ALMIPL SOLAR

Powering The New Age (Energy)

SOLAR LOAD CALCULATION

Mohammed Mubarak
Solar Energy

Solar Power Layout for Home

Appliance or Load	Power(Watts)	Hours used in a Day(hr/day)	Watt-Hour per day (W- hr/day)
6 FL Lamps	25	5	750
3 ceiling fans	50	8	1200
1 table fan	20	6	120
1 television	150	6	900
1 refrigerator	100	12	1200
1 dvd	20	3	60
1 laptop charger	60	4	240
1washing machine	300	1	300
3 mobile charger	2	2	12
1 microwave oven	1200	0.5	600

Given, surge currents, for ceiling fn 2 and for table fn 2 and for refrigerator it is 3. Now the system will powered by 12volts DC and 120Wp (Watt Peak) PV module of one top company

Determine-

1. Power consumption Demand or panel.
2. Size of solar system or panel
3. Size of the battery
4. Size of the solar charge controller

Solution:-

Power consumption demand:-

Total appliances used for one day= (6*25w*5h) + (3*20*8) + (1*20*6) + (1*150*6) + (1*100*12) + (1*20*3) + (1*60*4) + (1*300*1) + (3*2*2) + (1*1200*.5)

= 750 + 1200 + 120 + 900 + 1200 + 60 + 240 + 300 + 12 + 600

Total load demand = 5382 watt-hr/day

Size of the solar system:-

We know that, to calculate the size of the solar system, we take 30% more than the load demand, i.e. multiply it with 1.3

Therefore, Total PV panel energy needed = 5382 W-h/day * 1.3

= 6996.6 W-h/day

Consider, peak sun hours = 4hrs per day

Divide it by 4

Therefore PV panel capacity = 6996.6/4 = 1749.15

Therefore Numbers of PV panels needed = 1749.15 / 120(Wp) given Wp=120

=14.57, approx. 15panels needed for one hr

Size of the inverter (Neglecting Surge)

Total Watts of all the appliances= (6*25) + (3*50) + (1*20) + (1*150) + (1*100) + (1*20) + (1*60) + (1*300) + (3*2) + (1*1200)

=2156 Watts

For efficiency and power factor parameter, divide the connected watts by '0.9*0.9' i.e 0.81 factor.

As we know KW/P.f =

KVA i.e 2156/0.81 =

2661.728

For safety, Inverter should be 25-30% bigger than total watts of appliances, hence multiply with 1.3

= 2661.728*1.3

=3460.246 VA

=3.4602 KVA

Therefore, size of the inverter (neglecting surges) = 3.4602 KVA

Size of the inverter (considering surge currents)

Total Watts = (6*25) + (3*50*2) + (1*20*2) + (1*150) + (1*100*3) + (1*20) + (1*60) + (1*300) + (3*2) + (1*1200)

= 2526 Watts

For ‘n’ and ‘pf’ i.e =

2526/.081 = 3118.518 25-

30% Bigger = 3118.518 *

1.3

= 4054.047 VA

= 4.05407 KVA

Therefore, Size of the Inverter (considering surges) = 4.0540 KVA

Size of the Battery:-

Total power of all appliance = 5382 Watt-hours/ day as calculated above There is a loss in every battery i.e divide it with .85

= 5382/0.85 = 6331.764 W-hr/day

For depth of discharge, divide answer with 0.6

= 6331.764/0.6 = 10552.941 W-hr/day

Divide answer with nominal battery voltage (given) i.e 12V-DC

= 10552.94/12 = 879.411

Therefore Let days of autonomy = 3

(multiply with 3)

= 879.411*3

Size of the battery = 2638.235 A-hrs/dy

Size of the Solar Charge Controller:-

Consider, Specifications of Suntech STP 120-12/Tb 12 Wp , 12V poly-

crystalline solar panel Maximum power at STC (Pmax) = 120Wp

Open circuit voltage (V_{OC}) = 21.8 V

Short circuit current (I_{SC}) = 7.65A

Optimum operating voltage (V_{mp}) = 17.2V

Power Tolerance = 5%

Solar charge controller rating mainly depends on Isc current.

Solar charge controller rating = 4 strings * 7.65 * 1.3

= 39.78

Approx. 40A at 12V

– DC So, charge controller should

be rated at 40A, 12V-DC

4th Floor 4B, Mandira Apartments,
North Boag Road, T-Nagar Chennai- 600 017
Email: Solarbazaarpl@gmail.com
Web: www.almipl.com
Mobile: 94452 30332 /9383132332

Green Energy Promoters