

Off Grid Battery Sizing



You've been asked to design an off-grid system for a client. They have the following electrical loads:

- 6 LED lights rated at 8W each and run on a 12VDC system
 - o These are left on for 4 hours per day
- 1 TV rated at 150W that requires 120VAC
 - o They watch 2 hours of TV per day
- 1 refrigerator that runs on 120VAC and uses 200W
 - o This runs for about 4 hours total per day

1. Tabulate the loads

Appliance (DC)	Quantity	Power (W)	Usage Time (h)	Energy (Wh)	Max Demand (W)	Surge Demand
LED Lights	6	8	4	192	48	
Appliance (AC)						
TV	1	150	2	300	187.5 VA @ 0.8pf	187.5 VA
Refrigerator	1	200	4	800	250 VA @ 0.8pf	500 VA
					437.5 VA	687.5 VA

2. Add the loads (DC Loads + (AC Loads/inverter efficiency))
 = 192 Wh + (1100 Wh / 90%)
 = 192 Wh + 1222 Wh
 = 1414 Wh

3. Determine system voltage
24 Volts – Medium size system

4. Calculate base battery bank size
1414 Wh / 24 V = 58.93 Ah

5. Determine days of autonomy
58.93 Ah x 5 days = 294.63 Ah

6. Calculate for depth of discharge
294.63 Ah / 70% = 420.90 Ah

7. Derate for temperature
420.90 Ah x 105% = 441.94 Ah

8. Select a discharge rate
441.94 Ah @ C₁₀₀