



DLR Group

Architecture

Engineering

Planning

Interiors

**KCP&L Greenwood Central Solar Station
Voltage Drop Calculations
Greenwood, Missouri**

Missouri Certificate of Authority #001614 Engineering

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Project:

Location:

By:

Date:

13-16101-00 KCP&L Greenwood Central Solar Station

Greenwood, MO

Eric Loos

12/11/2015

AC VOLTAGE DROP CALCULATIONS

DLR Group

Feeder Data		Conduit Type	Length (ft)	Type	Size (AWG/Kcmil)	# Parallel Runs	System Voltage	Phases	Voltage type	Freq.	PF	I (Amps)*	Voltage Drop	%VD
From	To													
Medium Voltage Feeders														
INTERCONN	MSGR	Non-Metallic	60	Al	1000	1	12470	3 ph.	VLL	60Hz	1.00	256.96	0.614	0.005%
MSGR	XFMR-01	Non-Metallic	225	Al	1000	1	12470	3 ph.	VLL	60Hz	1.00	256.96	2.303	0.018%
XFMR-01	XFMR-02	Non-Metallic	275	Al	1000	1	12470	3 ph.	VLL	60Hz	1.00	256.96	2.815	0.023%
XFMR-02	SECTIONALIZER	Non-Metallic	275	Al	1000	1	12470	3 ph.	VLL	60Hz	1.00	256.96	2.815	0.023%
SECTIONALIZER	MSGR	Non-Metallic	225	Al	1000	1	12470	3 ph.	VLL	60Hz	1.00	256.96	2.303	0.018%
XMFR-02	MSGR	Non-Metallic	500	Al	1000	1	12470	3 ph.	VLL	60Hz	1.00	256.96	5.118	0.041%
120V Branch Circuits														
Pnl L1	Pole 1 Ltg	Non-Metallic	300	Cu	10	1	120	1 ph.	VLL	60Hz	1.00	2.8	2.016	1.680%
Pnl L1	Pole 3 Ltg	Non-Metallic	700	Cu	6	1	120	1 ph.	VLL	60Hz	1.00	2.8	1.921	1.601%
Pnl L1	Pole 3 Sec Cam	Non-Metallic	700	Cu	6	1	120	1 ph.	VLL	60Hz	1.00	4.2	2.881	2.401%
Pnl L1	Pole 2 Ltg	Non-Metallic	1000	Cu	4	1	120	1 ph.	VLL	60Hz	1.00	2.8	1.736	1.447%
Pnl L1	Gate operator	Non-Metallic	60	Cu	10	1	120	1 ph.	VLL	60Hz	1.00	12	1.728	1.440%
Pnl L1	SCADA	Non-Metallic	20	Cu	12	1	120	1 ph.	VLL	60Hz	1.00	10	0.800	0.667%
Pnl L1	Sec Encl 2	Non-Metallic	20	Cu	12	1	120	1 ph.	VLL	60Hz	1.00	5	0.400	0.333%
Misc Feeders														
Pnl G1	Pnl L1	Non-Metallic	300	Cu	8	1	480	3 ph.	VLL	60Hz	0.95	18	7.080	1.475%

*Current used for MV feeders worst case @ full 5MW plant

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DC VOLTAGE DROP CALCULATIONS											
											
Feeder Data		Type	Size (AWG/Kcmil)	Wire Type	Length (ft)	# Parallel Runs	System Voltage *	Temperature (°C)	I (Amps)	Voltage Drop	%VD
From	To										
PV Module Worst Case											
Module	Comb	Cu	10	Stranded	240	1	595	75	8.38	5.189	0.872%
INV-01 Combiner Boxes											
CB1-1	INV-1	Al	500	Stranded	375	1	595	75	142	4.503	0.757%
CB2-1	INV-1	Al	250	Stranded	350	2	595	75	168.2	4.985	0.838%
CB3-1	INV-1	Al	250	Stranded	325	2	595	75	177.0	4.872	0.819%
CB4-1	INV-1	Al	250	Stranded	300	2	595	75	185.9	4.722	0.794%
CB5-1	INV-1	Al	250	Stranded	275	2	595	75	194.7	4.535	0.762%
CB6-1	INV-1	Al	250	Stranded	250	2	595	75	212.4	4.498	0.756%
CB7-1	INV-1	Al	500	Stranded	260	1	595	75	150.5	3.317	0.557%
CB7-2	INV-1	Al	500	Stranded	515	1	595	75	141.6	6.184	1.039%
CB8-1	INV-1	Al	500	Stranded	290	1	595	75	159.3	3.918	0.658%
CB8-2	INV-1	Al	500	Stranded	545	1	595	75	150.5	6.953	1.169%
CB9-1	INV-1	Al	500	Stranded	320	1	595	75	159.3	4.323	0.727%
CB9-2	INV-1	Al	500	Stranded	575	1	595	75	150.5	7.336	1.233%
CB10-1	INV-1	Al	500	Stranded	350	1	595	75	159.3	4.728	0.795%
CB10-2	INV-1	Al	500	Stranded	605	1	595	75	150.5	7.719	1.297%
CB11-1	INV-1	Al	500	Stranded	380	1	595	75	159.3	5.133	0.863%
CB11-2	INV-1	Al	500	Stranded	635	1	595	75	150.5	8.101	1.362%
CB12-1	INV-1	Al	500	Stranded	410	1	595	75	159.3	5.539	0.931%
CB12-2	INV-1	Al	500	Stranded	665	1	595	75	150.5	8.484	1.426%
CB13-1	INV-1	Al	500	Stranded	440	1	595	75	159.3	5.944	0.999%
CB13-2	INV-1	Al	500	Stranded	695	1	595	75	150.5	8.867	1.490%
INV-02 Combiner Boxes											
CB14-1	INV-2	Al	500	Stranded	280	1	595	75	150.5	3.572	0.600%
CB14-2	INV-2	Al	500	Stranded	590	1	595	75	150.5	7.527	1.265%
CB15-1	INV-2	Al	500	Stranded	250	1	595	75	141.6	3.002	0.505%
CB15-2	INV-2	Al	500	Stranded	510	1	595	75	132.8	5.741	0.965%
CB16-1	INV-2	Al	500	Stranded	280	1	595	75	141.6	3.362	0.565%
CB16-2	INV-2	Al	500	Stranded	560	1	595	75	132.8	6.304	1.060%
CB17-1	INV-2	Al	500	Stranded	310	1	595	75	132.8	3.490	0.587%
CB17-2	INV-2	Al	500	Stranded	590	1	595	75	132.8	6.642	1.116%
CB18-1	INV-2	Al	500	Stranded	340	1	595	75	132.8	3.827	0.643%
CB18-2	INV-2	Al	500	Stranded	620	1	595	75	123.9	6.514	1.095%
CB19-1	INV-2	Al	500	Stranded	370	1	595	75	132.8	4.165	0.700%
CB19-2	INV-2	Al	500	Stranded	650	1	595	75	123.9	6.829	1.148%
CB20-1	INV-2	Al	500	Stranded	400	1	595	75	132.8	4.503	0.757%
CB20-2	INV-2	Al	500	Stranded	680	1	595	75	123.9	7.145	1.201%
CB21-1	INV-2	Al	500	Stranded	430	1	595	75	132.8	4.841	0.814%
CB21-2	INV-2	Al	500	Stranded	710	1	595	75	123.9	7.460	1.254%

* Voltage used is worst case @ high temperature per string voltage calculation