Battery Capacity Converter (Ah, Wh, kWh)

Converts battery capacity in ampere-hours at a nominal voltage to stored and usable energy, with specific energy and runtime at a chosen load power.

Method: Energy = capacity × nominal voltage

Input parameters

Unit system: SI

Parameter	Value	Unit
Rated capacity	100.00	Ah
Nominal voltage	51.200	V
Usable depth of discharge	90.000	%
Battery mass	45.000	kg
Load power	0.80000	kW

Calculated results

Parameter	Value	Unit
Stored energy	5.1200	kWh
Usable energy	4.6080	kWh
Specific energy	113.78	Wh/kg
Runtime at the load	5.7600	h

Notes for this case

• Energy is charge times voltage: E[Wh] = Q[Ah] × V_n. The nominal voltage is the average over a discharge (3.2 V per LFP cell, 3.6–3.7 V for NMC, 2.0 V for lead-acid), so the result is a rated figure. Usable energy depends on the permitted depth of discharge; real runtime is also cut by inverter losses, temperature and the discharge rate (Peukert effect for lead-acid).

Formula and method

$$E = QV_n, \quad E_u = E \cdot DoD, \quad t = \frac{E_u}{P_L}$$

Variables

Q	Rated capacity	C
V_n	Nominal voltage	V
DoD	Usable depth of discharge	-
m	Battery mass	kg
P_L	Load power	W
E	Stored energy	J
E_u	Usable energy	J
e_m	Specific energy	J/kg
t	Runtime at the load	s

Method and standards

Ah to Wh.

Assumptions and limits

- Nominal voltage constant over the discharge; no rate effects.

References

Energy = capacity × nominal voltage

Report details

Report reference	FCC-5MTX-GBNE (the same inputs always give the same reference)
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Release checks	3 reference cases of this calculator, computed independently, are checked on every release

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/general/unit-conversions/battery-energy-converter

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.