစုပေါင်း (MWh)	ပျမ်းမျှ ထုတ်လုပ်မှု (MWh)	Peak Time Load (MW)	Low Time Load (MW)	မှတ်ချက်
၁	အခြားစက်ရုံ	၄၀	၂၆၄.၀၀	၁၁.၀၀	၂၅.၁၉		
၂	သပြေဝ	၃၀	၂၂၈.၂၅	၉.၅၁	၂၃.၉၀		
၃	တောင်တော်ကွင်း	၂၀	၁၅၀.၄၁	၆.၂၇	၁၆.၁၃		
၄	အခြားစက်ရုံ	၃၀	၂၁၄.၅၁	၈.၉၄	၂၂.၄၄		
၅	အခြားစက်ရုံ	၃၀	၂၁၃.၆၁	၈.၉၀	၂၁.၉၃		
၆	အခြားစက်ရုံ	၃၀	၂၂၀.၄၉	၉.၁၉	၂၂.၀၈		
၇	သပြေဝ - (၃)	၃၀	၂၅၅.၀၄	၁၀.၆၃	၂၈.၀၅		
နေရောင်ခြည် စုစုပေါင်းချုပ်		၂၁၀	၁၅၄၆.၃၁	၆၄.၄၃	၁၅၉.၇၂		

လျှပ်စစ်စွမ်းအားဝန်ကြီးဌာန

လျှပ်စစ်ဓာတ်အားထုတ်လုပ်ရေးလုပ်ငန်း

နေရောင်ခြည်စွမ်းအင်သုံးလျှပ်စစ်ဓာတ်အားပေးစက်ရုံများ၏ နေ့စဉ်ဓာတ်အားထုတ်လုပ် ပို့လွှတ်မှုအခြေပြဇယား

၂၀၂၄ ခုနှစ်၊ ဧပြီ လ၊ ၆ ရက်

စဉ်	စက်ရုံအမည်	တပ်ဆင် အင်အား (MW)	ထုတ်လုပ်မှု စုစုပေါင်း (MWh)	ပျမ်းမျှ ထုတ်လုပ်မှု (MWh)	Peak Time Load (MW)	Low Time Load (MW)	မှတ်ချက်
၁	အခြားစက်ရုံ	၄၀	၂၄၂.၆၀	၁၀.၁၁	၂၉.၉၁		
၂	သပြေဝ	၃၀	၂၀၄.၈၈	၈.၅၄	၂၄-၃၁		
၃	တောင်တော်ကွင်း	၂၀	၁၃၃.၃၂	၅.၅၆	၁၅.၁၃		
၄	အခြားစက်ရုံ	၃၀	၁၉၈.၄၂	၈.၂၇	၂၄-၉၅		
၅	အခြားစက်ရုံ	၃၀	၁၈၆.၀၀	၇.၇၅	၂၀.၈၄		
၆	အခြားစက်ရုံ	၃၀	၂၀၉.၃၆	၈.၇၂	၂၅-၂၅		
၇	သပြေဝ - (၃)	၃၀	၂၂၅-၃၈	၉-၃၉	၂၇-၉၅		
နေရောင်ခြည် စုစုပေါင်းချုပ်		၂၁၀	၁၃၉၉.၉၆	၅၈.၃၃	၁၆၈.၃၄		

Solar power generating plants Status

၂၀၂၄ ခုနှစ်၊ ဇွန်လ ၁၀ ရက်

စဉ်	စက်ရုံအမည်	တပ်ဆင် အင်အား (MW)	ထုတ်လုပ်မှု စုစုပေါင်း (MWh)	ပျမ်းမျှ ထုတ်လုပ်မှု (MWh)	Peak Time Load (MW)	Low Time Load (MW)	မှတ်ချက်
၁	အခြားစက်ရုံ	၄၀	၂၃၃.၇၃	၉.၇၄	၃၃.၀၈		
၂	သပြေဝ	၃၀	၂၂၄.၅၂	၉.၃၆	၂၂.၁၇		
၃	တောင်တော်ကွင်း	၂၀	၁၇၁.၂၆	၇.၁၄	၂၀.၀၂		
၄	အခြားစက်ရုံ	၃၀	၂၀၀.၃၅	၈.၃၅	၂၈.၄၉		
၅	အခြားစက်ရုံ	၃၀	၁၉၉.၂၀	၈.၃၀	၂၇.၂၅		
၆	အခြားစက်ရုံ	၃၀	၁၉၂.၈၉	၈.၀၄	၂၆.၁၆		
၇	သပြေဝ - (၃)	၃၀	၂၅၀.၀၇	၁၀.၄၂	၁၁.၀၅		Solar - ၂၃၇.၇၁ MWh BESS - ၁၂.၃၆ MWh
၈	သာစည်	၃၀	၂၆၄.၄၇	၁၁.၀၂	၂၉.၇၉		Solar - ၂၅၂.၃၅ MWh BESS - ၁၂.၁၂ MWh
နေရောင်ခြည် စုစုပေါင်းချုပ်		၂၄၀	၁၇၃၆.၄၉	၇၂.၃၅	၁၉၀.၀၁		

Q & A

Chinese Philosopher Xunzi



**I hear and I forget,
I see and I remember,
I do and I understand.**

**Tell me, I forget.
Show me, I remember.
Involve me, I understand.**