Department of Electrical Engineering

IIT Hyderabad

Power Storage Optimization of a Battery.

This project is submitted as a part of Independent Project to partially fulfil the requirement of credits.

The faculty guide is Dr. Vaskar Sarkar, Associate Professor EE department has helped us and guided us throughout the project.

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Input Files:

We have given 4 different inputs in 4 excel sheets.

The file input1.xls contains the data of pvpower, load and grid price. Pvpower is entirely below the load in this case.

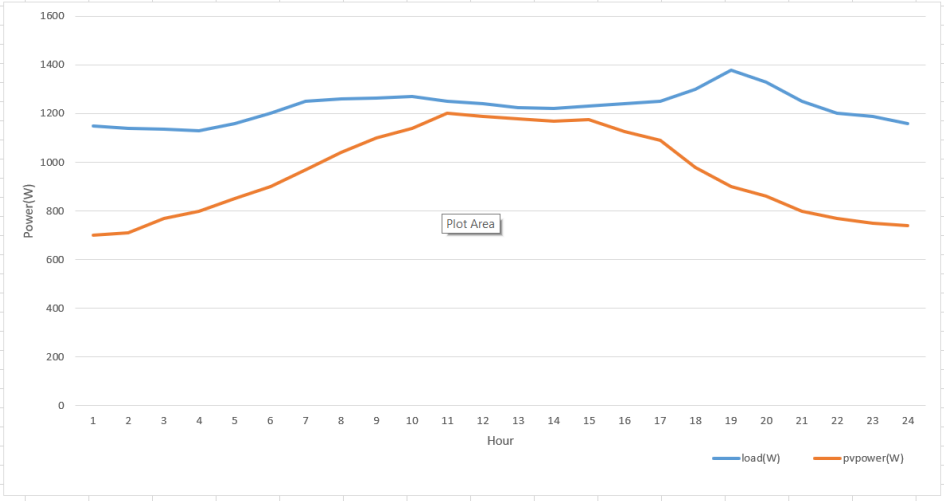
In case 2, file input2.xls has pvpower just below the load.

In case 3, file input3.xls has pvpower is just above the load.

In case 4, file input4.xls has pvpower entirely above the load.

This is our case 1.

hour	load(W)	pvpower(W)	grid price(Rs per W)
1	1150	700	2.5
2	1140	710	2.525
3	1135	770	2.55
4	1130	800	2.6
5	1160	850	2.675
6	1200	900	2.75
7	1250	970	2.8
8	1260	1040	2.95
9	1265	1100	3
10	1270	1140	3.1
11	1250	1200	3.1
12	1240	1190	3.2
13	1225	1180	3.2
14	1220	1170	3.1
15	1230	1175	3
16	1240	1125	3.45
17	1250	1090	3.7
18	1300	980	4.5
19	1380	900	4.9
20	1330	860	5.2
21	1250	800	5.4
22	1200	770	4.5
23	1190	750	3.2
24	1160	740	2.5



Other Parameters:

The total power of the system (pvpower, grid, load, storage) should be constant ignoring the battery losses.

The charging(pch) and discharging rate(pdh) of the battery should lie between a 0 and fixed value. The value of that fixed value is given as pcmax.

At any hour, the energy stored in the battery must be in a fixed range. That range is given as minstorage and maxstorage. At the end of any day, the initial and final storage value must be the same.

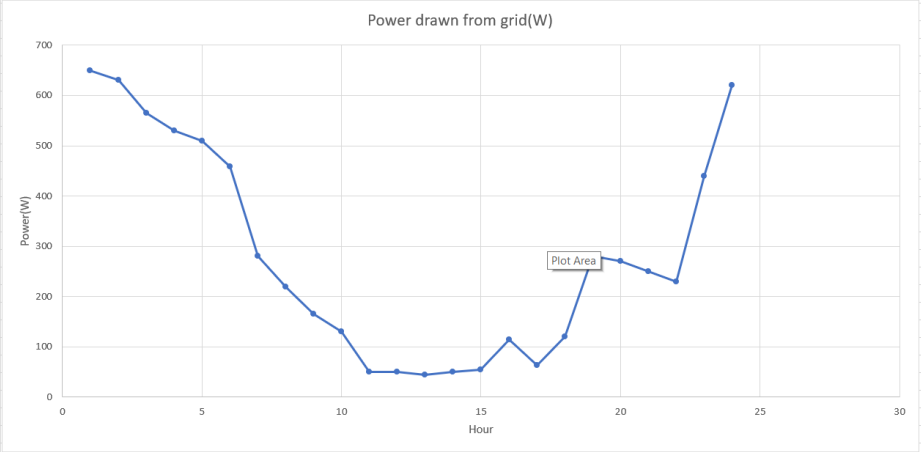
Output:

After executing the power.m matlab file, we get output files generated in the same folder.

We can check the outputs in the files output1.xls for input1.xls and the same with all other input files.

The output of case 1 looks as this.

	A	B
1	Pgrid	Netprice
2	650	21058.66
3	630	
4	565	
5	530	
6	510	
7	457.8947	
8	280	
9	220	
10	165	
11	130	
12	50	
13	50	
14	45	
15	50	
16	55	
17	115	
18	63.5	
19	120	
20	280	
21	270	
22	250	
23	230	
24	440	
25	620	



Observations:

Case 1:

When the input has pvpower below the load, we got the netprice as 21058 Rupees. The excess power needed is mostly taken from the grid and is supplied to load and also for charging the battery. Hence the net price is high as over the day we are drawing a lot of power from the grid.

Also, the battery is charged during the day time as the grid price is low compared to night time. This power is supplied to load during the night as the grid price is high.

Case 2:

When the input has pvpower just below the load, we got the netprice as 17481 Rupees. The pvpower is not entirely sufficient to provide the load, so it still draws power from the grid same as the previous case, but less compared to it. Hence, we observed a drop in the netprice. The battery still behaves the same as it charges during the morning when the price is low and discharges during night.

Case 3:

When the input has pvpower just above the load, we got the netprice as 4585 Rupees. The pvpower is just sufficient to provide the load, but it still draws power from the grid for charging the batter and also to provide the load supply when pvpower isn't sufficient. Hence, we observe a sharp drop in the netprice. The battery does gets charged to store some energy and gives it when the load power is higher than the pvpower.

Case 4:

When the input has pvpower entirely above the load, we got the netprice as -12747 Rupees. It means that, we are supplying power to the grid as we have excess of pvpower and earning the money. Initially we observe that power is drawn from grid. This is because the rate is low at those times. Later the pvpower supplies power to the grid and some to the battery for storing, which can also be seen to discharge and supply power to the load and also the grid during the 17:00 to 22:00, simultaneously earning profit while fulfilling the load.