

Residential Battery Load Calculator

Estimate residential backup battery energy, energy margin, inverter margin, and runtime from essential load, backup duration, efficiency, reserve, and entered equipment ratings.

Generated October 10, 2026

<https://www.elecatrix.com/residential-load-service/residential-battery-load-calculator/>

Inputs

Input	Value	Unit
Essential load	3	kW
Backup duration target	8	h
Entered battery energy	40	kWh
Inverter/system efficiency	90	%
Additional energy reserve	15	%
Entered inverter rating	5	kW

Results

Result	Value	Unit
Required battery energy	30.6667	kWh
Battery energy margin	9.3333	kWh
Inverter power margin	2	kW
Runtime from entered battery	12	h

Status

Status	Value	Unit
Planning note	Entered battery and inverter cover the planning estimate.	

Calculation details

Detail	Value	Unit
Calculation basis	Battery energy is calculated from entered essential load, runtime target, efficiency, reserve, battery capacity, and inverter rating.	

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Review boundary

Energy planning only; no battery system, BMS, fire-safety, utility, or code-compliance approval is made.

Formulas

Required battery energy=Essential load x Backup hours/(Efficiency/100) x (1+Reserve/100)

Battery energy margin=Entered battery energy-Required battery energy

Inverter power margin=Entered inverter rating-Essential load

Estimated runtime=Entered battery energy x (Efficiency/100)/Essential load

Warnings and limitations

This residential battery load estimate does not select or approve a battery system, inverter, BMS, ESS installation, fire-safety design, utility interconnection, or code compliance.