

APENDICE G. CALCULOS DE REGULACIÓN Y PÉRDIDAS PARA INVERSORES



DISEÑO DE UN SISTEMA FOTOVOLTAICO PARA LA LADRILLERA ARCILLAS SANTA ROSA COMPARANDO EL IMPACTO TÉCNICO Y ECONÓMICO DEL USO DE INVERSORES CONTRA EL USO DE MICROINVERSORES



CÁLCULO DE REGULACIÓN (CORRIENTE ALTERNA - AC)

TRAMO	LONGITUD (MTS)	KVA DISEÑO	KVA (15 AÑOS)	MOMENTO KVA (m)	CONDUCTOR AWG CU THHN 75°C	TIPO DE RED	FC DE RED	KG COND	K CONDUCTOR (TENSIÓN DISEÑO [V])	R COND [Ω/km]	REGULACION PARCIAL	REGULACION ACOMULADA	PERDIDA DE POTENCIA PARCIAL (%), a F.P.=	PERDIDA DE POTENCIA TOTAL (%)	
T.D.Exist. - TOTALIZADOR	10	300,000	348,29	1741,45	2*250 MCM	FFFN	1,00	19,407	440	0,000100243	0,139	0,174568	0,174568	0,125032	0,125032
TOTALIZADOR - Inversor 1	3	100,000	116,10	348,29	2/0	FFFN	1,00	33,275	0,000171875	0,261	0,059862	0,234431	0,046954	0,171987	
TOTALIZADOR - Inversor 2	4	100,000	116,10	464,39	2/0	FFFN	1,00	33,275	0,000171875	0,261	0,079817	0,254385	0,062606	0,187638	
TOTALIZADOR - Inversor 3	15	100,000	116,10	1741,45	2/0	FFFN	1,00	33,275	0,000171875	0,261	0,299312	0,473880	0,234772	0,359804	

CÁLCULO DE REGULACIÓN (CORRIENTE DIRECTA - DC)

TRAMO	LONGITUD (MTS)	POTENCIA DE DISEÑO [W]	CORRIENTE DE DISEÑO [A]	CORRIENTE (15 AÑOS) [A]	CONDUCTOR AWG CU XLPE SR [AWG]	SECCIÓN CALIBRE [mm2]	p - RESISTIVIDAD DEL CU	PROTECCIÓN	VOLTAJE DEL STRING [Vmax]	R COND [Ω/km]	REGULACION PARCIAL	REGULACION ACOMULADA	PERDIDA DE POTENCIA PARCIAL (%)	PERDIDA DE POTENCIA TOTAL (%)
<b>INVERSOR 1</b>														
<b>MPPT 1</b>														
STRING 1 - BOX COMB	64	6.250	16,15	18,75	#10	6	0,0172	20 A	487	3,350	1,650893	1,650893	1,205955	1,205955
STRING 2 - BOX COMB	76	6.250	16,15	18,75	#10	6	0,0172	20 A	487	3,350	1,960436	1,960436	1,432071	1,432071
BOX COMB - INVERSOR	3	12.500	32,30	37,50	#6	16	0,0172	40 A	487	1,320	0,060984	2,021420	0,044548	1,476620
<b>MPPT 2</b>														
STRING 1 - BOX COMB	62	6.250	16,15	18,75	#10	6	0,0172	20 A	487	3,350	1,599303	1,599303	1,168269	1,168269
STRING 2 - BOX COMB	74	6.250	16,15	18,75	#10	6	0,0172	20 A	487	3,350	1,908845	1,908845	1,394385	1,394385
BOX COMB - INVERSOR	3	12.500	32,30	37,50	#6	16	0,0172	40 A	487	1,320	0,060984	1,969830	0,044548	1,438934
<b>MPPT 3</b>														
STRING 1 - BOX COMB	59	6.250	16,15	18,75	#10	6	0,0172	20 A	487	3,350	1,521917	1,521917	1,111740	1,111740
STRING 2 - BOX COMB	100	5.175	15,90	18,46	#10	6	0,0172	20 A	450	3,350	2,748401	2,748401	2,205819	2,205819
BOX COMB - INVERSOR	3	12.500	32,30	37,50	#6	16	0,0172	40 A	487	1,320	0,060984	2,809385	0,044548	2,250368
<b>MPPT 4</b>														
STRING 1 - BOX COMB	57	6.250	16,15	18,75	#10	6	0,0172	20 A	487	3,350	1,470327	1,470327	1,074053	1,074053
STRING 2 - BOX COMB	69	6.250	16,15	18,75	#10	6	0,0172	20 A	487	3,350	1,779869	1,779869	1,300170	1,300170
BOX COMB - INVERSOR	3	12.500	32,30	37,50	#6	16	0,0172	40 A	487	1,320	0,060984	1,840854	0,044548	1,344718
<b>MPPT 5</b>														
STRING 1 - BOX COMB	54	6.250	16,15	18,75	#10	6	0,0172	20 A	487	3,350	1,392941	1,392941	1,017524	1,017524
STRING 2 - BOX COMB	66	6.250	16,15	18,75	#10	6	0,0172	20 A	487	3,350	1,702483	1,702483	1,243641	1,243641
BOX COMB - INVERSOR	3	12.500	32,30	37,50	#6	16	0,0172	40 A	487	1,320	0,060984	1,763468	0,044548	1,288189
<b>MPPT 6</b>														
STRING 1 - BOX COMB	51	6.250	16,15	18,75	#10	6	0,0172	20 A	487	3,350	1,315555	1,315555	0,960995	0,960995
STRING 2 - BOX COMB	63	6.250	16,15	18,75	#10	6	0,0172	20 A	487	3,350	1,625098	1,625098	1,187112	1,187112
BOX COMB - INVERSOR	3	12.500	32,30	37,50	#6	16	0,0172	40 A	487	1,320	0,060984	1,686082	0,044548	1,231660
<b>MPPT 7</b>														
STRING 1 - BOX COMB	49	6.250	16,15	18,75	#10	6	0,0172	20 A	487	3,350	1,263965	1,263965	0,923309	0,923309
STRING 2 - BOX COMB	61	6.250	16,15	18,75	#10	6	0,0172	20 A	487	3,350	1,573507	1,573507	1,149426	1,149426
BOX COMB - INVERSOR	3	12.500	32,30	37,50	#6	16	0,0172	40 A	487	1,320	0,060984	1,634492	0,044548	1,193974
<b>MPPT 8</b>														
STRING 1 - BOX COMB	51	6.250	16,15	18,75	#10	6	0,0172	20 A	487	3,350	1,315555	1,315555	0,960995	0,960995
STRING 2 - BOX COMB	64	6.250	16,15	18,75	#10	6	0,0172	20 A	487	3,350	1,650893	1,650893	1,205955	1,205955
BOX COMB - INVERSOR	3	12.500	32,30	37,50	#6	16	0,0172	40 A	487	1,320	0,060984	1,711878	0,044548	1,250503
<b>MPPT 9</b>														
STRING 1 - BOX COMB	75	6.250	16,15	18,75	#10	6	0,0172	20 A	487	3,350	1,934640	1,934640	1,413228	1,413228
STRING 2 - BOX COMB	70	6.250	16,15	18,75	#10	6	0,0172	20 A	487	3,350	1,805664	1,805664	1,319013	1,319013
BOX COMB - INVERSOR	3	12.500	32,30	37,50	#6	16	0,0172	40 A	487	1,320	0,060984	1,866649	0,044548	1,363561
<b>MPPT 10</b>														
STRING 1 - BOX COMB	65	6.250	16,15	18,75	#10	6	0,0172	20 A	487	3,350	1,676688	1,676688	1,224798	1,224798
STRING 2 - BOX COMB	63	6.250	16,15	18,75	#10	6	0,0172	20 A	487	3,350	1,625098	1,625098	1,187112	1,187112
BOX COMB - INVERSOR	3	12.500	32,30	37,50	#6	16	0,0172	40 A	487	1,320	0,060984	1,686082	0,044548	1,231660
<b>INVERSOR 2</b>														
<b>MPPT 1</b>														
STRING 1 - BOX COMB	52	6.250	16,15	18,75	#10	6	0,0172	20 A	487	3,350	1,341351	1,341351	0,979838	0,979838
STRING 2 - BOX COMB	64	6.250	16,15	18,75	#10	6	0,0172	20 A	487	3,350	1,650893	1,650893	1,205955	1,205955
BOX COMB - INVERSOR	3	12.500	32,30	37,50	#6	16	0,0172	40 A	487	1,320	0,060984	1,711878	0,044548	1,250503
<b>MPPT 2</b>														
STRING 1 - BOX COMB	50	6.250	16,15	18,75	#10	6	0,0172	20 A	487	3,350	1,289760	1,289760	0,942152	0,942152
STRING 2 - BOX COMB	62	6.250	16,15	18,75	#10	6	0,0172	20 A	487	3,350	1,599303	1,599303	1,168269	1,168269
BOX COMB - INVERSOR	3	12.500	32,30	37,50	#6	16	0,0172	40 A	487	1,320	0,060984	1,660287	0,044548	1,212817
<b>MPPT 3</b>														
STRING 1 - BOX COMB	51	6.250	16,15	18,75	#10	6	0,0172	20 A	487	3,350	1,315555	1,315555	0,960995	0,960995
STRING 2 - BOX COMB	63	6.250	16,15	18,75	#10	6	0,0172	20 A	487	3,350	1,625098	1,625098	1,187112	1,187112
BOX COMB - INVERSOR	3	12.500	32,30	37,50	#6	16	0,0172	40 A	487	1,320	0,060984	1,686082	0,044548	1,231660
<b>MPPT 4</b>														

STRING 1 - BOX COMB	53	6.250	16,15	18,75	#10	6	0,0172	20 A	487	3,350	1,367146	<b>1,367146</b>	0,998681	<b>0,998681</b>
STRING 2 - BOX COMB	65	6.250	16,15	18,75	#10	6	0,0172	20 A	487	3,350	1,676688	<b>1,676688</b>	1,224798	<b>1,224798</b>
BOX COMB - INVERSOR	3	12.500	32,30	37,50	#6	16	0,0172	40 A	487	1,320	0,060984	<b>1,737673</b>	0,044548	<b>1,269346</b>
MPPT 5														
STRING 1 - BOX COMB	56	6.250	16,15	18,75	#10	6	0,0172	20 A	487	3,350	1,444531	<b>1,444531</b>	1,055210	<b>1,055210</b>
STRING 2 - BOX COMB	68	6.250	16,15	18,75	#10	6	0,0172	20 A	487	3,350	1,754074	<b>1,754074</b>	1,281327	<b>1,281327</b>
BOX COMB - INVERSOR	3	12.500	32,30	37,50	#6	16	0,0172	40 A	487	1,320	0,060984	<b>1,815058</b>	0,044548	<b>1,325875</b>
MPPT 6														
STRING 1 - BOX COMB	58	6.250	16,15	18,75	#10	6	0,0172	20 A	487	3,350	1,496122	<b>1,496122</b>	1,092897	<b>1,092897</b>
STRING 2 - BOX COMB	70	6.250	16,15	18,75	#10	6	0,0172	20 A	487	3,350	1,805664	<b>1,805664</b>	1,319013	<b>1,319013</b>
BOX COMB - INVERSOR	3	12.500	32,30	37,50	#6	16	0,0172	40 A	487	1,320	0,060984	<b>1,866649</b>	0,044548	<b>1,363561</b>
MPPT 7														
STRING 1 - BOX COMB	61	6.250	16,15	18,75	#10	6	0,0172	20 A	487	3,350	1,573507	<b>1,573507</b>	1,149426	<b>1,149426</b>
STRING 2 - BOX COMB	73	6.250	16,15	18,75	#10	6	0,0172	20 A	487	3,350	1,883050	<b>1,883050</b>	1,375542	<b>1,375542</b>
BOX COMB - INVERSOR	3	12.500	32,30	37,50	#6	16	0,0172	40 A	487	1,320	0,060984	<b>1,944034</b>	0,044548	<b>1,420091</b>
MPPT 8														
STRING 1 - BOX COMB	63	6.250	16,15	18,75	#10	6	0,0172	20 A	487	3,350	1,625098	<b>1,625098</b>	1,187112	<b>1,187112</b>
STRING 2 - BOX COMB	75	6.250	16,15	18,75	#10	6	0,0172	20 A	487	3,350	1,934640	<b>1,934640</b>	1,413228	<b>1,413228</b>
BOX COMB - INVERSOR	3	12.500	32,30	37,50	#6	16	0,0172	40 A	487	1,320	0,060984	<b>1,995625</b>	0,044548	<b>1,457777</b>
MPPT 9														
STRING 1 - BOX COMB	63	6.250	16,15	18,75	#10	6	0,0172	20 A	487	3,350	1,625098	<b>1,625098</b>	1,187112	<b>1,187112</b>
STRING 2 - BOX COMB	65	6.250	16,15	18,75	#10	6	0,0172	20 A	487	3,350	1,676688	<b>1,676688</b>	1,224798	<b>1,224798</b>
BOX COMB - INVERSOR	3	12.500	32,30	37,50	#6	16	0,0172	40 A	487	1,320	0,060984	<b>1,737673</b>	0,044548	<b>1,269346</b>
MPPT 10														
STRING 1 - BOX COMB	70	6.250	16,15	18,75	#10	6	0,0172	20 A	487	3,350	1,805664	<b>1,805664</b>	1,319013	<b>1,319013</b>
STRING 2 - BOX COMB	75	6.250	16,15	18,75	#10	6	0,0172	20 A	487	3,350	1,934640	<b>1,934640</b>	1,413228	<b>1,413228</b>
BOX COMB - INVERSOR	3	12.500	32,30	37,50	#6	16	0,0172	40 A	487	1,320	0,060984	<b>1,995625</b>	0,044548	<b>1,457777</b>
INVERSOR 3														
MPPT 1														
STRING 1 - BOX COMB	99	6.250	16,15	18,75	#10	6	0,0172	20 A	487	3,350	2,553725	<b>2,553725</b>	1,865461	<b>1,865461</b>
STRING 2 - BOX COMB	111	6.250	16,15	18,75	#10	6	0,0172	20 A	487	3,350	2,863268	<b>2,863268</b>	2,091578	<b>2,091578</b>
BOX COMB - INVERSOR	3	12.500	32,30	37,50	#6	16	0,0172	40 A	487	1,320	0,060984	<b>2,924252</b>	0,044548	<b>2,136126</b>
MPPT 2														
STRING 1 - BOX COMB	97	6.250	16,15	18,75	#10	6	0,0172	20 A	487	3,350	2,502135	<b>2,502135</b>	1,827775	<b>1,827775</b>
STRING 2 - BOX COMB	109	6.250	16,15	18,75	#10	6	0,0172	20 A	487	3,350	2,811677	<b>2,811677</b>	2,053892	<b>2,053892</b>
BOX COMB - INVERSOR	3	12.500	32,30	37,50	#6	16	0,0172	40 A	487	1,320	0,060984	<b>2,872662</b>	0,044548	<b>2,098440</b>
MPPT 3														
STRING 1 - BOX COMB	94	6.250	16,15	18,75	#10	6	0,0172	20 A	487	3,350	2,424749	<b>2,424749</b>	1,771246	<b>1,771246</b>
STRING 2 - BOX COMB	106	6.250	16,15	18,75	#10	6	0,0172	20 A	487	3,350	2,734292	<b>2,734292</b>	1,997363	<b>1,997363</b>
BOX COMB - INVERSOR	3	12.500	32,30	37,50	#6	16	0,0172	40 A	487	1,320	0,060984	<b>2,795276</b>	0,044548	<b>2,041911</b>
MPPT 4														
STRING 1 - BOX COMB	92	6.250	16,15	18,75	#10	6	0,0172	20 A	487	3,350	2,373159	<b>2,373159</b>	1,733560	<b>1,733560</b>
STRING 2 - BOX COMB	104	6.250	16,15	18,75	#10	6	0,0172	20 A	487	3,350	2,682701	<b>2,682701</b>	1,959677	<b>1,959677</b>
BOX COMB - INVERSOR	3	12.500	32,30	37,50	#6	16	0,0172	40 A	487	1,320	0,060984	<b>2,743686</b>	0,044548	<b>2,004225</b>
MPPT 5														
STRING 1 - BOX COMB	89	6.250	16,15	18,75	#10	6	0,0172	20 A	487	3,350	2,295773	<b>2,295773</b>	1,677031	<b>1,677031</b>
STRING 2 - BOX COMB	101	6.250	16,15	18,75	#10	6	0,0172	20 A	487	3,350	2,605316	<b>2,605316</b>	1,903147	<b>1,903147</b>
BOX COMB - INVERSOR	3	12.500	32,30	37,50	#6	16	0,0172	40 A	487	1,320	0,060984	<b>2,666300</b>	0,044548	<b>1,947696</b>
MPPT 6														
STRING 1 - BOX COMB	87	6.250	16,15	18,75	#10	6	0,0172	20 A	487	3,350	2,244183	<b>2,244183</b>	1,639345	<b>1,639345</b>
STRING 2 - BOX COMB	99	6.250	16,15	18,75	#10	6	0,0172	20 A	487	3,350	2,553725	<b>2,553725</b>	1,865461	<b>1,865461</b>
BOX COMB - INVERSOR	3	12.500	32,30	37,50	#6	16	0,0172	40 A	487	1,320	0,060984	<b>2,614710</b>	0,044548	<b>1,910010</b>
MPPT 7														
STRING 1 - BOX COMB	84	6.250	16,15	18,75	#10	6	0,0172	20 A	487	3,350	2,166797	<b>2,166797</b>	1,582816	<b>1,582816</b>
STRING 2 - BOX COMB	96	6.250	16,15	18,75	#10	6	0,0172	20 A	487	3,350	2,476340	<b>2,476340</b>	1,808932	<b>1,808932</b>
BOX COMB - INVERSOR	3	12.500	32,30	37,50	#6	16	0,0172	40 A	487	1,320	0,060984	<b>2,537324</b>	0,044548	<b>1,853481</b>
MPPT 8														
STRING 1 - BOX COMB	81	6.250	16,15	18,75	#10	6	0,0172	20 A	487	3,350	2,089412	<b>2,089412</b>	1,526287	<b>1,526287</b>
STRING 2 - BOX COMB	93	6.250	16,15	18,75	#10	6	0,0172	20 A	487	3,350	2,398954	<b>2,398954</b>	1,752403	<b>1,752403</b>
BOX COMB - INVERSOR	3	12.500	32,30	37,50	#6	16	0,0172	40 A	487	1,320	0,060984	<b>2,459939</b>	0,044548	<b>1,796951</b>
MPPT 9														
STRING 1 - BOX COMB	110	6.250	16,15	18,75	#10	6	0,0172	20 A	487	3,350	2,837472	<b>2,837472</b>	2,072735	<b>2,072735</b>
STRING 2 - BOX COMB	105	6.250	16,15	18,75	#10	6	0,0172	20 A	487	3,350	2,708496	<b>2,708496</b>	1,978520	<b>1,978520</b>
BOX COMB - INVERSOR	3	12.500	32,30	37,50	#6	16	0,0172	40 A	487	1,320	0,060984	<b>2,769481</b>	0,044548	<b>2,023068</b>
MPPT 10														
STRING 1 - BOX COMB	100	6.250	16,15	18,75	#10	6	0,0172	20 A	487	3,350	2,579520	<b>2,579520</b>	1,884304	<b>1,884304</b>
STRING 2 - BOX COMB	95	6.250	16,15	18,75	#10	6	0,0172	20 A	487	3,350	2,450544	<b>2,450544</b>	1,790089	<b>1,790089</b>
BOX COMB - INVERSOR	3	12.500	32,30	37,50	#6	16	0,0172	40 A	487	1,320	0,060984	<b>2,511529</b>	0,044548	<b>1,834637</b>