Team Meeting

Type of meeting:	Meeting with Client
Note taker:	Ahmed Sobi

Attendees: Whole team present

Please read:

Please bring: Laptop

Minutes

Agenda item:	Safety Moment	**Presenter:**	Chufu

Discussion:

This week safety moment was about Earthquake and how to take precaution. Planning for such phenomena is very important therefore, you and your family need to be prepared. Knowing the sketch of your home and the evacuation details, emergency needed materials, and placing necessary items at an easy access could save your life.

Agenda item:	Array Wiring Diagram and Conductor Sizing and type	**Presenter:**	Katayi

Discussion:

Katayi discussed the array wiring diagram based on the below AutoCAD drawing, showing the wiring and how every CB is connected with one underground conductor that takes the current to inverter. The diagram also shows the wiring of each rack to the combiner boxes. However the below tables and values are under revision as it was pointed out on the meeting the table was used for the conductor sizing was wrong. Students should have picked the size based on the current and safety factor not the voltage.

string (harness), rack to CB, and CB to inverter conductor sizing and current.

| Conductors	Isc(A)	IMP(A)	Type	Material	AWG
String (Harness)	9.44	14.75	free air	Copper	14
Rack to CB (Jumper)	18.88	29.5	free air	Copper	12
CB to Inverter	75.52	236	Underground	Copper	6

Average of worst-case DCB voltage drop:	2.52%

The following table was used to pick the sizes

Table 310.106(A) Minimum Size of Conductors

Conductor Voltage Rating (Volts)	Minimum Conductor Size (AWG)	
	Copper	Aluminum or Copper-Clad Aluminum
0–2000	14	12
2001–5000	8	8
5001–8000	6	6
8001–15,000	2	2
15,001–28,000	1	1
28,001–35,000	1/0	1/0

Array wiring diagram
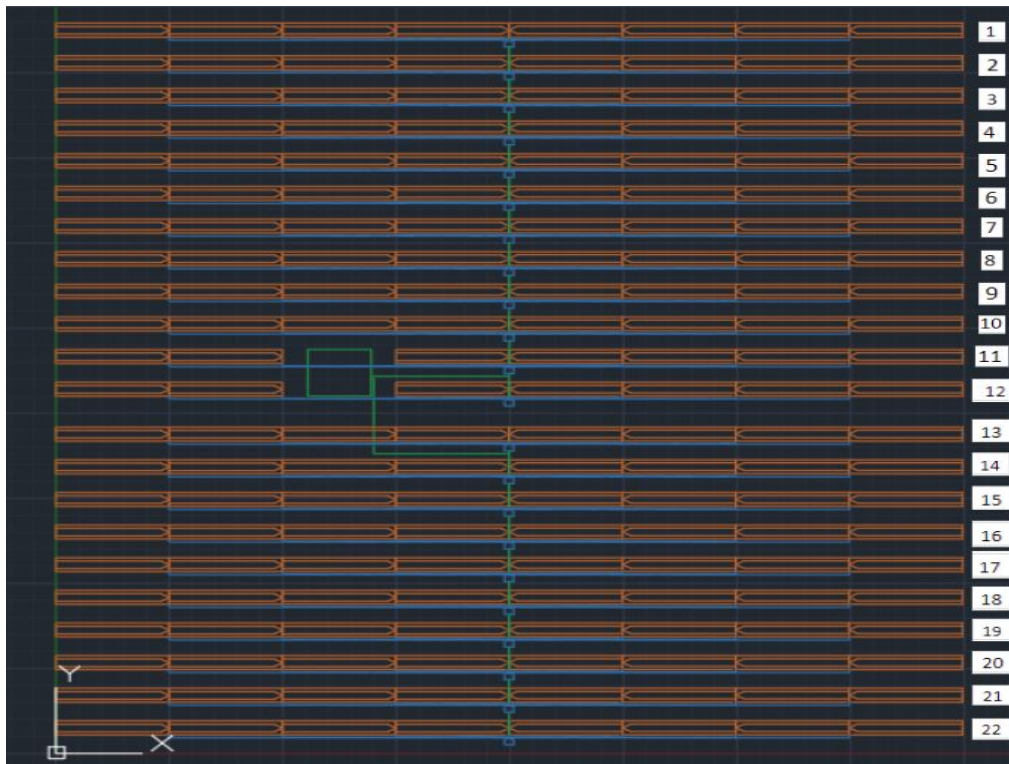
▬	Wire Harness
▬	Jumper
▬	Feeder wire

Action items	Person responsible	Deadline
✓ Final Array Wiring	Kat and Nur	10/29
✓ Final Conductor Sizing	Kat and Nur	10/29

Agenda item: Voltage Drop Calculations **Presenter:** Katayi

Discussion:

This week draft of the voltage drop calculation was continuation of last week draft as we were trying to gain more understanding and get the right calculation. However as was discussed in the meeting the below calculation will be improved next week based on picking the optimal conductor sizing. Next week the students will change the length and voltage drop calculation of the cables because there are 2 inputs going to one CB instead of 8 inputs

	Disconnect Combiner Box NUMBER	INPUT DC FUSE SIZE	NUMBER OF STRINGS	NUMBER OF INPUTS	SHORT CIRCUIT CURRENT (ISC)	MAX POWER CURRENT (IMP)	MAX POWER VOLTAGE (VMP)	DC FEEDER WIRE SIZE AND TYPE	ONE WAY DISTANCE NOT TO EXCEED (FT)
	DCB#-##	AMP			AMP	AMP	VOLT		
					18.8	29.50	972		
INVERTER 1	DCB1-01	240	16	8	150	236	7776	(<1>) - <6 AWG Copper Underground>	
	DCB1-02	240	16	8	150	236	7776	(<1>) - <6 AWG Copper Underground>	
	DCB1-03	240	16	8	150	236	7776	(<1>) - <6 AWG Copper Underground>	
	DCB1-04	240	16	8	150	236	7776	(<1>) - <6 AWG Copper Underground>	
	DCB1-05	240	16	8	150	236	7776	(<1>) - <6 AWG Copper Underground>	
	DCB1-06	240	16	8	150	236	7776	(<1>) - <6 AWG Copper Underground>	
	DCB1-07	240	16	8	150	236	7776	(<1>) - <6 AWG Copper Underground>	
	DCB1-08	240	16	8	150	236	7776	(<1>) - <6 AWG Copper Underground>	
	DCB1-09	240	16	8	150	236	7776	(<1>) - <6 AWG Copper Underground>	
	DCB1-10	240	16	8	150	236	7776	(<1>) - <6 AWG Copper Underground>	
	DCB1-11	210	14	7	131	207	6804	(<1>) - <6 AWG Copper Underground>	
	DCB1-12	210	14	7	131	207	6804	(<1>) - <6 AWG Copper Underground>	
	DCB1-13	240	16	8	150	236	7776	(<1>) - <6 AWG Copper Underground>	
	DCB1-14	240	16	8	150	236	7776	(<1>) - <6 AWG Copper Underground>	
	DCB1-15	240	16	8	150	236	7776	(<1>) - <6 AWG Copper Underground>	
	DCB1-16	240	16	8	150	236	7776	(<1>) - <6 AWG Copper Underground>	
	DCB1-17	240	16	8	150	236	7776	(<1>) - <6 AWG Copper Underground>	
	DCB1-18	240	16	8	150	236	7776	(<1>) - <6 AWG Copper Underground>	
	DCB1-19	240	16	8	150	236	7776	(<1>) - <6 AWG Copper Underground>	
	DCB1-20	240	16	8	150	236	7776	(<1>) - <6 AWG Copper Underground>	
	DCB1-21	240	16	8	150	236	7776	(<1>) - <6 AWG Copper Underground>	
	DCB1-22	240	16	8	150	236	7776	(<1>) - <6 AWG Copper Underground>	
	INVERTER 1 TOTALS		348	174	3265	5133	7776		

INVERTER DC FUSE IDENTIFICATION

DCB Information

8 Input Disconnect Combiner Box (CBs 1 - 10 & 13 - 22)

Circuit	from	to	power (W)	Voltage (Vmp)	Current (Imp)	DCB Fuse (A)	Cable Size (AWG)	Cable Length (Ft)
1	ER - 1	DCB	28,674	972	29.5	30	12	193.75
2	ER - 2	DCB	28,674	972	29.5	30	12	131.35
3	ER - 3	DCB	28,674	972	29.5	30	12	68.95
4	ER - 4	DCB	28,674	972	29.5	30	12	6.55
5	ER - 5	DCB	28,674	972	29.5	30	12	6.55
6	ER - 6	DCB	28,674	972	29.5	30	12	68.95
7	ER - 7	DCB	28,674	972	29.5	30	12	131.35
8	ER - 8	DCB	28,674	972	29.5	30	12	193.75
Total:			229,392		236			

7 Input Disconnect Combiner Box (CB 11)

Circuit	from	to	power (W)	Voltage (Vmp)	Current (Imp)	DCB Fuse (A)	Cable Size (AWG)	Cable Length (Ft)
1	ER - 1	DCB	28,674	972	29.5	30	12	198.842
2	ER - 2	DCB	28,674	972	29.5	30	12	136.442
3	ER - 3	DCB	28,674	972	29.5	30	12	6.55
4	ER - 4	DCB	28,674	972	29.5	30	12	6.55
5	ER - 5	DCB	28,674	972	29.5	30	12	68.95
6	ER - 6	DCB	28,674	972	29.5	30	12	131.35
7	ER - 7	DCB	28,674	972	29.5	30	12	193.75
Total:			200,718		206.5			

7 Input Disconnect Combiner Box (CB 12)

Circuit	from	to	power (W)	Voltage (Vmp)	Current (Imp)	DCB Fuse (A)	Cable Size (AWG)	Cable Length (Ft)
1	ER - 1	DCB	28,674	972	29.5	30	12	203.934
2	ER - 2	DCB	28,674	972	29.5	30	12	141.534
3	ER - 3	DCB	28,674	972	29.5	30	12	6.55
4	ER - 4	DCB	28,674	972	29.5	30	12	6.55
5	ER - 5	DCB	28,674	972	29.5	30	12	131.35
6	ER - 6	DCB	28,674	972	29.5	30	12	131.35
7	ER - 7	DCB	28,674	972	29.5	30	12	193.75
Total:			200,718		206.5			

Voltage drop calculation from racks to CB

DCB	Strings per Harness	IMP for circuit	Rack Harness Length	Rack Harness wire size	Rack Harness resistance	Rack Harness resistance	Voltage Drop of Harness	Jumper Length	Jumper wire size	Jumper resistance	Jumper resistance	Voltage Drop of Jumper	DCB Whip length	DCB Whip wire size	DCB Whip resistance	DCB Whip resistance	Voltage Drop of DCB Whip	Total resistance	Total voltage drop	Voltage drop for branch
DCB#-##	per rack	Amp	feet	AWG	Ohm/kft	Ohm	Volts	feet	AWG	Ohm/kft	Ohm	Volts	feet	AWG	Ohm/kft	Ohm	Volts	Ohm	Volts	percent
DCB1-01	2	29.5	62.4	14	3.1900	0.398	11.744304	193.75	12	2.0100	0.779	22.9768125	1.23705666	7	0.4982	0.001	0.036	1.177	34.757	3.58%
DCB1-02	2	29.5	62.4	14	3.1900	0.398	11.744304	131.35	12	2.0100	0.528	15.5767965	1.23705666	7	0.4982	0.001	0.036	0.926	27.357	2.81%
DCB1-03	2	29.5	62.4	14	3.1900	0.398	11.744304	68.95	12	2.0100	0.277	8.1767805	1.23705666	7	0.4982	0.001	0.036	0.675	19.957	2.05%
DCB1-04	2	29.5	62.4	14	3.1900	0.398	11.744304	6.55	12	2.0100	0.026	0.7767645	1.23705666	7	0.4982	0.001	0.036	0.424	12.557	1.29%
DCB1-05	2	29.5	62.4	14	3.1900	0.398	11.744304	6.55	12	2.0100	0.026	0.7767645	1.23705666	7	0.4982	0.001	0.036	0.424	12.557	1.29%
DCB1-06	2	29.5	62.4	14	3.1900	0.398	11.744304	68.95	12	2.0100	0.277	8.1767805	1.23705666	7	0.4982	0.001	0.036	0.675	19.957	2.05%
DCB1-07	2	29.5	62.4	14	3.1900	0.398	11.744304	131.35	12	2.0100	0.528	15.5767965	1.23705666	7	0.4982	0.001	0.036	0.926	27.357	2.81%
DCB1-08	2	29.5	62.4	14	3.1900	0.398	11.744304	193.75	12	2.0100	0.779	22.9768125	1.23705666	7	0.4982	0.001	0.036	1.177	34.757	3.58%
DCB11-01	2	29.5	62.4	14	3.1900	0.398	11.744304	198.842	12	2.0100	0.799	23.58067278	1.23705666	7	0.4982	0.001	0.036	1.197	35.361	3.64%
DCB11-02	2	29.5	62.4	14	3.1900	0.398	11.744304	136.442	12	2.0100	0.548	16.18065678	1.23705666	7	0.4982	0.001	0.036	0.946	27.961	2.88%
DCB11-00																				
DCB11-03	2	29.5	62.4	14	3.1900	0.398	11.744304	6.55	12	2.0100	0.026	0.7767645	1.23705666	7	0.4982	0.001	0.036	0.424	12.557	1.29%
DCB11-04	2	29.5	62.4	14	3.1900	0.398	11.744304	6.55	12	2.0100	0.026	0.7767645	1.23705666	7	0.4982	0.001	0.036	0.424	12.557	1.29%
DCB11-05	2	29.5	62.4	14	3.1900	0.398	11.744304	68.95	12	2.0100	0.277	8.1767805	1.23705666	7	0.4982	0.001	0.036	0.675	19.957	2.05%
DCB11-06	2	29.5	62.4	14	3.1900	0.398	11.744304	131.35	12	2.0100	0.528	15.5767965	1.23705666	7	0.4982	0.001	0.036	0.926	27.357	2.81%
DCB11-07	2	29.5	62.4	14	3.1900	0.398	11.744304	193.75	12	2.0100	0.779	22.9768125	1.23705666	7	0.4982	0.001	0.036	1.177	34.757	3.58%
DCB12-01	2	29.5	62.4	14	3.1900	0.398	11.744304	203.934	12	2.0100	0.82	24.18453306	1.23705666	7	0.4982	0.001	0.036	1.218	35.965	3.70%
DCB12-02	2	29.5	62.4	14	3.1900	0.398	11.744304	141.534	12	2.0100	0.569	16.78451706	1.23705666	7	0.4982	0.001	0.036	0.967	28.565	2.94%
DCB12-00																				
DCB12-03	2	29.5	62.4	14	3.1900	0.398	11.744304	6.55	12	2.0100	0.026	0.7767645	1.23705666	7	0.4982	0.001	0.036	0.424	12.557	1.29%
DCB12-04	2	29.5	62.4	14	3.1900	0.398	11.744304	6.55	12	2.0100	0.026	0.7767645	1.23705666	7	0.4982	0.001	0.036	0.424	12.557	1.29%
DCB12-05	2	29.5	62.4	14	3.1900	0.398	11.744304	131.35	12	2.0100	0.528	15.5767965	1.23705666	7	0.4982	0.001	0.036	0.926	27.357	2.81%
DCB12-06	2	29.5	62.4	14	3.1900	0.398	11.744304	193.75	12	2.0100	0.779	22.9768125	1.23705666	7	0.4982	0.001	0.036	1.177	34.757	3.58%
DCB12-07	2	29.5	62.4	14	3.1900	0.398	11.744304	131.35	12	2.0100	0.528	15.5767965	1.23705666	7	0.4982	0.001	0.036	0.926	27.357	2.81%

Action items	Person responsible	Deadline
✓ Finalize Voltage Drop Calculation	Kat and Nur	10/29

Agenda item: Collector & Feeder AutoCAD and Calculations   **Presenter:**   Chufu & YJ

Discussion:

Students continued last week approach in order to gain more understanding of collector system and feeder. This week we took a crack at the calculation to figure out the transformer rating, inverter rating, and the current coming out of each collector. After the meeting the student understood that they were using the wrong transformer rating which is AUX XFMR, instead we will be using the step-up XFMR parameters to get the output current. Overall we have 3 feeders attached to 34.5 KV bus. And each feeder will have 4 collector attached to it. And each collector will join and collect 3 inverter skid output. Input to 34.5 kV bus.

Single Inverter skid drawing
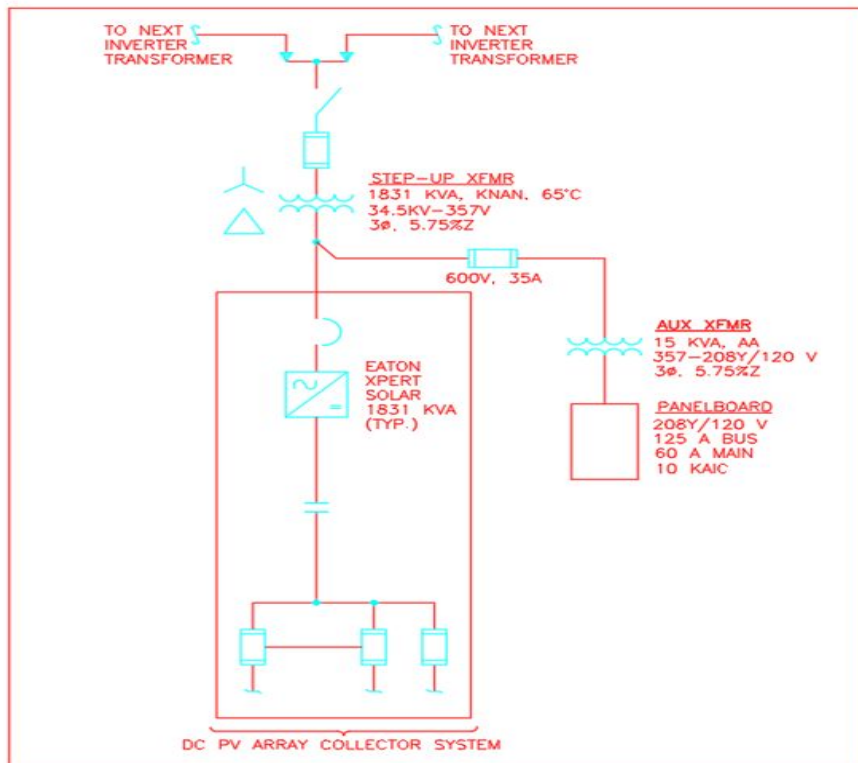
1831 KVA INVERTER TRANSFORMER DETAIL

Collectrer arrangement will be modified to have 3 instead of 4 inverter skids

UG CABLE
3-1/C 4/0, AL, MV-105, 35 KV,
FULL CONCENTRIC NEUTRAL
DIRECT BURIAL

XXXKV MCOV
ELBOW
SURGE
ARRESTER

SEE XXXX
FOR CONTINUATION

INV SKID 1
(1831 KVA)

INV SKID 2
(1831 KVA)

INV SKID 3
(1831 KVA)

INV SKID 4
(1831 KVA)

COLLECTOR ARRANGEMENT
4 XFMR (TYP)
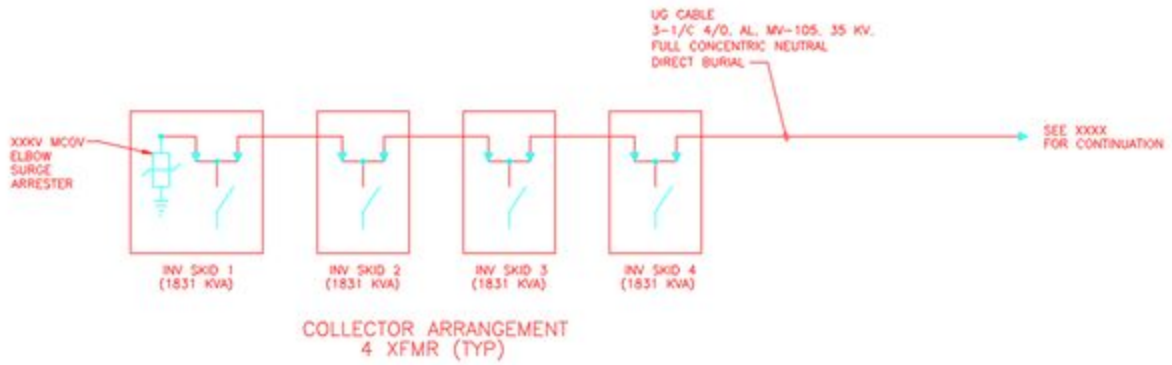
Feeder AutoCAD pdf version

TRANSMISSION LINE
1/C PER PHASE
556.5 KCMIL ACSR

FCI NOTE 1

123A
NOTE 3

TO COLLECTOR
ARRANGEMENT
(4 XFMR STRING)
(SK-4B)

22kV MCOV
SURGE
ARRESTOR

Conclusions:

The team will finalize the Voltage Drop Calculations, Conductor Sizing, Feeder, and collector.

Action items   **Person responsibleDeadline**

✓   n/a

Action Item List						
Item	**Description**	**Date Added**	**To Be Completed By**	**Date Closed**	**Scheduled Completion Date**	**Notes**
Voltage Drop Calculations and conductor sizing	Voltage Drop Calculations and conductor sizing modification	10/22	10/29			Nur and Katayi
Feeder	Conductor sizing and AutoCAD drawing.	10/22	10/29			Tam and YJ
Collector calculations	Figuring out the parameters for collector	10/22	10/29			Ahmed and Chufu

Other Information

Resources:

http://forums.mikeholt.com/showthread.php?t=93297
https://www.southwire.com/ProductCatalog/proddetail.jsp?htmlpreview=true&token=16&desc=ACSR
http://www.prioritywire.com/specs/ACSR.pdf

Special notes: None