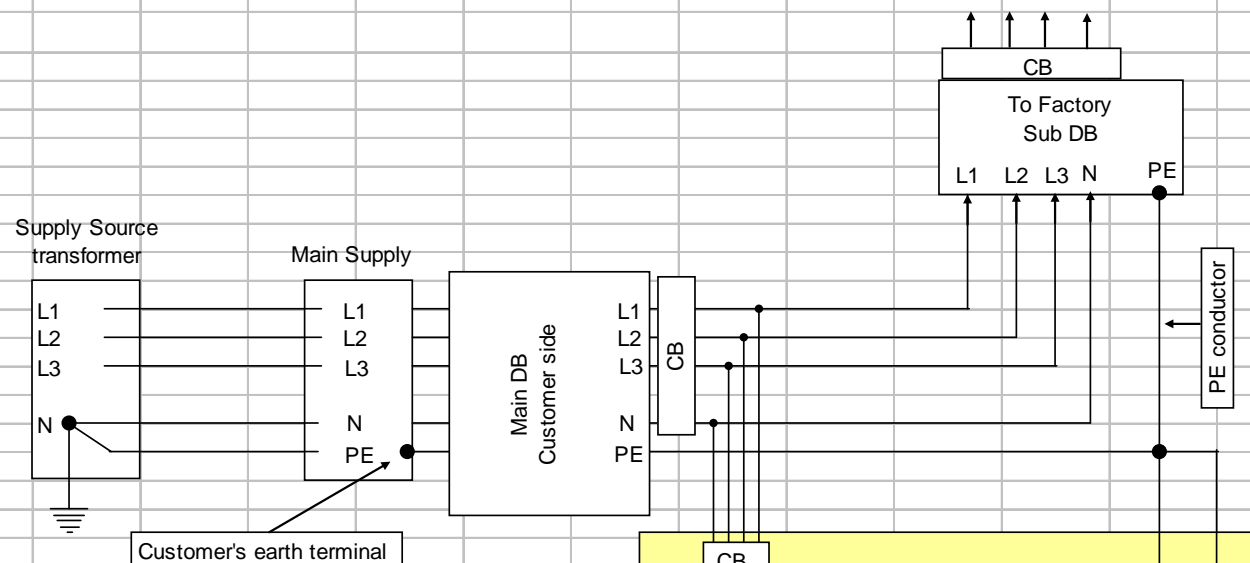




# Rooftop Solar

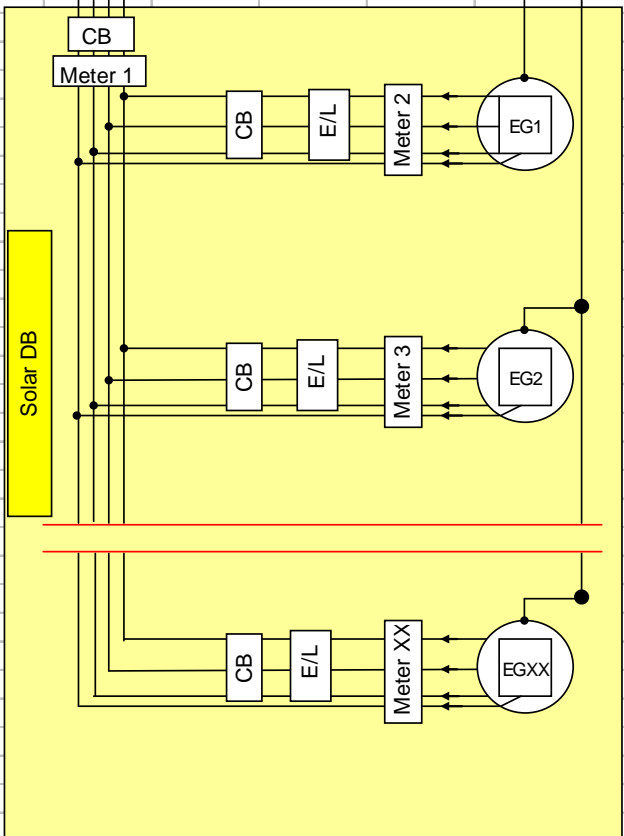
Industrial Installations  
Embedded Generation

# Line Diagram of Solar PV system for Ceres Fruit Growers



**Key:**  
 CB circuit-breaker  
 DB distribution board  
 EG embedded generator  
 E/L earth leakage

**Note 1 :** Meters 2 to XX are integrated in the Inverters



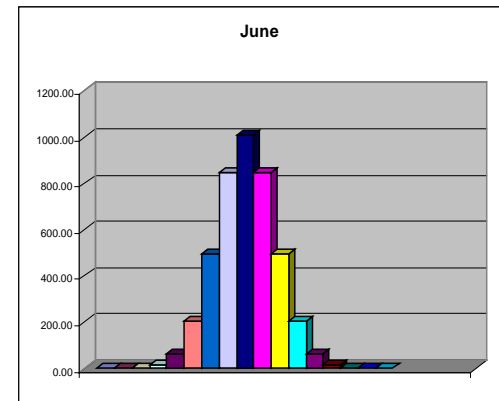
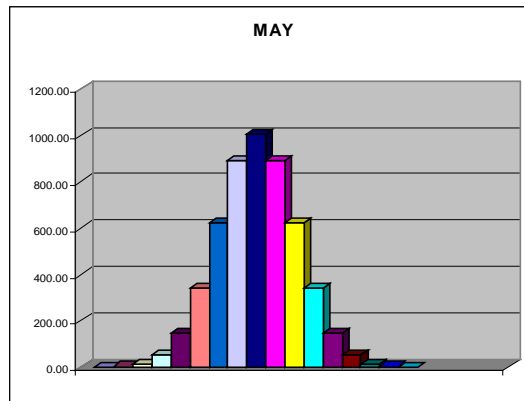
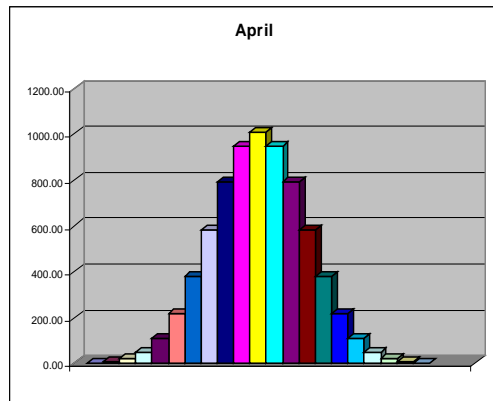
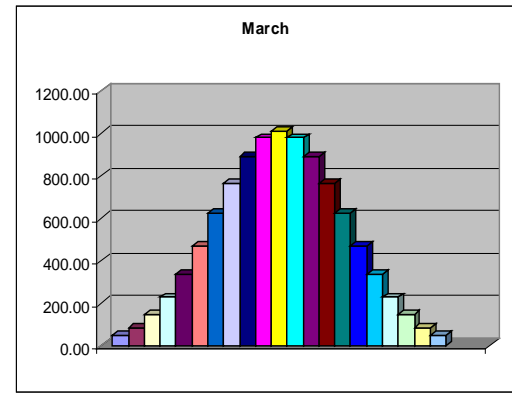
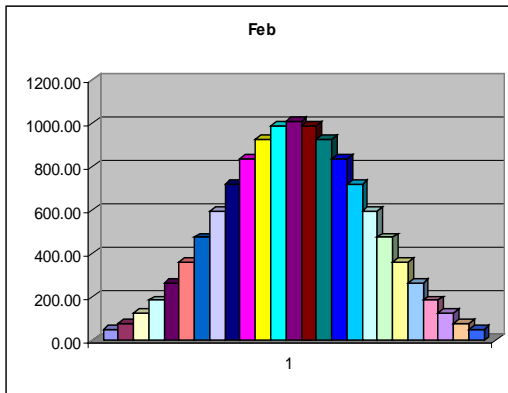
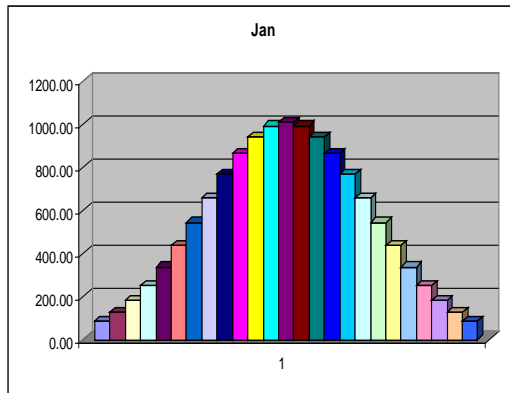






# Statistics

- 1700 kWh per year for every 1kW of solar.
  - Eg 1MW solar plant = 1700MWh per year.



Based on 1-hour Data Sheet

Based on 24h 7 days per week

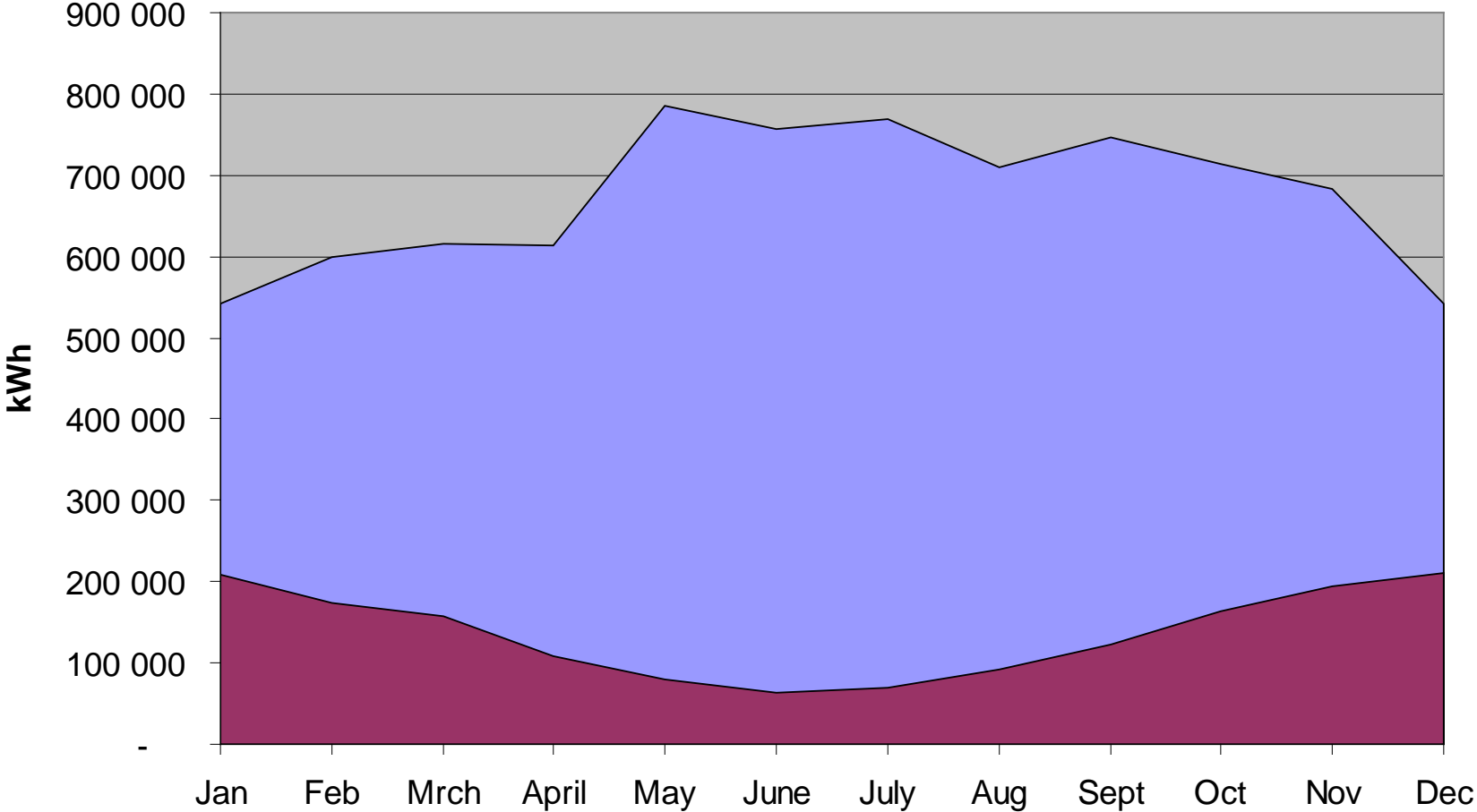
### Environmental Impacts

Item	/Kwh	Kwh's	Total / Year
Liters Water Saved	1.37	1 649 088	2 259 251
Kg. Coal Savings	0.54	1 649 088	890 508
Ash Reduced / Gram	155	1 649 088	255 608 640
SO <sub>2</sub> in Grams	7.93	1 649 088	13 077 268
NO <sub>x</sub> in Grams	4.19	1 649 088	6 909 679
CO <sub>2</sub> in Kg.	0.99	1 649 088	1 632 597

Source: Factors- Eskom Annual Report 2012.

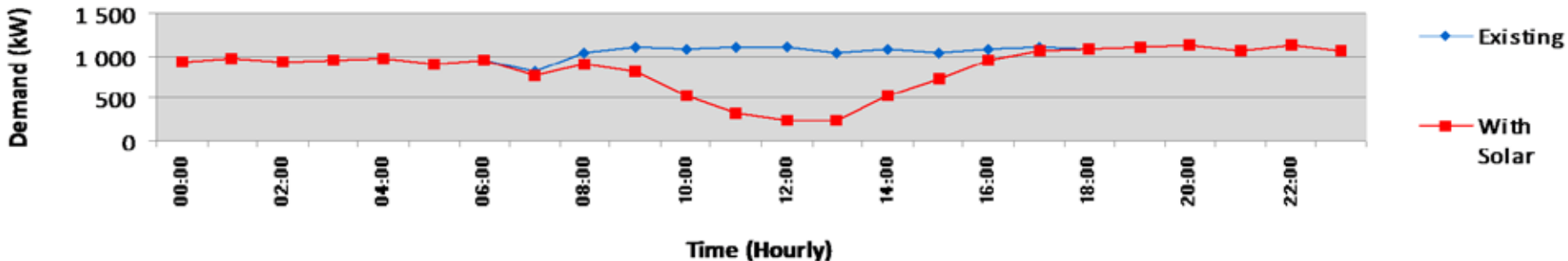
# Load profile kWh

Load Profile kWh Solar generation kWh

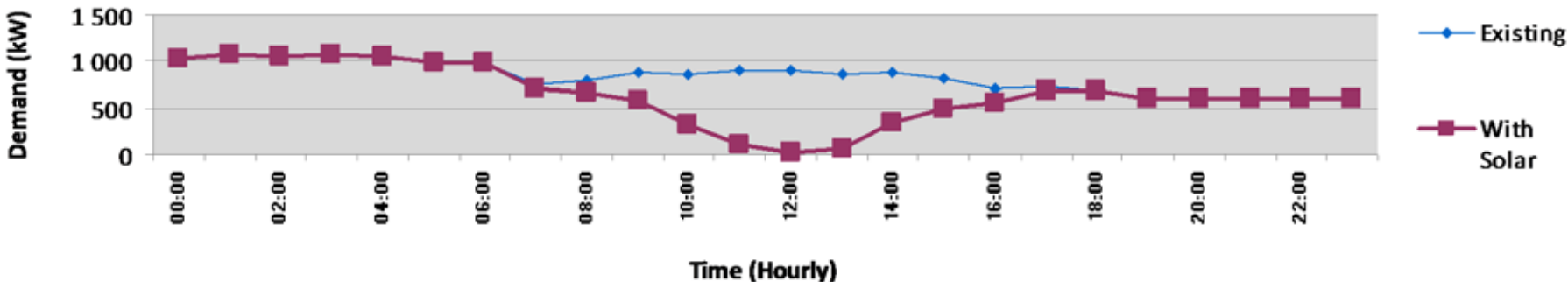




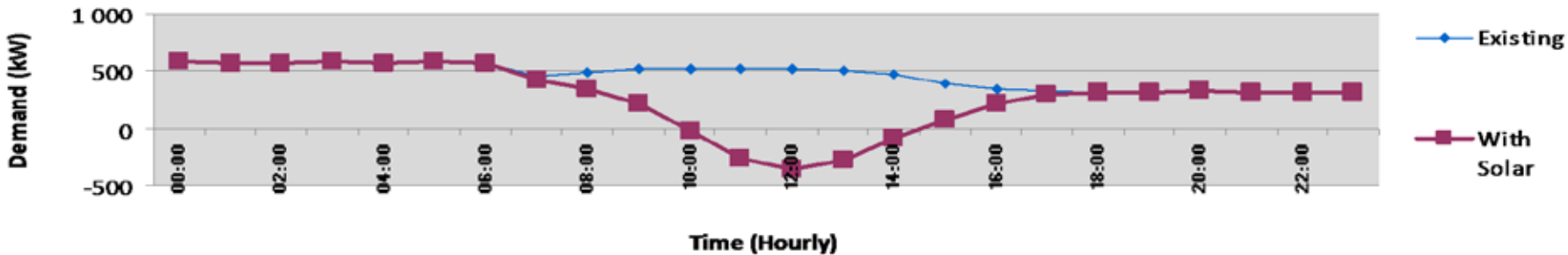
### Weekday Profile



### Saturday Profile

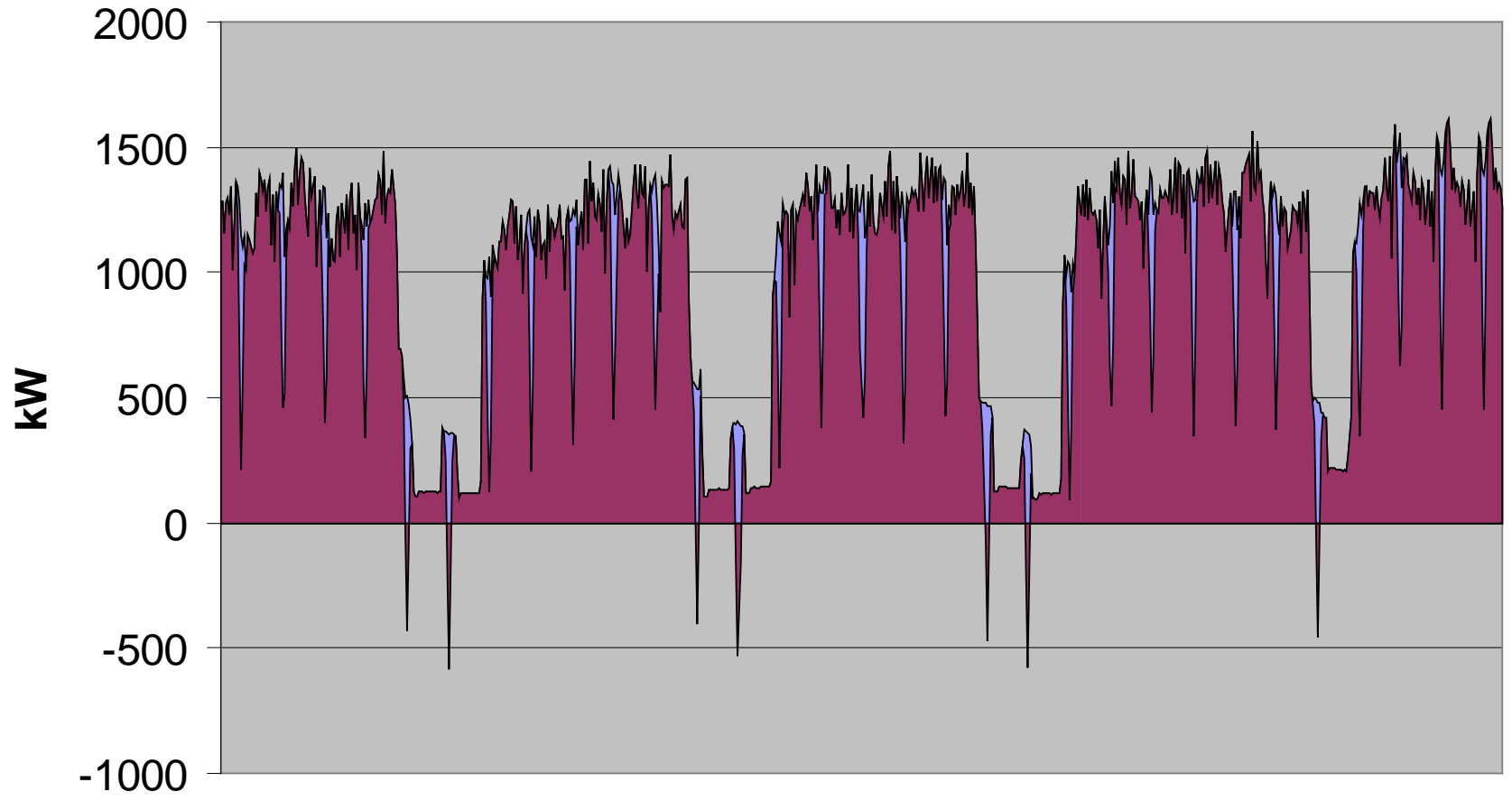


### Sunday Profile



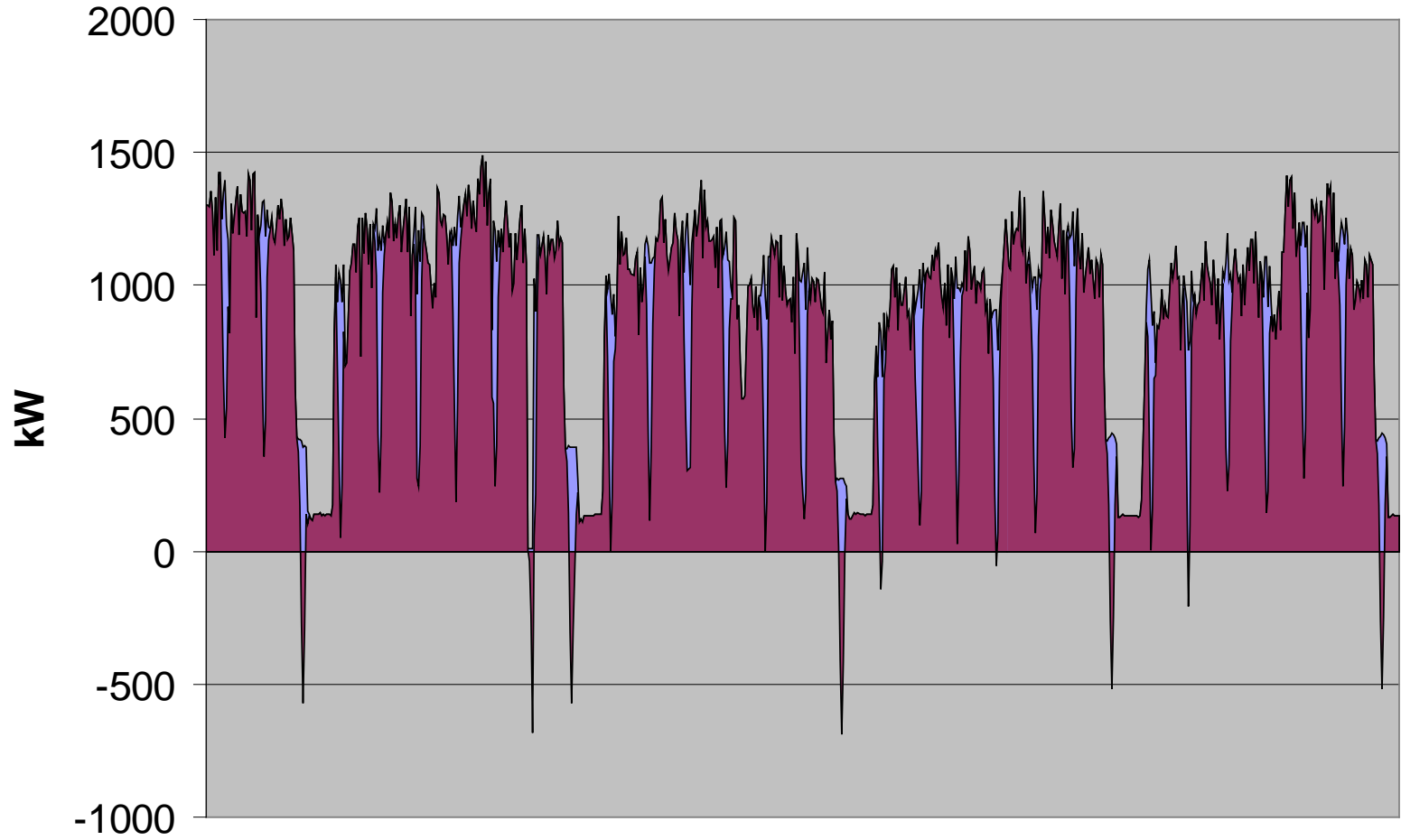
# July Load profile

Load no solar Load with Solar



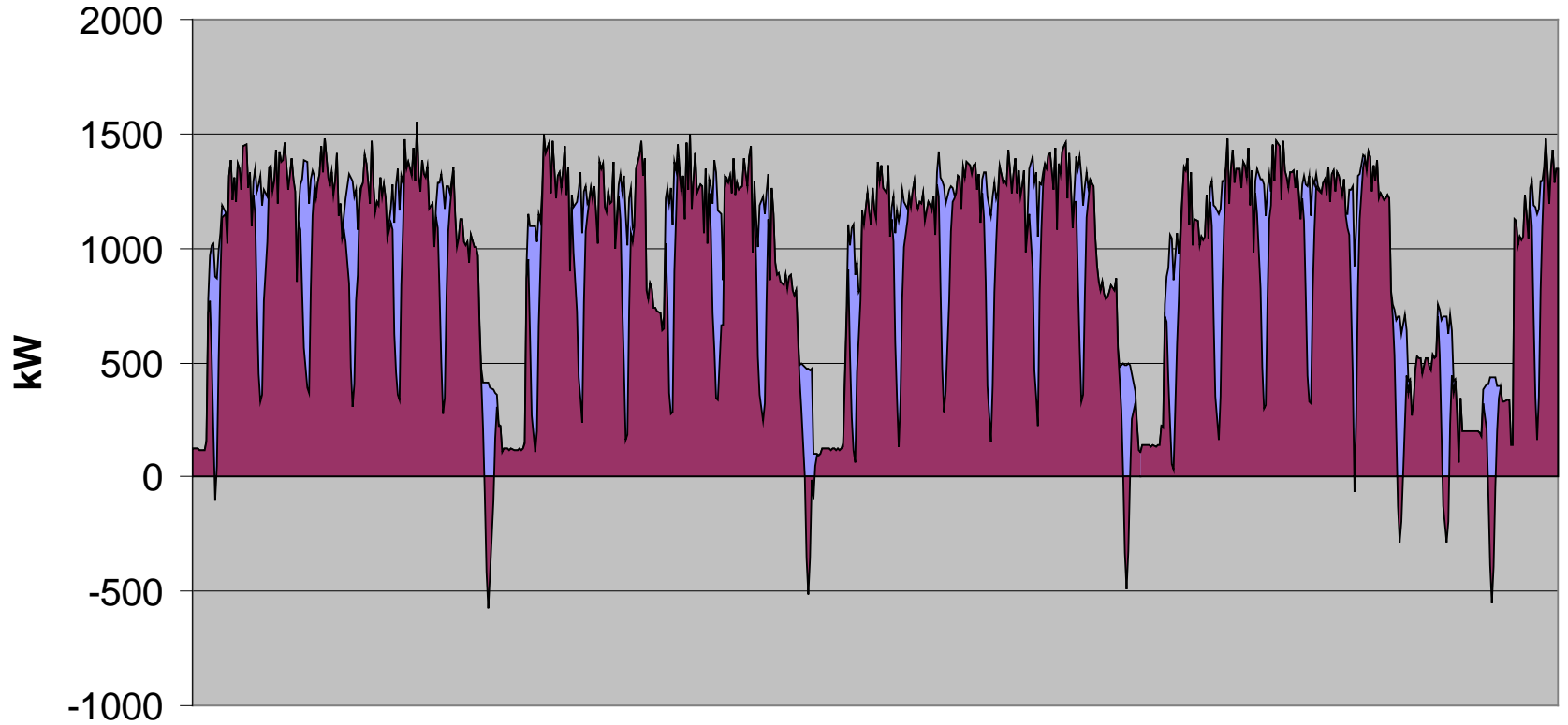
# August Load profile

Load no Solar Load with Solar



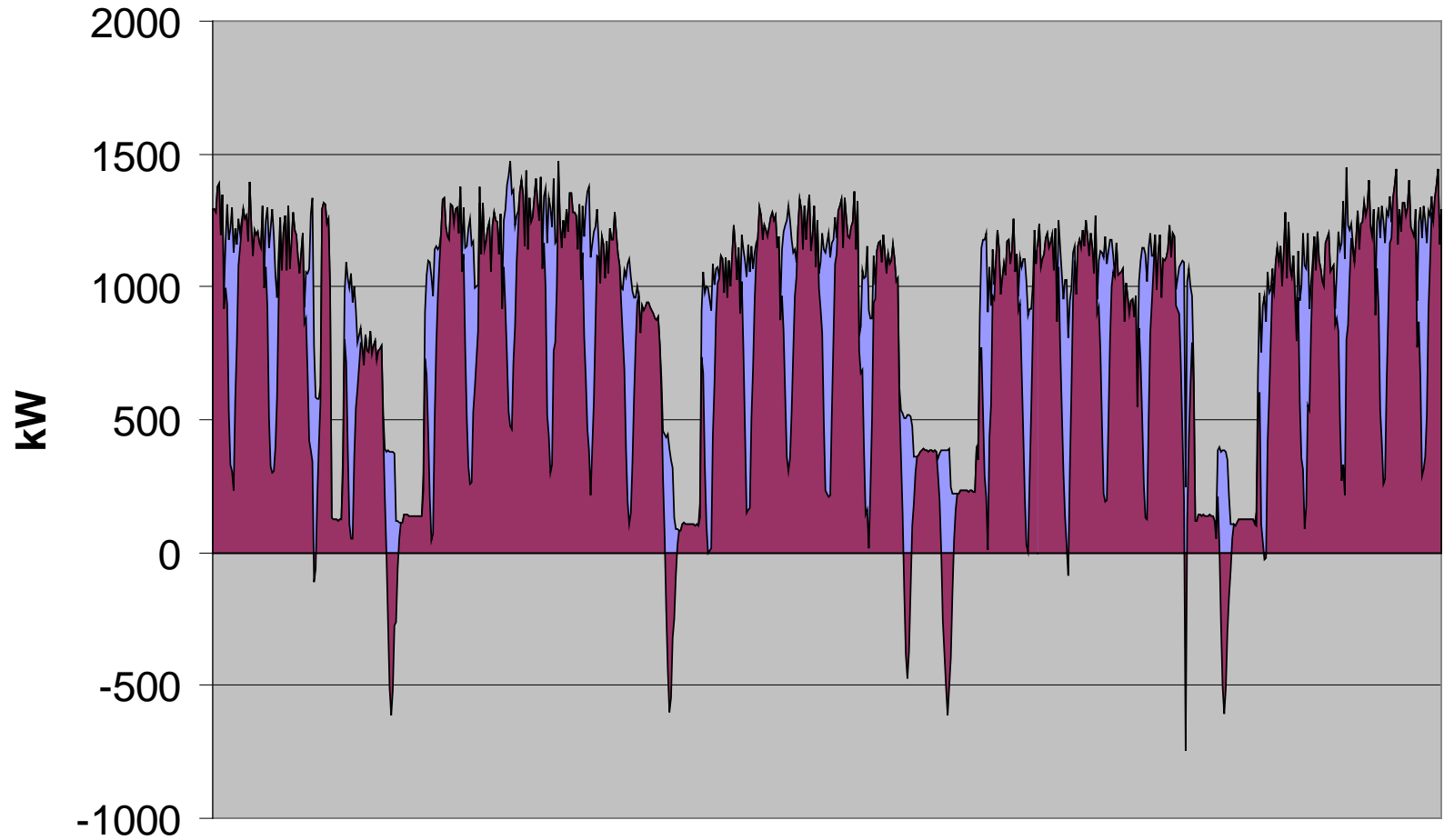
# Sept Load profile

Load no Solar Load with Solar



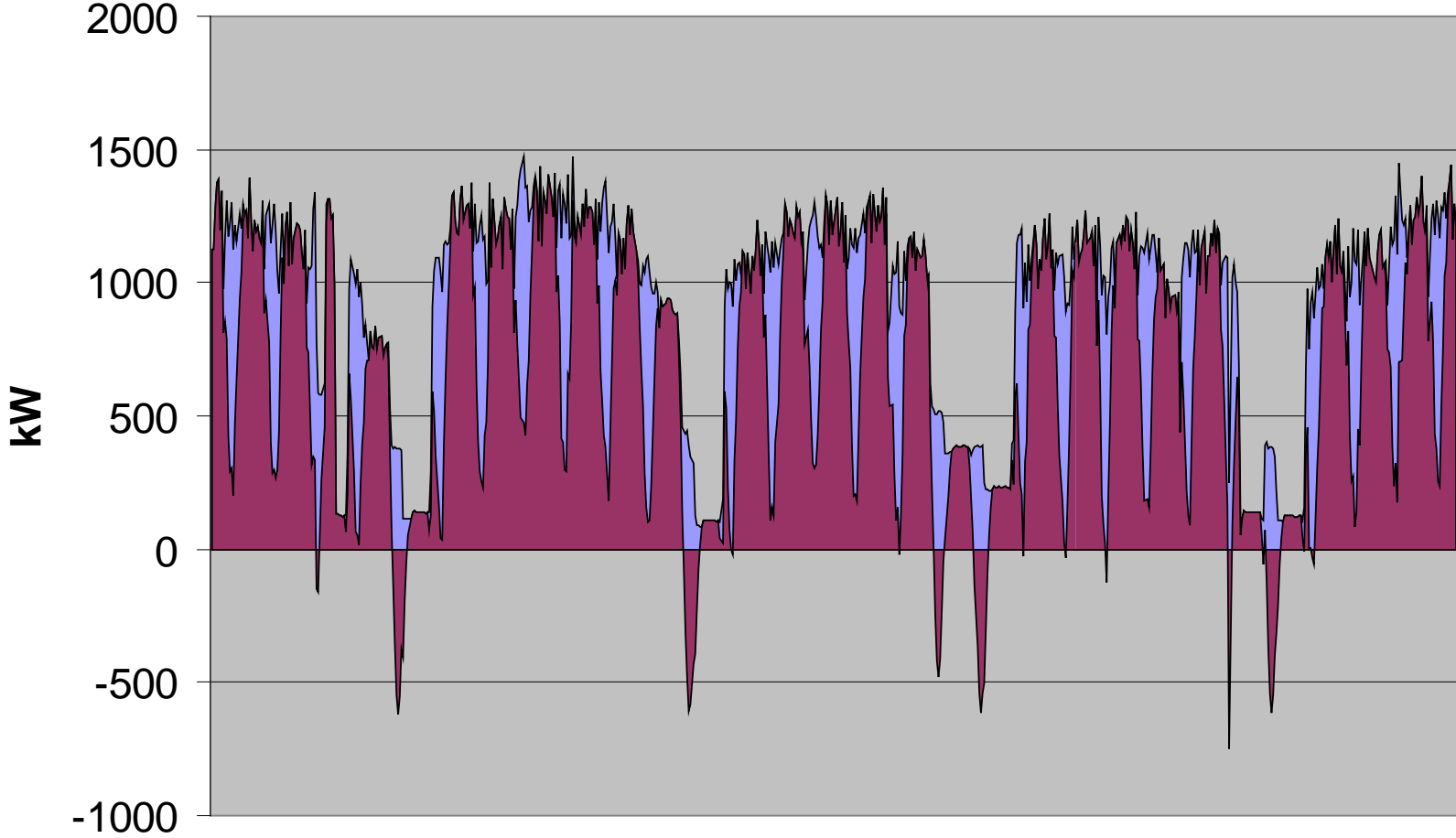
# October Load Profile

Load no Solar Load with Solar



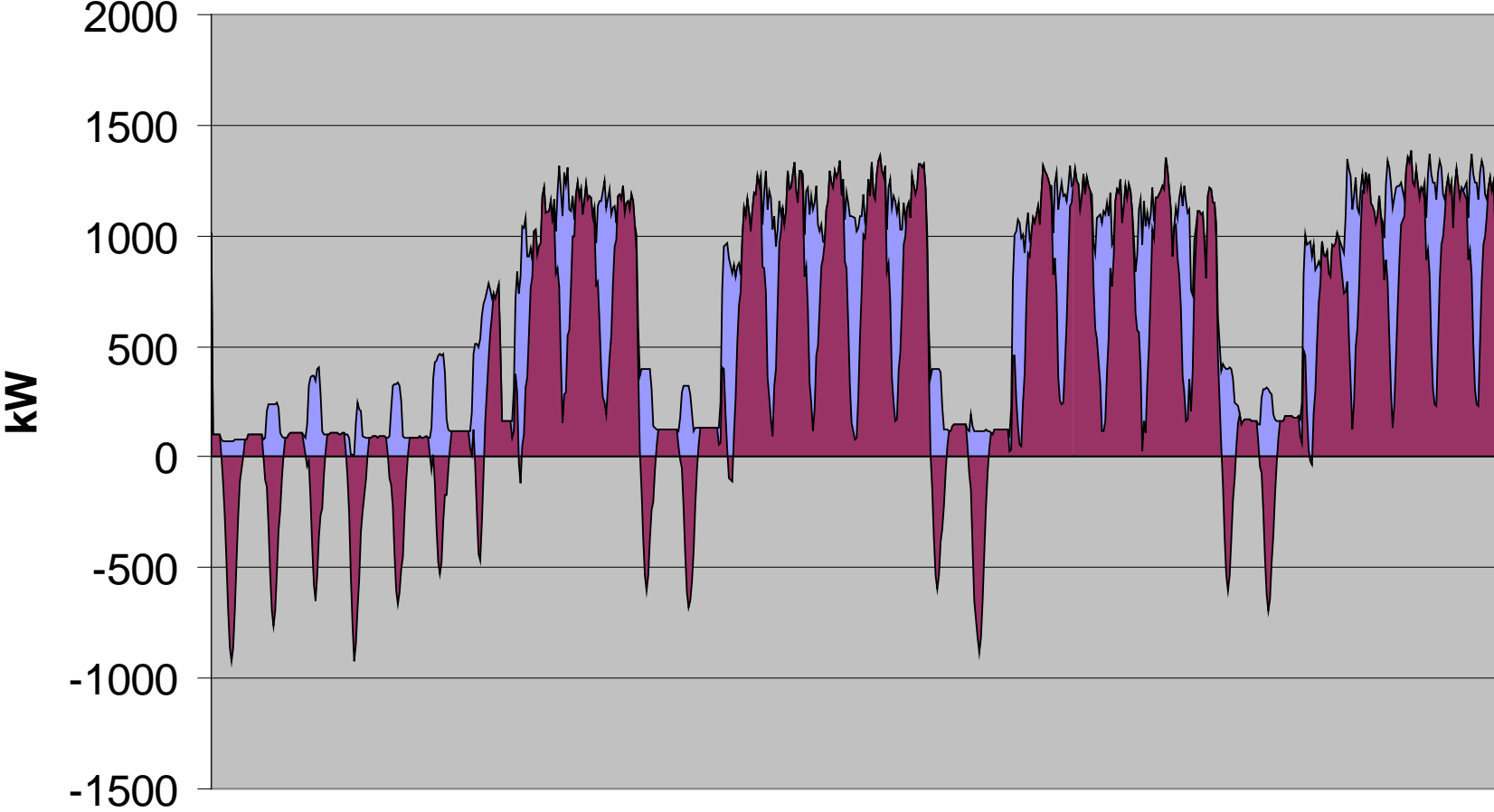
# November Load profile

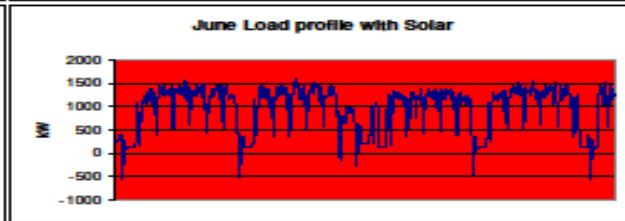
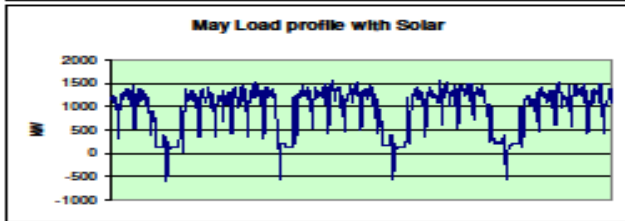
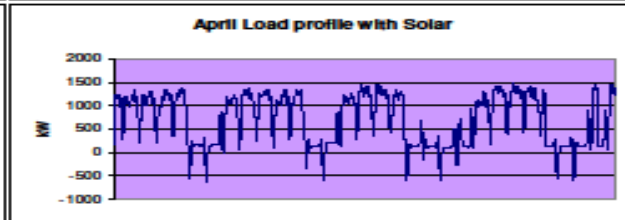
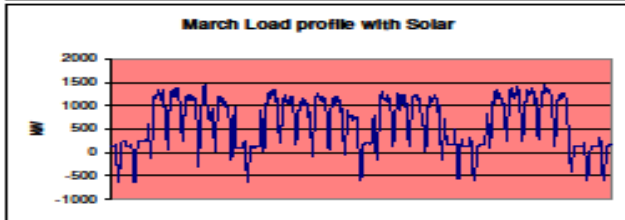
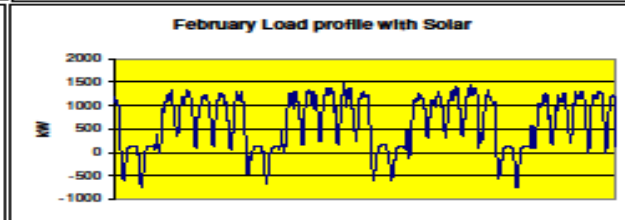
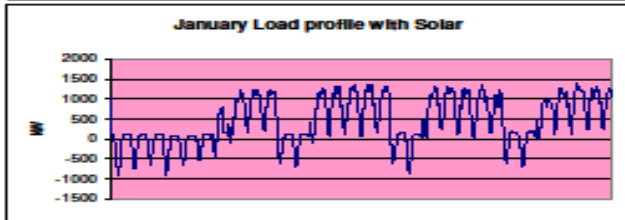
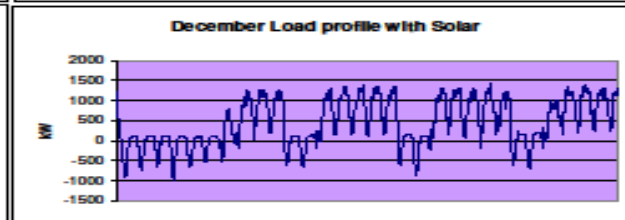
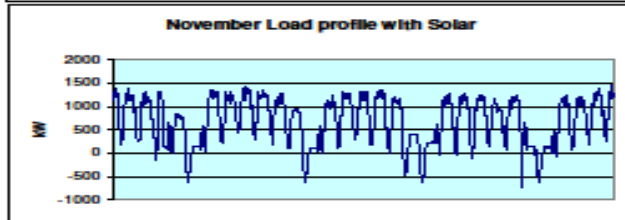
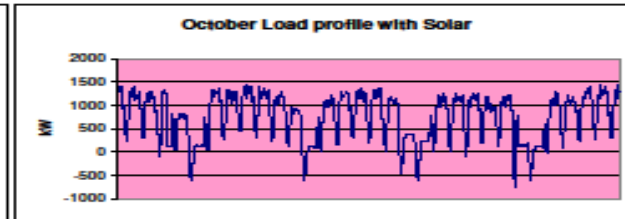
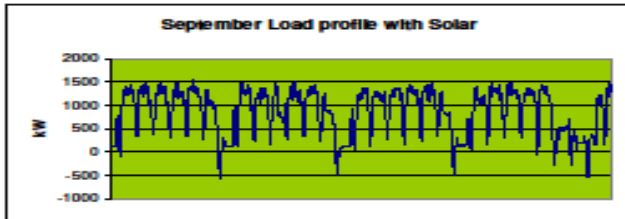
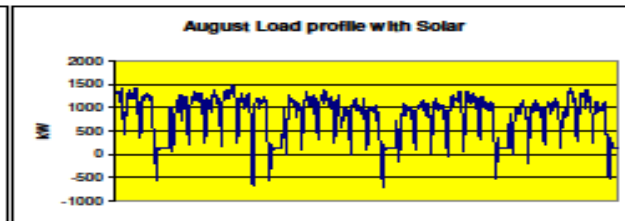
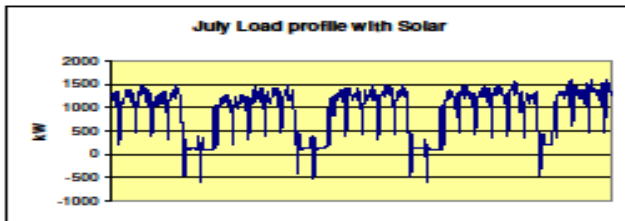
Load no Solar Load with Solar



# January Load profile

Load No Solar Load With Solar







	January Week	Feb Week	Mrch Week	April Week	May Week	June Week	Jul Week	Aug Week	Sept Week	Oct Week	Nov Week	Dec Week
06:00	1 674	904	0	0	0	0	0	0	0	0	1 365	1 828
07:00	4 152	2 586	1 024	64	0	0	0	0	222	1 281	3 551	4 426
08:00	7 584	5 397	3 360	532	21	1	3	94	1 206	3 903	6 780	7 902
09:00	12 117	9 563	7 644	2 659	440	86	164	1 040	4 222	8 320	11 211	12 402
10:00	16 933	14 389	13 749	8 379	3 802	1 814	2 454	5 587	10 325	14 286	16 058	17 112
11:00	20 699	18 386	19 552	16 669	13 742	10 967	12 193	15 273	17 652	19 759	19 920	20 758
12:00	22 132	19 952	21 988	20 962	21 057	19 854	20 724	21 343	21 106	22 014	21 404	22 139
13:00	20 699	18 386	19 552	16 669	13 742	10 967	12 193	15 273	17 652	19 759	19 920	20 758
14:00	16 933	14 389	13 749	8 379	3 802	1 814	2 454	5 587	10 325	14 286	16 058	17 112
15:00	12 117	9 563	7 644	2 659	440	86	164	1 040	4 222	8 320	11 211	12 402
16:00	7 584	5 397	3 360	532	21	1	3	94	1 206	3 903	6 780	7 902
17:00	4 152	2 586	1 024	64	0	0	0	0	222	1 281	3 551	4 426
18:00	1 674	904	0	0	0	0	0	0	0	0	1 365	1 828

	Sat	Sat	Sat	Sat	Sat	Sat	Sat	Sat	Sat	Sat	Sat	Sat
06:00	335	181	0	0	0	0	0	0	0	0	273	366
07:00	830	517	205	13	0	0	0	0	44	256	710	885
08:00	1 517	1 079	672	106	4	0	1	19	241	781	1 356	1 580
09:00	2 423	1 913	1 529	532	88	17	33	208	844	1 664	2 242	2 480
10:00	3 387	2 878	2 750	1 676	760	363	491	1 117	2 065	2 857	3 212	3 422
11:00	4 140	3 677	3 910	3 334	2 748	2 193	2 439	3 055	3 530	3 952	3 984	4 152
12:00	4 426	3 990	4 398	4 192	4 211	3 971	4 145	4 269	4 221	4 403	4 281	4 428
13:00	4 140	3 677	3 910	3 334	2 748	2 193	2 439	3 055	3 530	3 952	3 984	4 152
14:00	3 387	2 878	2 750	1 676	760	363	491	1 117	2 065	2 857	3 212	3 422
15:00	2 423	1 913	1 529	532	88	17	33	208	844	1 664	2 242	2 480
16:00	1 517	1 079	672	106	4	0	1	19	241	781	1 356	1 580
17:00	830	517	205	13	0	0	0	0	44	256	710	885
18:00	335	181	0	0	0	0	0	0	0	0	273	366

	Sun	Sun	Sun	Sun	Sun	Sun	Sun	Sun	Sun	Sun	Sun	Sun
06:00	335	181	0	0	0	0	0	0	0	0	273	366
07:00	830	517	205	13	0	0	0	0	44	256	710	885
08:00	1 517	1 079	672	106	4	0	1	19	241	781	1 356	1 580
09:00	2 423	1 913	1 529	532	88	17	33	208	844	1 664	2 242	2 480
10:00	3 387	2 878	2 750	1 676	760	363	491	1 117	2 065	2 857	3 212	3 422
11:00	4 140	3 677	3 910	3 334	2 748	2 193	2 439	3 055	3 530	3 952	3 984	4 152
12:00	4 426	3 990	4 398	4 192	4 211	3 971	4 145	4 269	4 221	4 403	4 281	4 428
13:00	4 140	3 677	3 910	3 334	2 748	2 193	2 439	3 055	3 530	3 952	3 984	4 152
14:00	3 387	2 878	2 750	1 676	760	363	491	1 117	2 065	2 857	3 212	3 422
15:00	2 423	1 913	1 529	532	88	17	33	208	844	1 664	2 242	2 480
16:00	1 517	1 079	672	106	4	0	1	19	241	781	1 356	1 580
17:00	830	517	205	13	0	0	0	0	44	256	710	885
18:00	335	181	0	0	0	0	0	0	0	0	273	366

20 207 827 171 363 157 706 108 597 79 892 63 824 70 494 91 464 123 702 163 955 194 846

January Total	Feb Total	Mrch Total	April Total	May Total	June Total	Jul Total	Aug Total	Sept Total	Oct Total	Nov Total	Dec Total
44 825	36 147	31 800	21 187	15 014	11 691	13 034	17 465	24 441	33 188	41 688	45 799
124 694	104 964	101 152	75 839	60 616	50 232	54 840	67 278	83 508	104 258	117 743	126 353
38 308	30 253	24 753	11 671	4 262	1 900	2 621	6 721	15 753	25 509	35 414	39 245
207 827	171 363	157 706	108 597	79 892	63 824	70 494	91 464	123 702	163 955	194 846	211 396

Low Season	294 090	899 128	226 067
High Season	42 190	172 350	11 242

Low Season	18%	55%	14%
High Season	3%	10%	1%
	20%	65%	14%

Eskom Miniflex Interval tariff			
	R/kWh	R/kWh	R/kWh
Low Season	R 0.3237	R 0.5101	R 0.8450
High Season	R 0.3738	R 0.6884	R 2.2719
Service Charge	R 144.1800 per day		
Admin Charge	R 26.1000 per day		
Reliability Charge	R 0.0028 per kWh		
Network demand charge	R 0.1166 per kWh		
Electrification and rural network sub	R 0.0562 per kWh		
Affordability sub	R 0.0224 per kWh		

Cost of Electricity			
Low Season	R 153 427	R 636 673	R 235 787
High Season	R 24 124	R 152 771	R 27 769

Total R 1 230 549  
Avg R 0.75 per kWh

## Cost to Municipality

- Typically R330 000 per year loss of income per 1MW installation
- Ceres Fruit Growers for instance 1MW Solar
  - Total Electricity account R23 300 000 pa
  - Loss of surplus to municipality R330 000 pa, 1.3% of account
  - Expected growth in demand per year 6-8%
- 1 Solar Water Geyser saves 120 kWh per month or 1460 kWh per year
- 1MW Solar panels = 1700 000 kWh per year = 1180 Solar water Geysers
- Replacing 1x60W bulb with a 5 Watt LED for 6 h per day saves 120 kWh per year.
- If the average household replaces 10x 60W bulbs with 10x5W LEDs then the saving = 1200 kWh per year.
- Thus a 1MW solar installation = 1411 households changing 10 bulbs to LED