

Unit 15



Dimensioning of a Solar/Battery Backup system

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Agenda



- ◆ What is dimensioning?
- ◆ User requirements and input data
- ◆ Solar dimensioning
- ◆ Battery dimensioning

What is dimensioning?



- ♦ What do I need to cover my needs in terms of electricity?
 - ✓ How many solar panels?
 - ✓ How many batteries?
- ♦ What voltage/current do I want to obtain?
 - ✓ What is my load?

Location Based Data



- ◆ Sun peak hours/day
 - ✓ Depending on your location
 - ✓ Plan for the worst!
- ◆ Nigeria: 4 sun peak/day

User requirements



- ◆ Power consumption
 - ✓ Total consumption of all electrical devices
- ◆ Anatomy
 - ✓ How many days should the system work without power input?

Equipment specification



- ◆ Battery
 - ✓ Capacity (Ah)
 - ✓ Max discharge (%)
 - ✓ Voltage (V)
- ◆ Solar Panels
 - ✓ Nominal power (W)

Example



- ◆ Power Consumption (load): 120 W
- ◆ Battery
 - ✓ Voltage: 12V
 - ✓ Capacity: 100 Ah
 - ✓ Max discharge: 50%

How many batteries do we need?

How much current do we need?



$$\text{Power} = \text{Voltage} * \text{Current} = V * I$$

$$I = 120 / 12 = 10 \text{ A}$$

How much energy do we need?



In 1 day:

$$\text{Energy/day} = 10 \text{ A} * 24\text{h} = 240 \text{ Ah}$$

$$\text{Energy/day} = 12 \text{ V} * 240 \text{ Ah} = 2880 \text{ Wh}$$

In 5 days:

$$5 * 240 \text{ Ah} = 1200 \text{ Ah}$$

How much energy do we need?



Assuming:

Max discharge level: 50%

Battery capacity: 100 Ah

Total energy = $1200 / 0,5 = 2400$ Ah

No of batteries: $2400 / 100 = 24$

How many solar panels are needed?



Assuming:

4 sun peak hours/day (4000 W/m²)

Panel current: 5 A

Energy needed/day: 240 Ah

Energy provided: 5 A * 4h = 20 Ah

No panels: 240/20 = 12