

Federation of Myanmar Engineering Society

Knowledge Sharing for Solar power Generation Plant

Experience of Project Reference

30 MW Thapyaywa Solar Power Plant

20 MW Taung Taw Gwin Solar Power Plant

Energy & Renewable Energy Committee

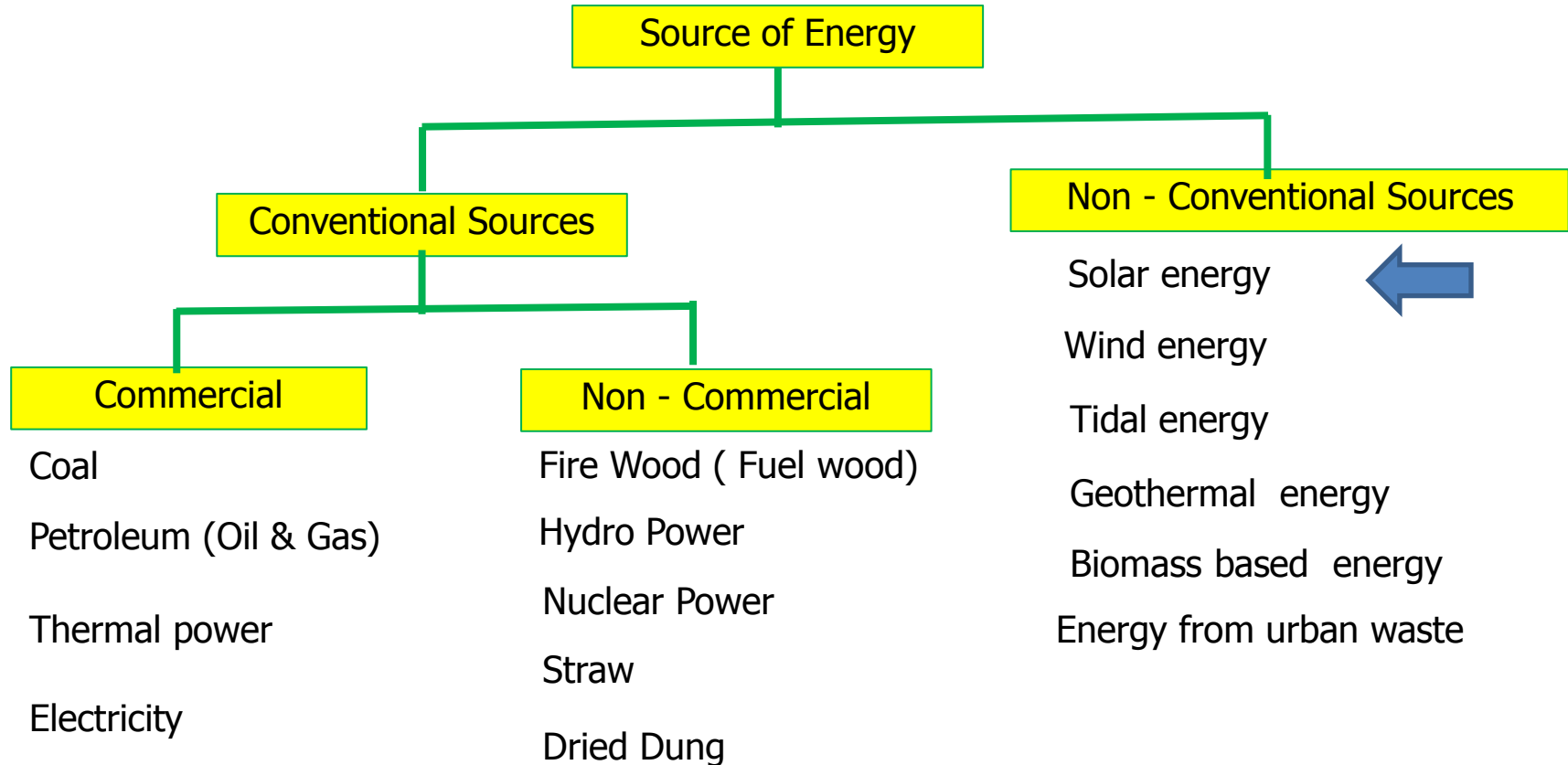
Date- 17-6-2023

Presented By U SHWE

BE(EP) 1977(Nov) PE 0063

Fed-MES Member – 020646 – M/EP

SOURCE OF ENERGY



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 (FIXED TYPE)



ROOF TOP SOLAR SYSTEM



Project's solar system



**30MW THAPYAYWA SOLAR POWER PLANT
AND
20MW TAUNG TAW GWIN SOLAR POWER PLANT**



**GROUND MOUNTED
HORIZONTAL SINGLE AXIS SOLAR TRACKING SYSTEM**

CLEAN POWER ENERGY CO., LTD
30MW GROUND MOUNTED SOLAR POWER PLANT
(THAPYAYWA)



GREEN POWER ENERGY CO.,LTD
20MW TAUNG TAW GWIN
GROUND MOUNTED SOLAR POWER PLANT

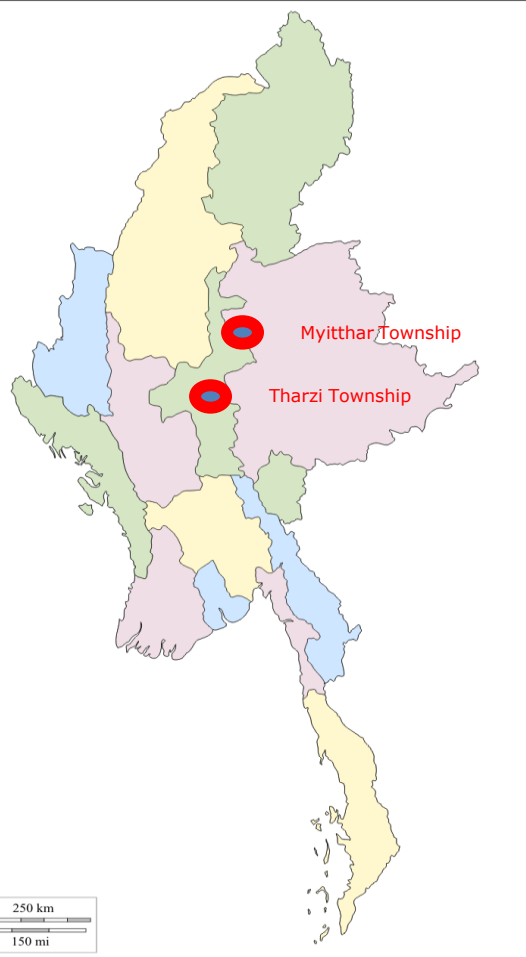


Bird's eye view of
20MW TAUNG DAW GWIN
GROUND MOUNTED SOLAR POWER PROJECT (MYANMAR)



The Project Background

Project Location



THAPYAYWA

Project Location Thapyaywa Village-Track, Tharzi
Township, Meiktila District, Mandalay
Region
(20 58' 39.33"N, 96 0' 45.20"E)

TAUNG TAW GWIN

Project Location 19 miles South-East of Kyauk-Se,
Myitthar Township, Kyauk-se District,
Mandalay Region
21°30' 10" N, 96° 14' 56" E

The Project Background

Developer

THAPYAYWA

Clean Power Energy Company Limited “CPE”

TAUNG TAW GWIN

Green Power Energy Company Limited “GPE”

The Project Background

Construction & Installation

THAPYAYWA.

TAUNG TAW GWIN

Royal Victory Engineering Services Co., Ltd

The Project Background

Commercial Operation Date (COD)

THAPYAYWA

COD Date : 16-Dec-2021

TAUNG TAW GWIN

COD Date : 17-Nov-2022

Engineering and Design Concept

Points for Design Consideration

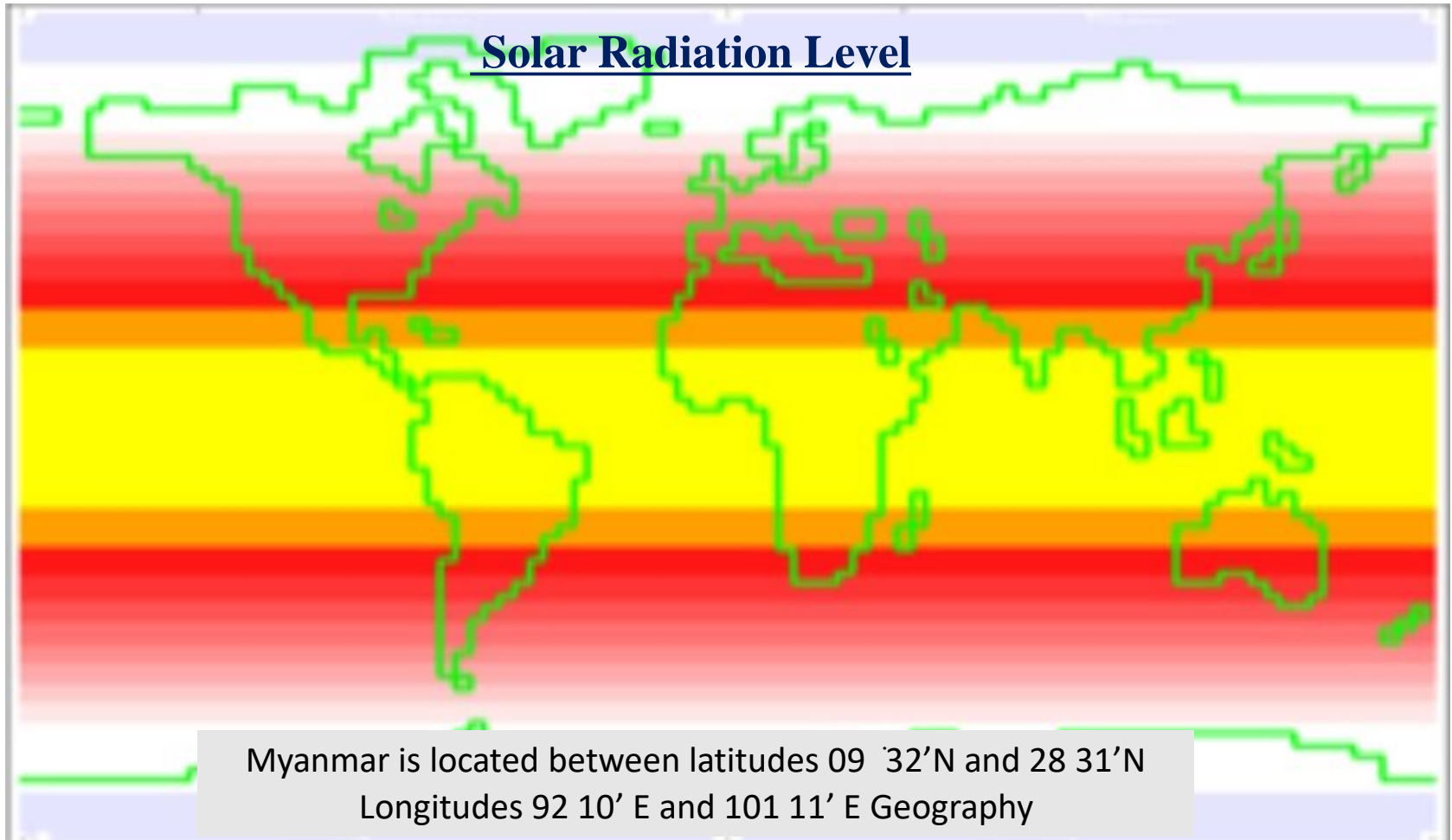
- Geographic Location (N, E),
- Weather condition
- Install capacity,
- System Voltage of project region,
- Require capacity of region substation
- Photovoltaic panel capacity (DC)

-Solar Energy Resources

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

- Thapyaywa (1850.5kwh/m² and 833kwh/m² respectively)

Solar Radiation Level



Mountly Average Solar Radiation Level at project site(Thapyaywa)

	Global Horizontal (kWh/m2)	Diffuse Horizontal (kWh/m2)	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

-Geotechnical Information

-Topography of project site is relatively Flat(or)Farmland (or) Hill (or) Others Terrain

-Altitude

Electrical Design requirement

-Main design Standards and Codes (IEC standard)

Electrical Primary

-Total install capacity on the AC(Alternative Current)

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

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

-Photovoltaic (PV) panel (solar panel) arrangement.(Fixed or Tracking)

-How to convert DC to AC (INVERTER) arrangement.

-Box typed Transformer setups and Switchgear arrangement

Electrical Control System

How to control entire Solar Power generation system

Operation and monitoring

Selection of main equipments

PV Module selection

INVERTER selection

Box-type transformer Design

Bracket type selection of Photovoltaic Array depends on fixed or tracker

Tracking Control System and Function of SCADA

Detail Specification of main material (Thapyaywa)

THAPYAYWA



PV Module

Brand Name	: Trina
Specification	: Maximum Power (P max) 445W±3%
Measurement	: L 210 x W 120 cm
Total Quantity	: 83752 Pcs.(Bifacial)



Inverter

Brand Name	: Sungrow
Wattage	: 250KW
Dimension	: 84.86 x 102.53 x 48.83cm (LxWxH)
Total Quantity	: 126 Nos.



Box Transformer

Brand	: Daqo
Rated Capacity	: 6300KVA
Dimension	: 625x280x365cm
Net Weight	: 22500KG
Dimension(Foundation):	680cm x 300cm x 210cm
Total Quantity	: 5 Nos.

DETAILED SPECIFICATION OF MAIN MATERIALS

TAUNG TAW GWIN



PV Module

Brand Name :
Maximum Power (P max)
Type

Total Quantity

Trina
:545WP
:Bifacial monocrystalline silicon
PV Module
:45980 Pcs.



String Inverter (On Grid Inverter)

Brand Name
Model
Rated Capacity
Total Quantity

:Sungrow
:SG 250 HX
:250KW
: 91 Nos.



Box Transformer

Brand
Rated Capacity
Rated Voltage
Total Quantity

:Shangdong Dachi
:6.3MVA x3sets + 4MVA x1 Sets
:33± 2.5%/0.8 – 0.8 kV
: 4 Nos

LONGI

授权书

隆基乐叶光伏科技有限公司授权

南京墨格新能源有限公司

为隆基乐叶光伏科技有限公司在江苏省的光伏系统

授权证书编号
LGL-Sale-2012-0106-A012

授权证书持有公司
南京墨格新能源有限公司

授权公司地址
南京市江宁区科学园竹山路605号2楼

授权公司电话
02552162170

授权有效期
2021年1月1日至2021年12月31日
合作商独立的向客户承担因产品销售行为所产生的责任,本
对合作商的损害行为不承担任何责任。

销售产品型号
隆基乐叶对外可查所有单品组件产品型号



西安经济控股集团江苏分公司地址:西安市雁塔区小寨路4369号

2021年1月
盖章日期

以上所有信息均可通过隆基乐叶光伏科技有限公司客服电话400-860-1

Daqo

箱式变电站 Prefabricated Substation 产品合格证 Certificated Card

型 号

Type: SIK

出厂编号

Serial No: CS2104035

出厂日期

Date of Manufacture: 2021-07-12

执行标准

Standard: GB/T17467-2020 IEC62271-202

检 验

Checker: 董祥

质量部

QA Department:

江苏大全长江电器股份有限公司
JIANGSU DAQO CHANGJIANG ELECTRIC CO., LTD.

电缆测试报告

ort of High Voltage Cable

30MW 光伏电站项目 NO. 11-Thapyaywa

3*1*95mm2

036

技术要求 chnical requirements	实测 Actual measurement	结果 Results	备注 Remarks
规格应符合设计要求, 外观 缘良好。 e and specification should n the design requirements; no age and has good insulation.		合格 Check Out	
正确 Correct		合格 Check Out	
符合要求 om to the requirements		合格 Check Out	
5kV/1min 不击穿 eakdown at 65kV/1min	65kV/1min	合格 Check Out	
子, 电缆截面 120mm ² 及以下, 前为 16mm ² ; 150mm ² 及以上 ood earth, when the cable s 120mm ² and below, actor section is 16mm ² ; when section is 150mm ² or above, actor section is 25mm ² .		合格 Check Out	

re during the test: 32 °C

71 %

董祥
2021-07-10

全长江电器股份有限公司
O CHANGJIANG ELECTRIC CO., LTD.

Power generation Estimate

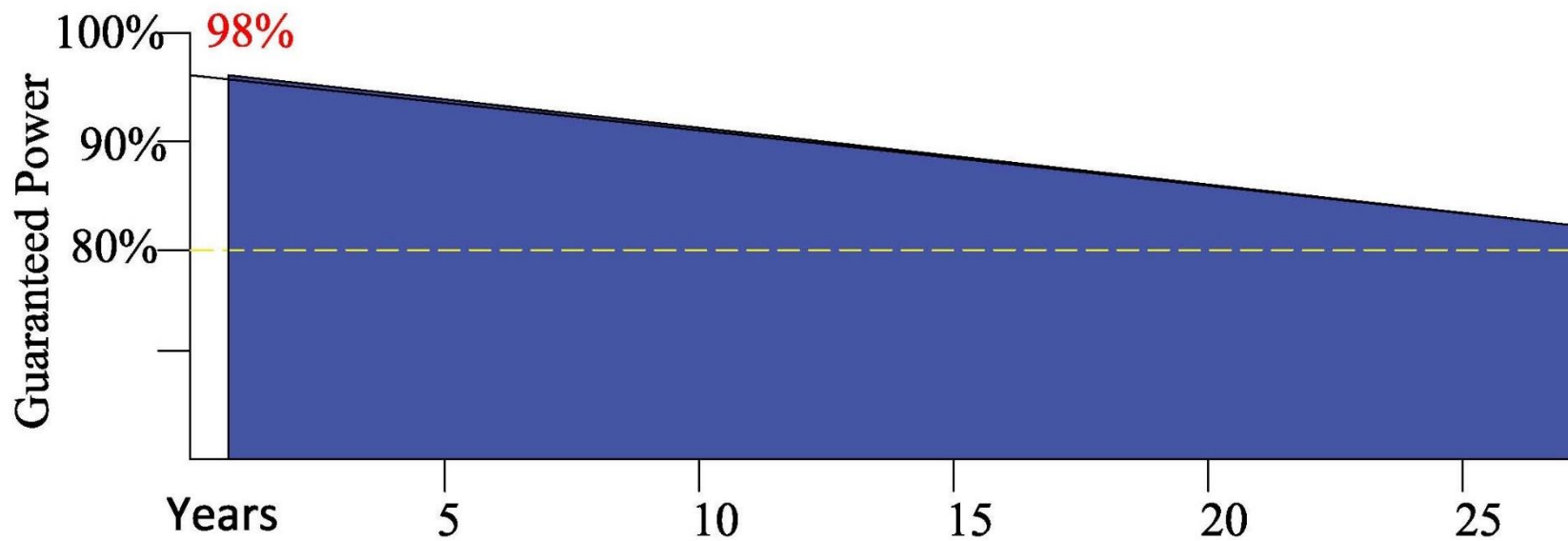
Power generation Estimate for 1 ~ 10 years

Year	Estimated Contracted Capacity	Estimated Contractor Energy						
	Indicative MWAC	Net Year Output (MWh)	Permissible limit of generation	lower annual 80%	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	lower annual 80%	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	

Solar Panel Life



Other Requirements

Fire Protection Design, Fire Alarm system

CCTV and security System

Station Communication (OPGW)

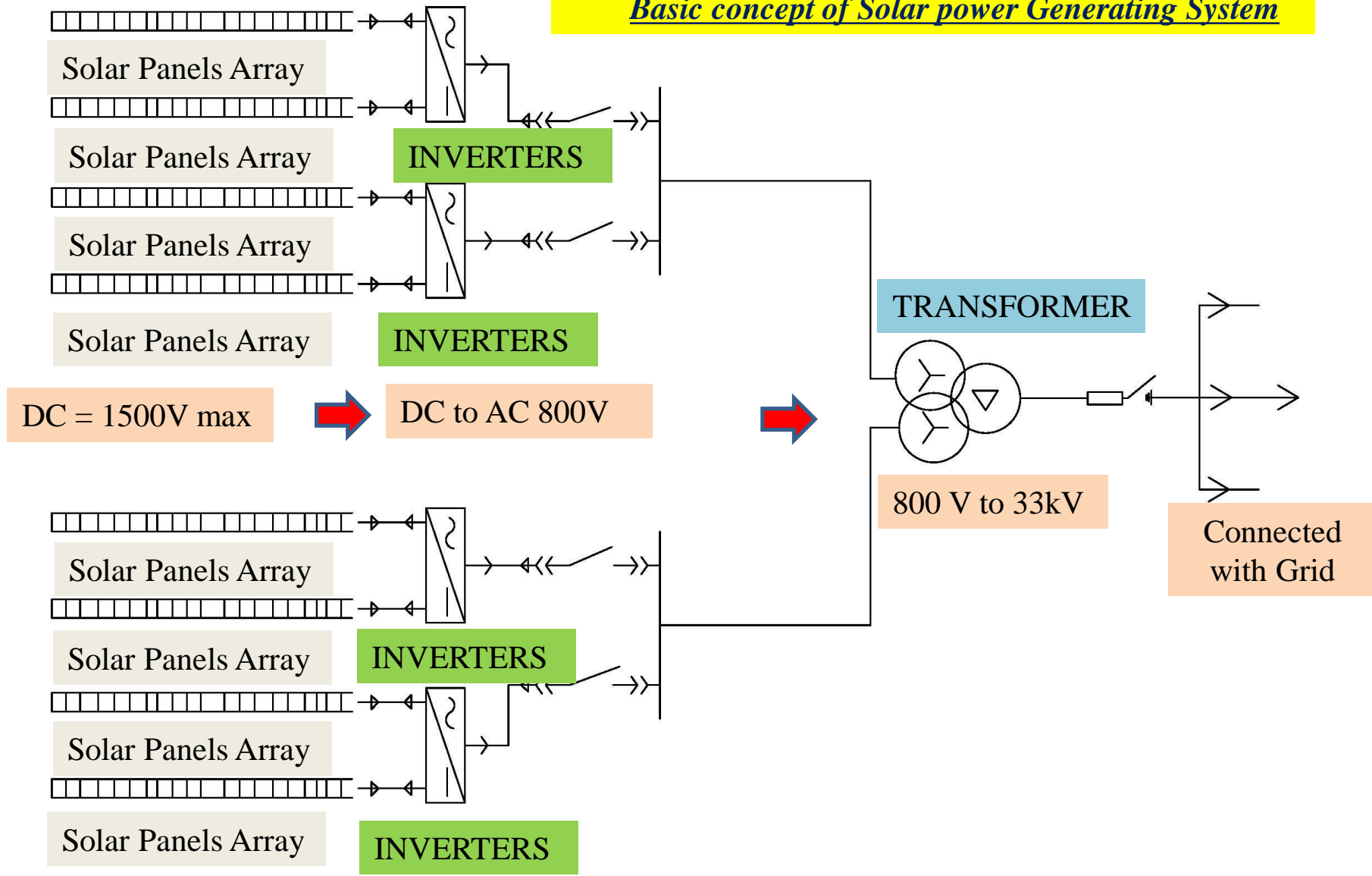
Protection Relay System

Construction of Civil and Electrical Design

Lightning Protection Design

Environmental Protection and Soil and Water conservation Design

Basic concept of Solar power Generating System



Basic concept of Solar power Generating System with images



PV Panel



DC cable



Inverter



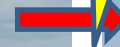
AC
Low Voltage
Cable



Box
Transformer



33kV
switchgear



36kV Cable



33kV
transmission
line

36kV Cable



O/H Line



Main Grid Substation
230/33kV

36kV Cable



Control and communication

MAIN INDICATORS

THAPYAYWA



CLEAN POWER ENERGY CO., LTD



GOLD ENERGY CO., LTD



Land acquisition	:	133.44 Acre (54 – hectares)
Installed Capacity		
	DC :	37.27 MWp
	AC :	31.45 MW
Average Annual Power Generating	:	66 million KWh
PV Module		
Type :	Bifacial monocrystalline silicon PV module	
Rated power	:	445Wp
No: of PV Module	:	83,752 –pcs

String Inverte		
Model	:	SG250HX 250kW
Nos. of inverter	:	126 – units
Box Transformer		
Model	:	YBM29-40.5/0.8
Capacity		6300KVA,
No: of box transformer	:	5- units
Single axis tracker support		
Single axis tracker support(1V58)	:	10 - sets
Single axis tracker support(1V87)	:	956 – sets
33KV Transmission Line	:	3.91 Mile(Single bundle double circuit
		605MCM, ACSR

MAIN INDICATORS

TAUNG TAW GWIN

Land acquisition : 80 Acre (32 – hectares)

Installed Capacity

DC : 25.059 MWp
AC : 22.75 MW

Average Annual Power

Generating : 45million KWh

PV Module

Type : Bifacial monocrystalline silicon
PV module

Rated power : 545Wp

No: of PV Module : 45,980 –pcs

String Inverte

Model : SG250HX 250kW

Nos. of inverter : 91 – units

Box Transformer

Model : YBM29-40.5/0.8
6300kVAX 3 Nos + 4000KVA,x 1Nos

No: of box transformer : 4- units

Single axis tracker support

Single axis tracker support(1V76) : 605 - sets

33KV Transmission Line

6 Mile, Twin bundled single circuit
795MCM, ACSR

Implementations and Construction Process

1. Looking for wider land area for solar farm.
2. Organization and Resources collection
3. Site cleaning, 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. Tracking motor drive control box wiring and program configuration.
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

1. Looking for wider land area for solar farm.

Basically land requirement for PV panel = $1\text{kW} / 6 \text{ m}^2$

For 1MW requirement is 6000 m^2 = about **1.5 Acre**

Consider for row by row space for 1 MW = $1.5 \times 2 = \mathbf{3 \text{ Acre}}$

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 = $4 \sim 4.5 \text{ acre}$

For Thapyaywa 30MW = $4.5 \times 30 = 135 \text{ Acre}$ (Present land **133.4 Acre**)

For Taung Taw Gwin 20MW = $4 \times 20 = 80 \text{ Acre}$ (Present land **80 Acre**)

2. Organization and Resources collection

ROYAL VICTORY ENGINEERING SERVICES CO., LTD



Total Vehicle and Machinery (493) units.

Machinery work force at site



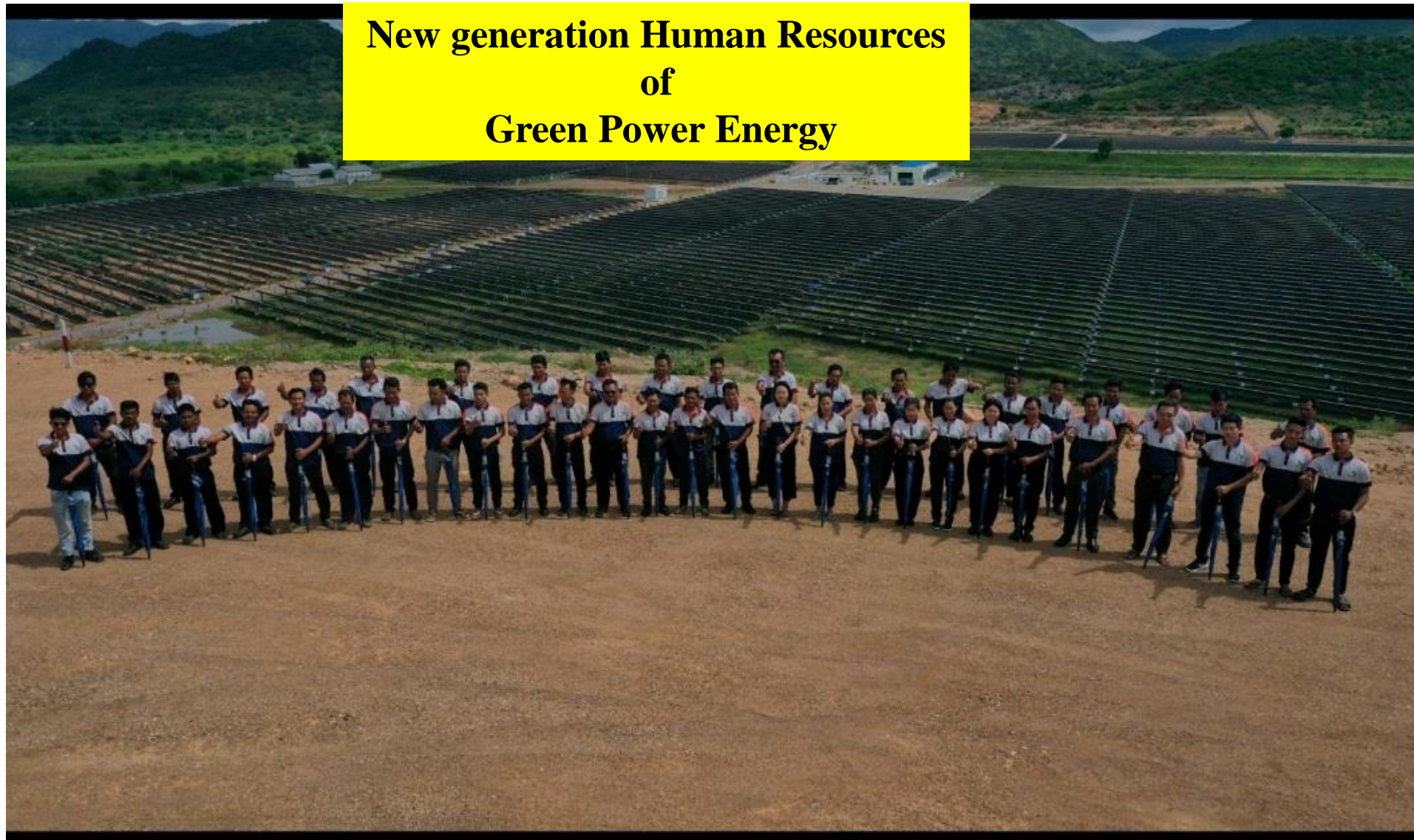
Machinery work force at site



New generation Human Resources of Clean Power Energy



New generation Human Resources of Green Power Energy



Manpower and Machinery at site

MANPOWER AND MACHINERIES

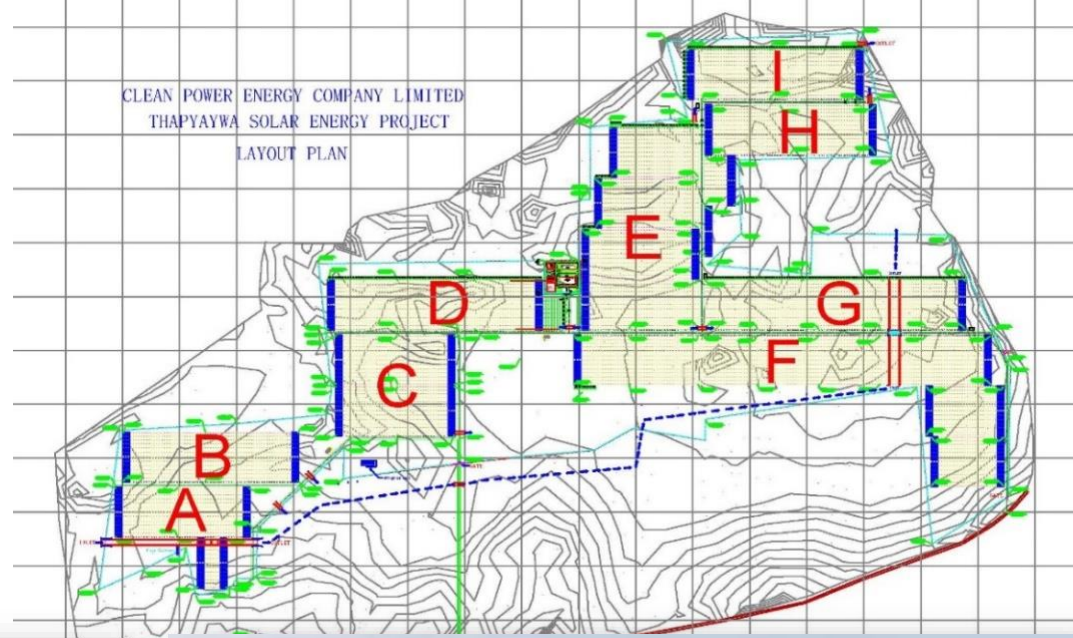


TOTAL MANPOWER- 550



A TOTAL OF (60) VEHICLES
AND
MACHINERIES

3. Site cleaning, Survey





3. Site cleaning, Survey

CONSTRUCTION PROCESS:

Cutting – 133,133.93 m³



Filling – 113,085.58



Target days - 60 days
Earthwork processing Days - 50 Days

4. Access road to project construction site

Access Road to ThapyaywaProject



Access Road to Taung Taw Gwin Project



Inspection Roads of Taung Taw Gwin Project



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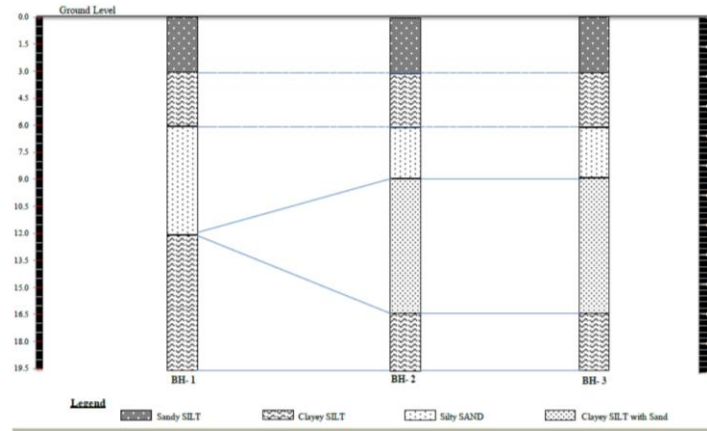
5. Soil testing



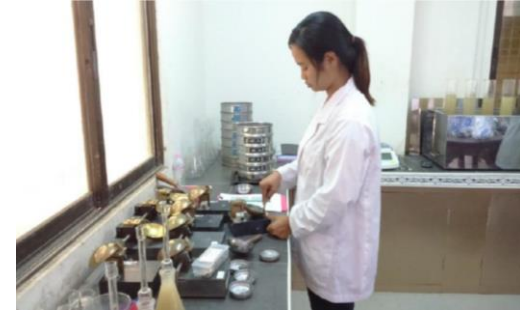
Drilling



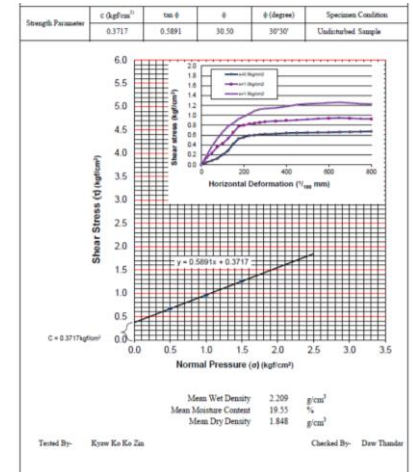
Core Sample



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	%	
												Kg/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. Enviromental 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



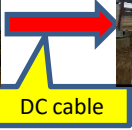
Noise Level Monitoring
at Source and Receptor

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																											

 Schedule
 Achieve



Scope of work of PV To Inverter Cable Laying Works

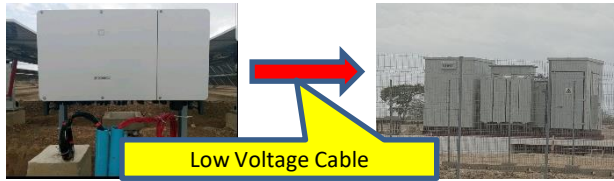
SN	Description	Civil	Mechanica l	Electrica l	
1	Cable Supporting Works	Yes		Yes	
2	Cable trenches Works	Yes		Yes	
3	Zone A, B, C, D, E, F, G, H	Yes	Yes	Yes	
4	25mm PVC conduit installation			Yes	
5	25mm GI,PVC coated Flexible installation			Yes	
6	150mm,Dia ,PVC pipe Installation			Yes	
7	4mm 2 PV cable installation Work			Yes	
8	4mm2 PV cable Termination work			Yes	
9	Checking	yes	yes	yes	
10	Inspection			Yes	
11	Testing			yes	



Inverter

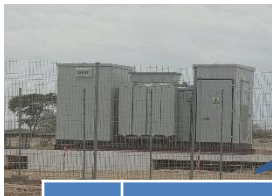
Scope of work of Inverter installation Works

SN	Description	Civil	Mechanical	Electrical	
1	Cable Supporting Works	Yes		Yes	
2	Cable trenches Works	Yes		Yes	
3	Zone A, B, C, D, E, F, G, H	Yes	Yes	Yes	
4	4mm ² PV cable Termination work			Yes	
5	4mm ² PV cable Termination work			Yes	
6	150mm,Dia ,PVC pipe Installation			Yes	
7	Inverter foundation work	Yes		Yes	
8	Inverter installation		Yes	Yes	
9	Checking	yes	yes	yes	
10	Inspection		Yes	Yes	
11	Testing(Supplier)			yes	
12	Setting and commissioning(Supplier)			yes	



Scope of work of Low Voltage Cable installation Works

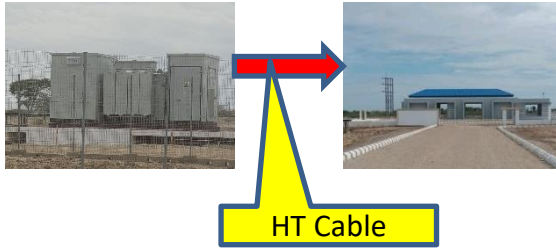
SN	Description	Civil	Mechanical	Electrical	
1	Cable Supporting Works	Yes		Yes	
2	Cable trenches Works (Earth, sand filling, earth Back fill)	Yes		Yes	
3	Zone A, B, C, D, E, F, G, H	Yes	Yes	Yes	
4	Low Voltage cable installation work			Yes	
5	Low Voltage cable Termination work			Yes	
6	Grounding/Earth Cable laying (GI Flat steel)		Yes	Yes	
7	150mm,Dia ,PVC pipe Installation			Yes	
8	Checking	Yes	Yes	Yes	
9	Inspection			Yes	
10	Testing			Yes	



Box
Transformer

Scope of work of Box Transformer Works

SN	Description	Civil	Mechanical	Electrical	
1	Transformer foundation work	yes	Yes	Yes	
2	Cable Supporting Works	Yes	Yes	Yes	
3	Cable trenches Works (Earth, sand filling, earth Back fill)	Yes	Yes	Yes	
4	Zone A, B, C, D, E, F, G, H,I	Yes	Yes	Yes	
5	Low Voltage cable termination work			Yes	
6	High Voltage cable Termination work			Yes	
7	Grounding/Earth Cable laying & Termination		Yes	Yes	
8	Transformer installation	Yes	Yes	Yes	
9	Transformer Oil Filling		Yes	Yes	
10	Checking			yes	
11	Inspection (Supplier, MOEE,EI)			yes	
12	Testing(Supplier, MOEE,EI)			yes	



Scope of work of HT cable laying Works

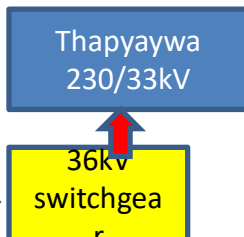
SN	Description	Civil	Mechanical	Electrical	
1	Draw pit Construction work	yes		Yes	
2	Cable Supporting Works	Yes	Yes	Yes	DC motors, are combine earth,
3	Cable trenches Works (Earth, sand filling, Soil Back fill)	yes	Yes	Yes	LA, Inverters Box Transformers, HT< earthing all are combine.
4	Zone A, B, C, D, E, F, G, H,I	Yes	Yes	Yes	Mesh type grounding make in front of substation
5	High Voltage cable Termination work			Yes	30 span(200x200Ft)
6	Grounding/Earth Cable laying & Termination			Yes	
7	Checking			yes	
8	Inspection (Supplier, MOEE,EI)			yes	
9	Testing(Supplier, MOEE,EI)			Yes	



33kV
switchgear

Scope of work of 33kV Switchgear Installation Works

SN	Description	Civil	Mechanical	Electrical	
1	Power House construction work	yes	Yes	yes	
2	Cable Supporting Works	Yes	Yes	yes	
3	Cable trenches Works (Earth, sand filling, earth Back fill)	yes		Yes	
4	36kV high voltage switchgear installation			Yes	
5	High Voltage cable Termination work			yes	
6	Earth Cable laying & Termination			Yes	
7	LA system	Yes		yes	
8	Control Room	Yes	Yes	yes	
9	Station Power & Grounding Transformer	Yes	Yes	yes	
10	Other security system(FA, CCTV,FF, etc)	Yes	yes	yes	
11	Checking		yes	yes	
12	Inspection (Supplier, MOEE,EI)		yes	yes	
13	Testing(Supplier, MOEE,EI)		yes	yes	
14	Control System Testing(Fibre optic, Copper, Server, Solar Tracking, Power stability)			yes	



Scope of work of 33kV Switchgear Installation Works

SN	Description	Civil	Mechanical	Electrical	
1	Site surveying, Site cleaning, line route	yes	Yes	yes	
2	Material collection	Yes	Yes	yes	
3	Cable trenches Works (Earth, sand filling, earth Back fill)	yes	Yes	Yes	
4	36kV high voltage switchgear installation(AIS switch bay)	Yes	Yes	Yes	
5	36kV Gantry installation work	Yes	yes	yes	
6	Earth Cable laying & Termination	Yes	Yes	Yes	
7	LA system	Yes	Yes	yes	
8	Control Room	Yes	Yes	yes	
9	Concrete pole erection work(Earth work, erection, footing)	Yes	Yes	yes	
10	Line accessories Installation	Yes	Yes	yes	
11	ACSR stringing work		yes	yes	
12	Inspection (Supplier, MOEE,EI)		yes	yes	
13	Testing(Supplier, MOEE,EI)		yes	yes	
14	Protection Testing		yes	yes	

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



Drilling (depth- 2.5 m, 2.2 m)



Rebar & formwork



Concreting



Footing



Levelling

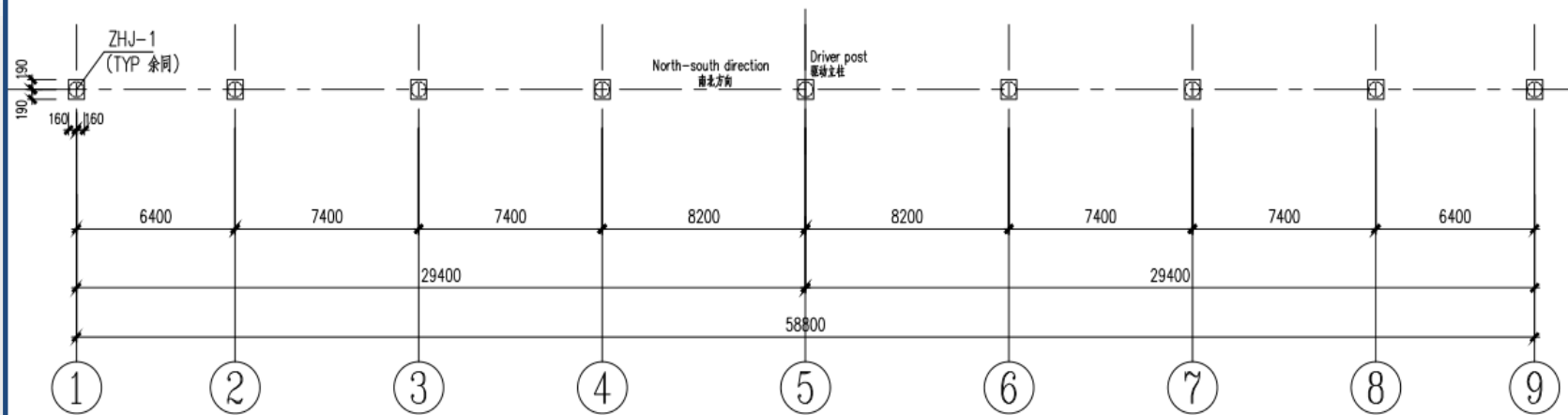


Concrete Foundation



Schedule : 12,518 nos.

Spacing of tracker supporting column



Layout of 1v58 pile foundation 1:200

1V58桩基布置图

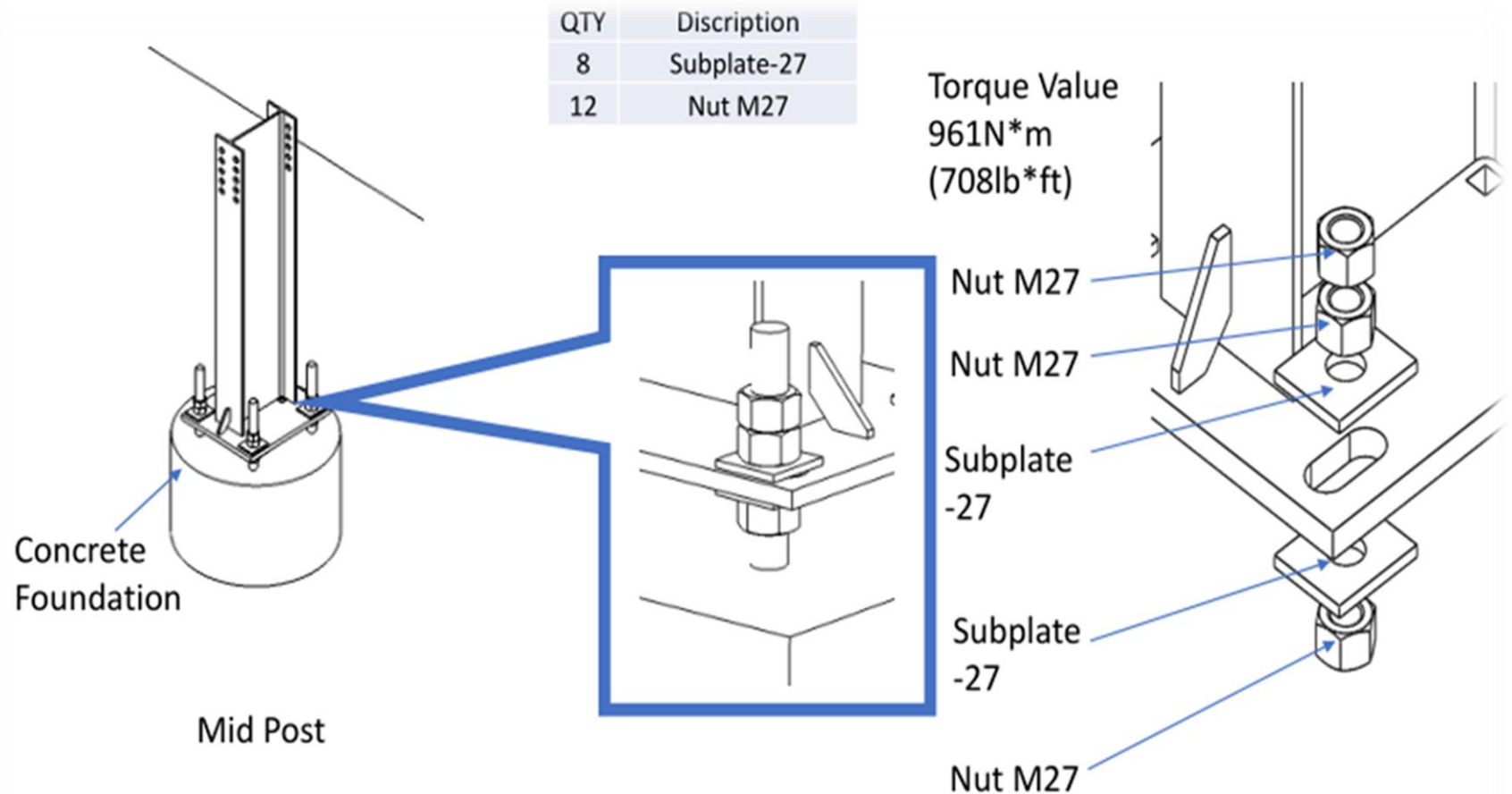
Type	Quantity	Schedule (pcs.)	Finished (pcs.)	Balance (pcs.)	Progress (%)
1V58 / 10 set	10 x 58	580	580	-	100
1V87 / 956 set	956 x 87	83,172	83,172	-	100
Total Quantity (PV Module)		83,752	83,752	-	100%

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 Area fencing Work



Iron Mesh Fencing(Thapyaywa)



Iron Mesh Fencing(Taungtawgwin)

Inspection Road in the Project Area



30MW Thapyaywa



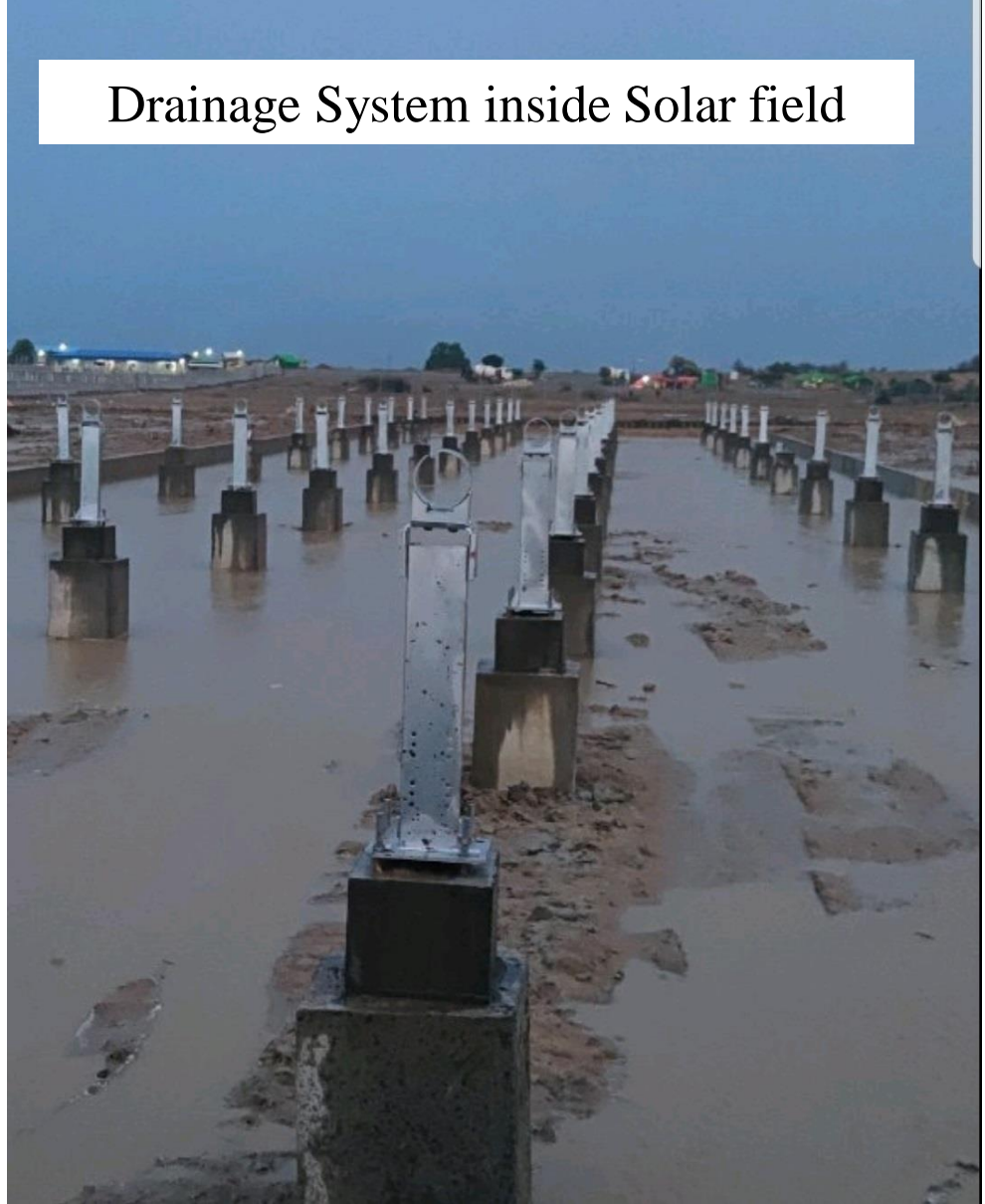
30MW Taungtawgwin

Drainage System Pipe Culvert(7 Openings)

Thapyaywa



Drainage System inside Solar field



Water flow during construction period



Construction of Bridge Across Myogyi Main Canal(1)



Drainage Intake(Thapyaywa)

Thapyaywa



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



Unloading at Chin Shwe Haw



Kunlon Bridge Crossing



Unloading at Taung Daw Gwin Project Site

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

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



Important Points for Supporting Structures installation

Supporting Structures will different depends on type of fixed and tracking system.

Need to know following things if we design Single axis solar tracking system

a) PV module size

b) PV Module's peak working Voltage & open circuit voltage

c) DC String voltage(Inverter input DC Voltage)

d) How many solar panel nos / string
as per present reference
(29 nos x 49.3V = 1429.7V)
(29 nos x 41.1 = 1191.9 V)

e) How many solar string/ 1 drive unit should be fixed on tracker
At least 2 strings / 1 drive unit,
Some drive unit tracking row have 3 strings

f) One row's total length including space between
panel to panel(gap between panel to panel = 25 +/- 5mm)

g) One row's total Column.

Manufacturer	Trina Solar Co.,Ltd
Peak power(Pmax)	445 Wp
Peak working Voltage(V mpp)	41.1V
Peak working Current(I mpp)	10.75A
Open circuit Voltage(V oc)	49.3V
Short Circuit current	11.32A
Standard Test condition(STC)	Solar radiation flux(1000W/m2)

Operation Temperature	Between -40 ~ 85°C
System Voltage(DC)	1500 V
FUSE rated current	20 A
Solar module Size(H x W x t)	2111 x 1046 x 30 mm
weight	28.6 kg
Cell Orientation	144 cells(6x24)
Front Glass Thickness	2mm
Protection Level of join Box	IP 68

Important Points for Supporting Structures installation (Continue)

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

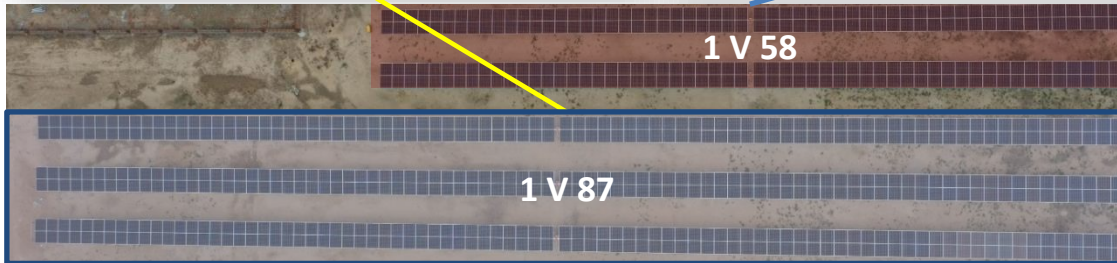
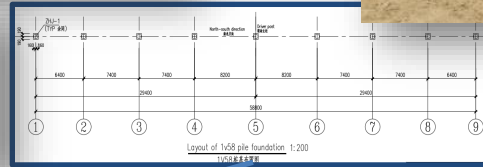
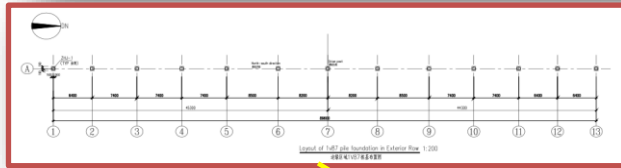
k) Do not forget detail accessories of solar panel supporting structure such as anchor bolts , nuts & washer, bearing rings & brackets, solar panel supporting bars, panel fixing brackets, bolts & nuts, washers,..etc.

L) Total support structure's Earth Quick resistance



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

THAPYAYWA



Record photo of 33kV overhead Transmission Line

TAUNG TAW GWIN



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

TAUNG TAW GWIN

Foundation (Switch Bay)

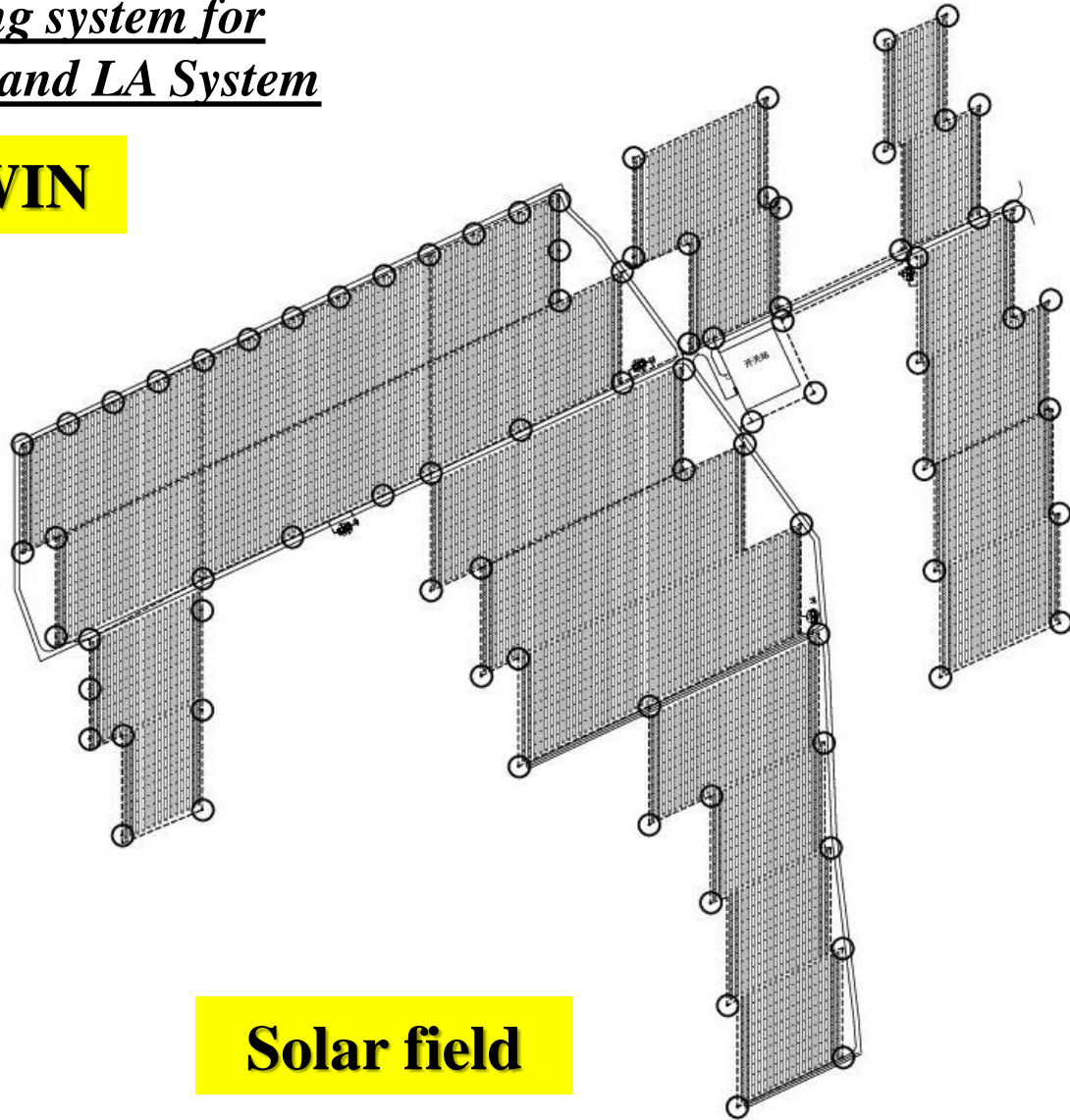


Finished (Switch Bay) at
Receiving Grid Substation



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

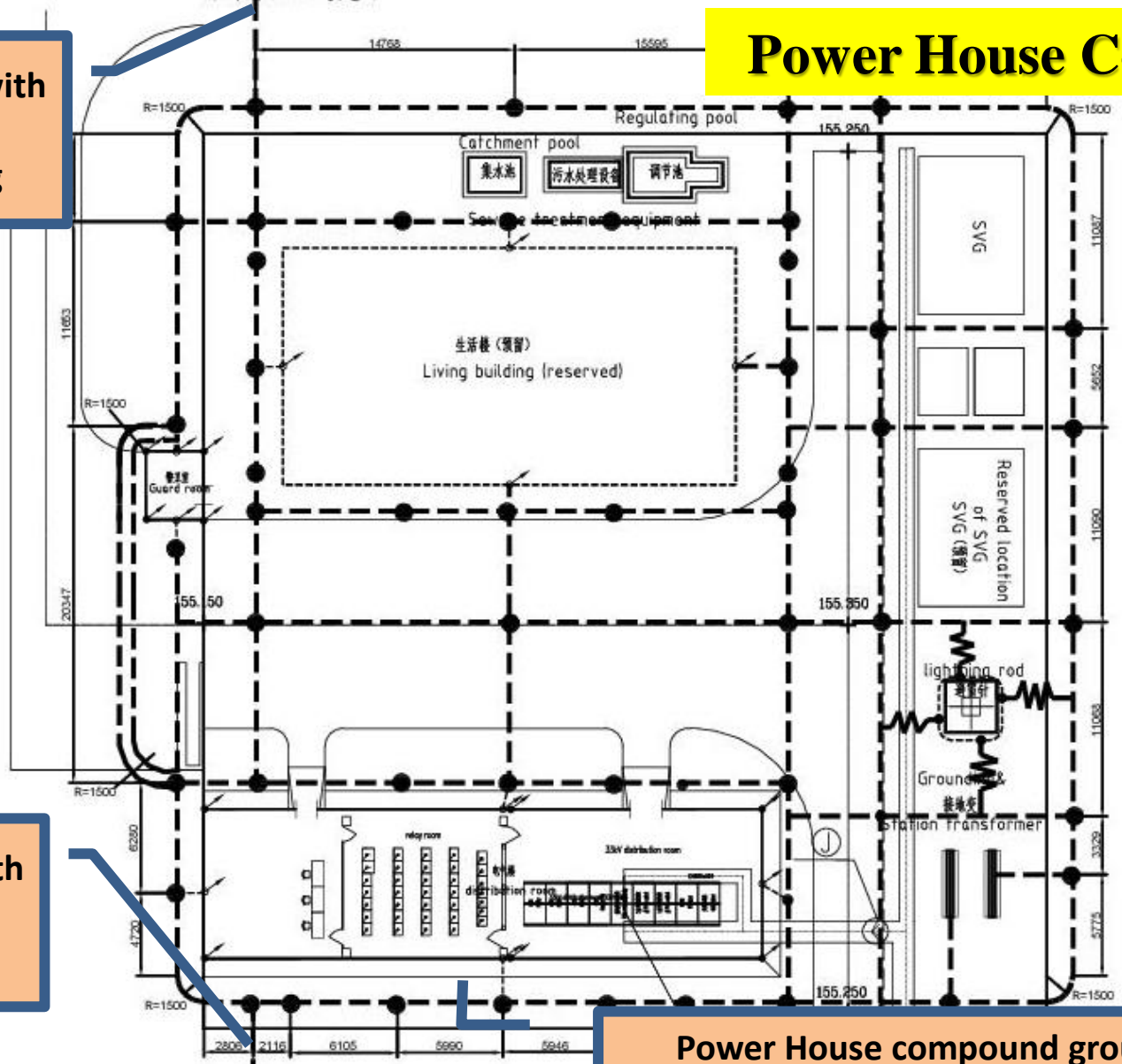
TAUNG TAW GWIN



Solar field

Connected with
PV field
grounding

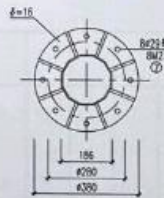
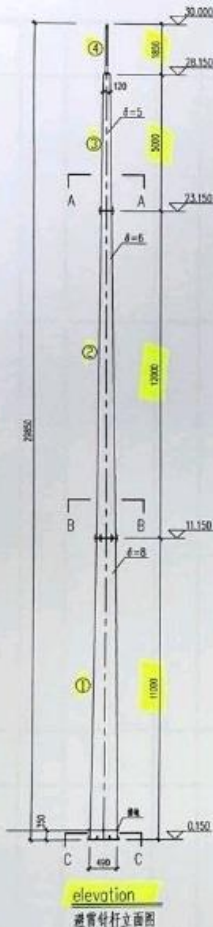
Power House Compound



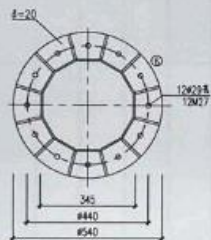
Connected with
PV field
grounding

Power House compound grounding Design

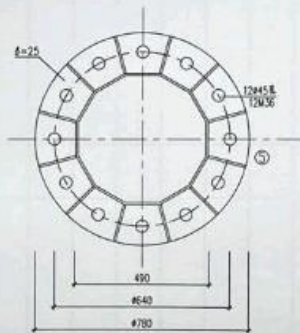
Lightning Arrester Detail Design



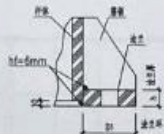
A~A放大(2块)



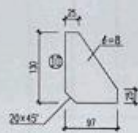
B~B放大(2块)



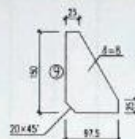
C~C 放大 (1 块)



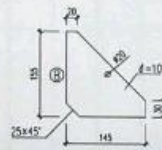
welding drawing
法兰、杆体、磨板连接图



A~A 船板

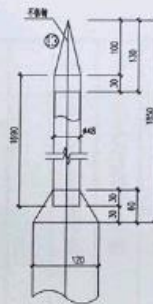


B~B 磨板

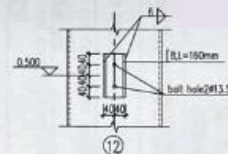


C~C 筋板

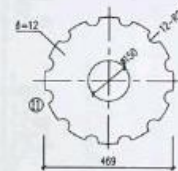
Two of them have holes 其中二號雀乳



Lightning rod top
杆顶放大图



Lightning rod bottom
杆底放大图



A 部件

One of the holes needs to be welded
其中一孔需焊接

**Total Height of Lightning
Arrester Pole = 30meter**

Record photos of Grounding Installation works



Grounding conductor Installation Work



Earthing Installation Work



Earthing Connection Installation Work



Lightning pole Installation

Lightning Pole Installation



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

Note!
LT side voltage is 800 V .

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

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

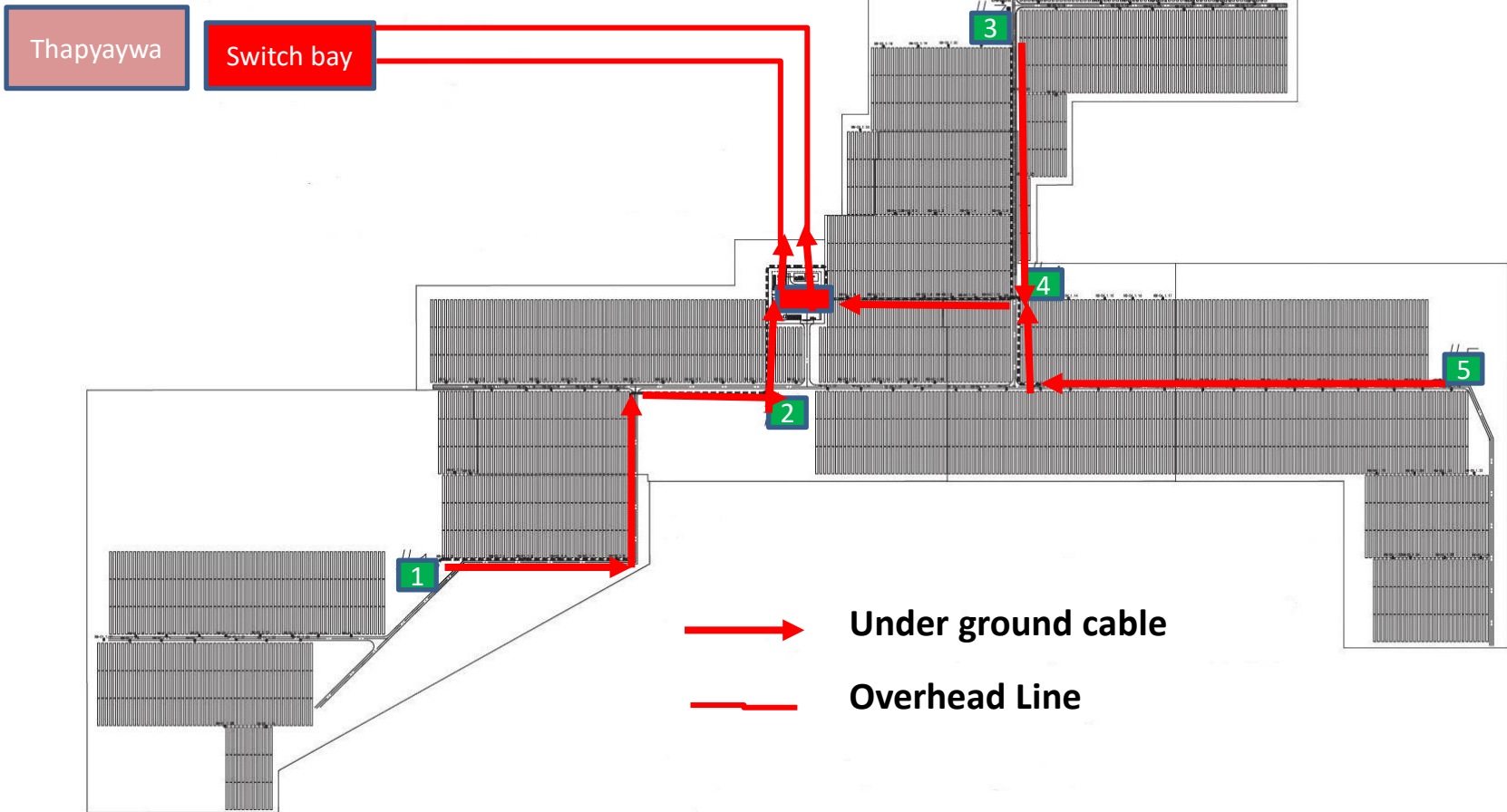


cable supporting Work

Under ground conduit provision works



HT Cable Laying



Cable Laying works



18. Inverters & Box typed transformers installation



Inverter Installation



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($29 \times 41.1 = 1191.9\text{V}$)
($29 \times 49.3 = 1429.7\text{ V}$)

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

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

Inverter Capacity = 250kVA = 225kW (if power factor 0.9)

Inverter Capacity = 250kVA = 250kW (if power factor 1)

Present project refrence 250kVA x 126 inverters = 31500 kVA = 31500kW = 31.5MW say **30 MW**(Thapyaywa)

Present project refrence 250kVA x91 inverters = 22750 kVA = 22750kW = 22.75MW say **20 MW** (TaungTawGwin

Please note that inverter output AC voltage is **800 V** for solar farm inverters design

Roof top inverters are 230V for single phase and 400V for three phase

Box-Typed Transformer Foundation work



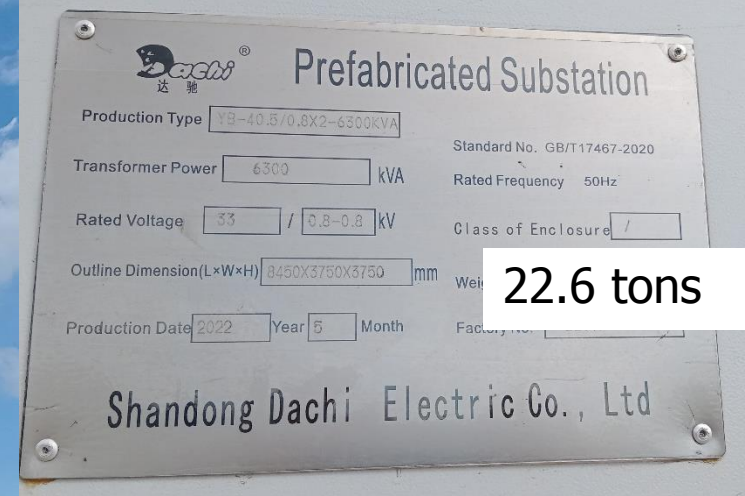
Note that Need to check Pipe sleeves position (Civil foundation drawing and Electrical drawing)

Box – Type Transformer Placing and Installation



Prefabrication of suitable lifting attachment to avoid unnecessary damages.

Box – Type Transformer unloading from transporter



Box - type Transformer Feature

225kW(250kVA)
3Phase Inverter x 13nos for
primary winding 1
800V

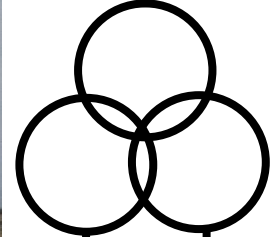
800V cubical

225kW(250kVA)
3Phase Inverter x 12nos for
primary winding 2
800V

33kV cubical

Double Split
Type - S11 – 6300kVA
33kV(33+/- 8 x 1.25%)/0.8/0.8kV

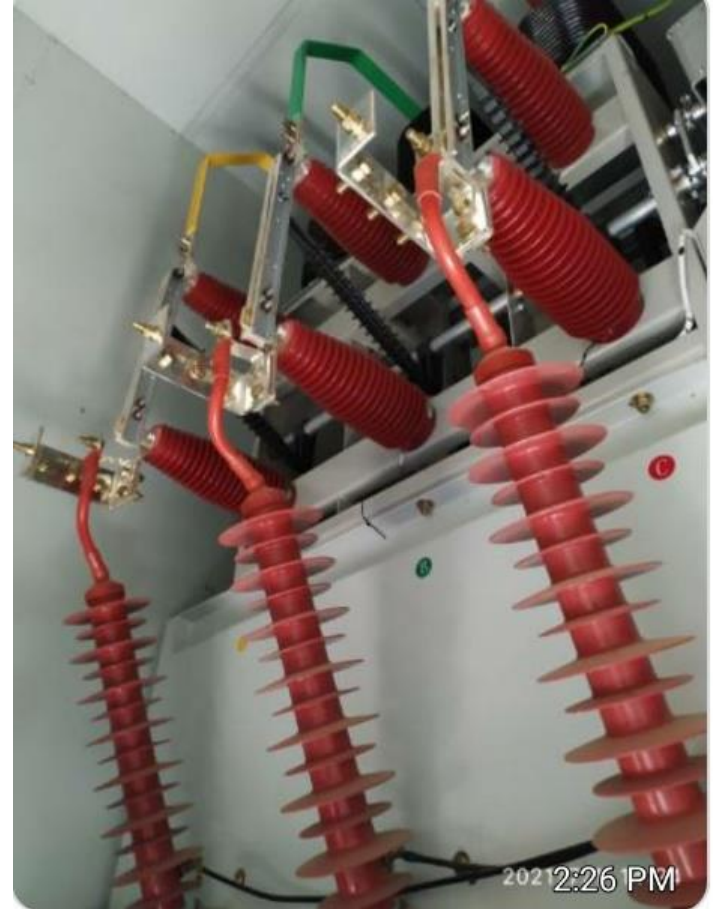
33kV
6250kVA



250x12=3000kVA
800V

250x13=3250kVA
800V

19. Cables & wires testing and Terminations



To Be continue