

Residential Sump Pump Backup Runtime Calculator

Review an intermittent sump-pump backup scenario using named pump and backup-equipment data. The result does not guarantee flood protection or emergency runtime.

Generated October 10, 2026

<https://www.elecatrix.com/solar-backup-power/residential-sump-pump-backup-runtime-calculator/>

Inputs

Input	Value	Unit
Pump running power	800	W
Pump starting or surge power	2000	W
Pump duty cycle	25	%
Battery voltage	12	V
Battery capacity	200	Ah
Usable battery fraction	80	%
Inverter efficiency	90	%
Inverter continuous limit	1500	W
Inverter surge limit	3000	W
Reserve fraction	10	%
Pump and backup model note	Record pump, battery, inverter, controller, and inflow assumptions separately.	

Results

Result	Value	Unit
Stored battery energy	2400	Wh
Usable backup energy	1555.2	Wh
Average pump load	200	W
Estimated runtime	7.776	h
Continuous inverter margin	700	W
Surge inverter margin	1000	W

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Surge margin comparison

Within entered surge limit

Calculation details

Detail	Value	Unit
Calculation basis	Stored battery energy is battery voltage times rated capacity. Usable backup energy applies the usable battery fraction, inverter efficiency, and reserve adjustment. Average pump load is running watts times duty cycle.	
Backup boundary	Runtime estimate only; verify pump starts, inflow, battery temperature/age, inverter waveform and surge behavior, backup controls, alarm, and flood risk separately. No runtime guarantee is made.	

Formulas

$$E_{\text{stored,Wh}} = V_{\text{battery}} \times C_{\text{Ah}}$$

$$E_{\text{usable}} = E_{\text{stored}} \times F_{\text{usable}} \times \eta_{\text{inverter}} \times (1 - F_{\text{reserve}})$$

$$P_{\text{avg}} = P_{\text{running}} \times F_{\text{duty}}$$

$$t_{\text{runtime}} = \frac{E_{\text{usable}}}{P_{\text{avg}}}$$

$$\text{Surge margin} = P_{\text{surge limit}} - P_{\text{starting}}$$

Warnings and limitations

This is a pump-specific runtime estimate. It does not guarantee flood protection, battery capacity, pump starts, inverter compatibility, transfer operation, or emergency performance.