Essential Electrical Equations and Conversions

Power, Voltage, and Current Calculations

Calculating Power

Volts x Amps = Watts
V x A = W
Voltage x Current = Power
V × I = P

Calculating Voltage

Watts ÷ Amps = Volts
W ÷ A = V
Power ÷ Current = Voltage
P ÷ I = V

Calculating Current

Watts ÷ Volts = Amps
W ÷ V = A
Power ÷ Voltage = Current
P ÷ V = I

Ohm's Law

Calculating Voltage

Volts = Amps x Ohms
V = A x Ω
Voltage = Current × Resistance
V = I × R

Calculating Current

Amps = Volts ÷ Ohms
A = V ÷ Ω
Current = Voltage ÷ Resistance
I = V ÷ R

Calculating Resistance

Ohms = Volts ÷ Amps
Ω = V ÷ A
Resistance = Voltage ÷ Current
R = V ÷ I

Calculating Energy

Power × Time = Energy
P × t = E
Watts × Hours = Watt-hours
W × h = Wh
Kilowatts × Hours = Kilowatt-hours
kW × h = kWh

Battery Capacity

Amps × Hours = Amp-hours
A × h = Ah

Calculating Energy Storage

Volts × Amp-hours = Watt-hours
V × Ah = Wh

Unit Conversions

k = 1000
M = 1000k (million)
G = 1000M (billion)
m = 1/1000 = milli

Percent to decimal

50% / 100 = 0.5

PV STC = Standard Test Conditions
25°C and 1000W/m^2

String sizing for longest string

Delta T x Coefficient = % increase voltage
Calculate Voc cold temp for 1 PV module
Divide Inverter max voltage by cold temp Voc
Get modules in series (round down)

String sizing for shortest string

Delta T x Coefficient = % decrease voltage
Calculate Vmp hot temp for 1 PV module
Divide inverter low voltage by hot temp Vmp
Get modules in series (round up)

DC PV fuse size (and equipment min)

Isc x 1.56 and round up

Fuse size for other (and equipment min)

Rated current x 1.25 and round up

Wire sizing = it's complicated
solarSEAN.com/wiresizing