EEP1 ELogBook – Week 6

AXXXXXXX - Brians Tjipto Meidianto

Studio

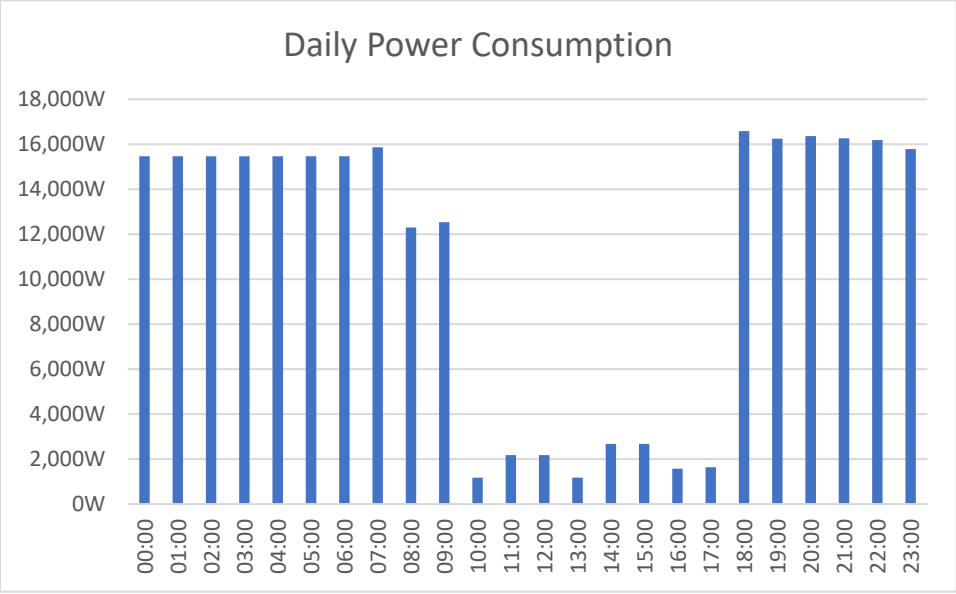
Activity 1

Usage:

Time	Light	AC	Fan	Fridge	Rice	Washing	Iron	TV	PC	Laptop	Wifi
00:00	=75+12*5	=3750*4	=70*0	300	=400*0	=600*0	=1500*0	=100*0	=120*0	=80*0	=10*3
01:00	=75+12*5	=3750*4	=70*0	300	=400*0	=600*0	=1500*0	=100*0	=120*0	=80*0	=10*3
02:00	=75+12*5	=3750*4	=70*0	300	=400*0	=600*0	=1500*0	=100*0	=120*0	=80*0	=10*3
03:00	=75+12*5	=3750*4	=70*0	300	=400*0	=600*0	=1500*0	=100*0	=120*0	=80*0	=10*3
04:00	=75+12*5	=3750*4	=70*0	300	=400*0	=600*0	=1500*0	=100*0	=120*0	=80*0	=10*3
05:00	=75+12*5	=3750*4	=70*0	300	=400*0	=600*0	=1500*0	=100*0	=120*0	=80*0	=10*3
06:00	=75+12*5	=3750*4	=70*0	300	=400*0	=600*0	=1500*0	=100*0	=120*0	=80*0	=10*3
07:00	=75+12*5	=3750*4	=70*0	300	=400*1	=600*0	=1500*0	=100*0	=120*0	=80*0	=10*3
08:00	=75+12*5	=3750*3	=70*0	300	=400*1	=600*0	=1500*0	=100*1	=120*0	=80*1	=10*3
09:00	=75+12*5	=3750*3	=70*0	300	=400*1	=600*0	=1500*0	=100*1	=120*2	=80*1	=10*3
10:00	=75+12*5	=3750*0	=70*3	300	=400*0	=600*0	=1500*0	=100*1	=120*2	=80*2	=10*3
11:00	=75+12*5	=3750*0	=70*3	300	=400*1	=600*1	=1500*0	=100*1	=120*2	=80*2	=10*3
12:00	=75+12*5	=3750*0	=70*3	300	=400*1	=600*1	=1500*0	=100*1	=120*2	=80*2	=10*3
13:00	=75+12*5	=3750*0	=70*3	300	=400*0	=600*0	=1500*0	=100*1	=120*2	=80*2	=10*3
14:00	=75+12*5	=3750*0	=70*3	300	=400*0	=600*0	=1500*1	=100*1	=120*2	=80*2	=10*3
15:00	=75+12*5	=3750*0	=70*3	300	=400*0	=600*0	=1500*1	=100*1	=120*2	=80*2	=10*3
16:00	=75+12*5	=3750*0	=70*3	300	=400*1	=600*0	=1500*0	=100*1	=120*2	=80*2	=10*3
17:00	=75+12*10	=3750*0	=70*3	300	=400*1	=600*0	=1500*0	=100*1	=120*2	=80*2	=10*3
18:00	=75+12*15	=3750*4	=70*0	300	=400*1	=600*0	=1500*0	=100*2	=120*2	=80*2	=10*3
19:00	=75+12*20	=3750*4	=70*0	300	=400*0	=600*0	=1500*0	=100*2	=120*2	=80*2	=10*3
20:00	=75+12*30	=3750*4	=70*0	300	=400*0	=600*0	=1500*0	=100*2	=120*2	=80*2	=10*3
21:00	=75+12*30	=3750*4	=70*0	300	=400*0	=600*0	=1500*0	=100*1	=120*2	=80*2	=10*3
22:00	=75+12*30	=3750*4	=70*0	300	=400*0	=600*0	=1500*0	=100*1	=120*2	=80*1	=10*3
23:00	=75+12*5	=3750*4	=70*0	300	=400*0	=600*0	=1500*0	=100*0	=120*2	=80*1	=10*3

Total Usage:

Time	Light	AC	Fan	Fridge	Rice	Washing	Iron	TV	PC	Laptop	Wifi	Total
00:00	135W	15,000W	0W	300W	0W	0W	0W	0W	0W	0W	30W	15,465W
01:00	135W	15,000W	0W	300W	0W	0W	0W	0W	0W	0W	30W	15,465W
02:00	135W	15,000W	0W	300W	0W	0W	0W	0W	0W	0W	30W	15,465W
03:00	135W	15,000W	0W	300W	0W	0W	0W	0W	0W	0W	30W	15,465W
04:00	135W	15,000W	0W	300W	0W	0W	0W	0W	0W	0W	30W	15,465W
05:00	135W	15,000W	0W	300W	0W	0W	0W	0W	0W	0W	30W	15,465W
06:00	135W	15,000W	0W	300W	0W	0W	0W	0W	0W	0W	30W	15,465W
07:00	135W	15,000W	0W	300W	400W	0W	0W	0W	0W	0W	30W	15,865W
08:00	135W	11,250W	0W	300W	400W	0W	0W	100W	0W	80W	30W	12,295W
09:00	135W	11,250W	0W	300W	400W	0W	0W	100W	240W	80W	30W	12,535W
10:00	135W	0W	210W	300W	0W	0W	0W	100W	240W	160W	30W	1,175W
11:00	135W	0W	210W	300W	400W	600W	0W	100W	240W	160W	30W	2,175W
12:00	135W	0W	210W	300W	400W	600W	0W	100W	240W	160W	30W	2,175W
13:00	135W	0W	210W	300W	0W	0W	0W	100W	240W	160W	30W	1,175W
14:00	135W	0W	210W	300W	0W	0W	1,500W	100W	240W	160W	30W	2,675W
15:00	135W	0W	210W	300W	0W	0W	1,500W	100W	240W	160W	30W	2,675W
16:00	135W	0W	210W	300W	400W	0W	0W	100W	240W	160W	30W	1,575W
17:00	195W	0W	210W	300W	400W	0W	0W	100W	240W	160W	30W	1,635W
18:00	255W	15,000W	0W	300W	400W	0W	0W	200W	240W	160W	30W	16,585W
19:00	315W	15,000W	0W	300W	0W	0W	0W	200W	240W	160W	30W	16,245W
20:00	435W	15,000W	0W	300W	0W	0W	0W	200W	240W	160W	30W	16,365W
21:00	435W	15,000W	0W	300W	0W	0W	0W	100W	240W	160W	30W	16,265W
22:00	435W	15,000W	0W	300W	0W	0W	0W	100W	240W	80W	30W	16,185W
23:00	135W	15,000W	0W	300W	0W	0W	0W	0W	240W	80W	30W	15,785W
Total	4,500W	232,500W	1,680W	7,200W	3,200W	1,200W	3,000W	1,800W	3,600W	2,240W	720W	**261,640W**
Avg. Watt Hour	188Wh	9,688Wh	70Wh	300Wh	133Wh	50Wh	125Wh	75Wh	150Wh	93Wh	30Wh	10,902Wh



Max power is 16585W at 6pm, min is 1175W at 10am and 1pm

Most power consumption is from the AC at 9688Wh, and the least is from the Wi-Fi at 30Wh.

Activity 2

a. Helix Bridge
   Assume there is 10,000 people maximum support, and half are male, and the other half are female.
   Average mass for male is 70kg and average mass of female is 55kg.
   So, the total mass will be around: 70 x 5000 + 55 x 5000 = 6.25 x 10^5kg
   Total weight applied 6.25 x 10^5kg x 10 = 6.25 MN
b. Assume 1 HDB Floor has 12 units.
   Each unit has 5 rooms.
   Each room is 3m x 3m = 9m^2
   Lift + spacing - 2 lifts x (1.5m x 1.5m + 2m x 2m) = 12.5m^2
   Corridor - 6 units x 6m x 2m x 2 corridors = 144m^2
   Total = 9 x 5 x 12 + 12.5 + 144 = 696.5m^2
   2500mm x 696.5 = 1,741,250mm = 1.741 L/m^2

Activity 3a

a. 4.4 hrs. peak sunshine
   The roof is 1000m^2, assuming 1 solar panel is 1m^2, there are a total of 1000 panels.
   4.4hrs x 1000W/m^2 x 1000 panel x 365days x 0.2 = 321,000,000 = 3.21 x 10^8 Wh.
b. 4.4 hrs. peak sunshine
   The roof is 1000m^2, 1 solar panel is 2.278m x 1.133m = 2.58m^2, there are a total of 387.6 panels ~ 387 panels
   4.4hrs x 550W x 387 panels x 365 days x 0.75 = 256,377,825Wh = 2.56 x 10^8 Wh.

Activity 3b

E4A is 1000 m^2 and has 7 floors for a total of 7000 m^2.

7000 m^2 x 750 lux = 5,250,000 lumens.

(5,250,000 lumens / 3500 lumens) x 32 W = 48,000 W.

48,000 W x 10 hrs. x 365 days = 175,000,000 Wh.

Therefore, solar panels give out roughly 256,000,000 Wh and the Lighting needed is 175,000,000 Wh, therefore the solar panels in theory would be able to light up the whole E4A building.

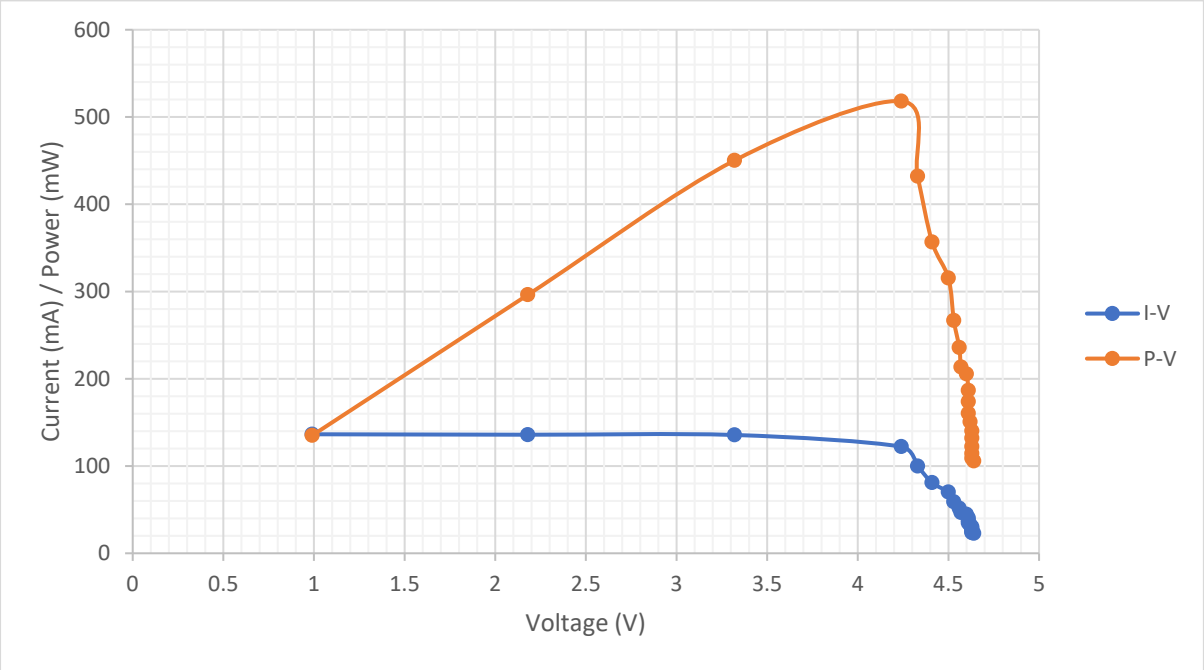
Lab

Activity 1

Voc: 0V

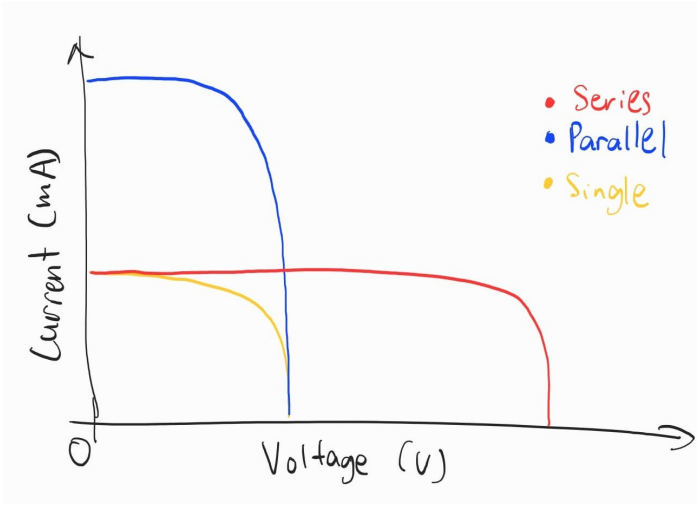
Isc: 150mA

Voltage	Current	Power
0.99	136.4	135.036
2.18	135.9	296.262
3.32	135.6	450.192
4.24	122.2	518.128
4.33	99.8	432.134
4.41	80.9	356.769
4.5	70.1	315.45
4.53	58.9	266.817
4.56	51.7	235.752
4.57	46.7	213.419
4.6	44.7	205.62
4.61	40.5	186.705
4.61	37.7	173.797
4.61	34.8	160.428
4.62	32.6	150.612
4.63	30.3	140.289
4.63	28.5	131.955
4.63	26.4	122.232
4.63	24.7	114.361
4.63	23.5	108.805
4.64	22.8	105.792



Pmax: 518.128 mW, with Vmp: 4.24 V, and Imp: 122.2 mA, and Rmp: 30 Ω

1. Values of voltage and current:
    a. R < Rmp: Current will increase, while Voltage will decrease
    b. R > Rmp: Current will decrease, while Voltage will increase
2.
3. 60 Ω
4. Sketched approximate I-V graph of the combined PV source.



Activity 2

1. Isc: 400mA
   Voc: 2.3V
   Pmax: 350mW
   Vmp: 1.2V
   Imp: 350mA
2. 350mW / 20 * 100 = 1750mW
   1.75W / 1000W/m^2 = 0.00175 m^2 = 17.5 cm^2
3. 6.26 peak sun hours * 31 days = 194.06 hours of sunlight
   194.06 hrs * 350mW = 67921mW = 67.9W
4. PV array producing 240 W at 200 V
    a. 200 V / 1.2 V = 166.67 modules ~ 167 modules
       240 W / 350 mW = 685.7 modules ~ 686 modules
       686 / 167 = 4.107 branches = 5 branches
    b. 167 S 5 P
    c. 167 modules * 2.3 V = 384.1V
       5 modules * 400 mA = 2000 mA = 2 A
5. 4.4 peak sun hours * 365 days = 1606 hours of sunlight
   167 modules * 5 branches * 350 mW = 292250 mW = 292.25W
   292.25 W * 1606 = 469353.5 W = 4.7 x 10^5