Off-grid health post

Prepared for Sample client (demo) · 2026-10-27 · 12 V system

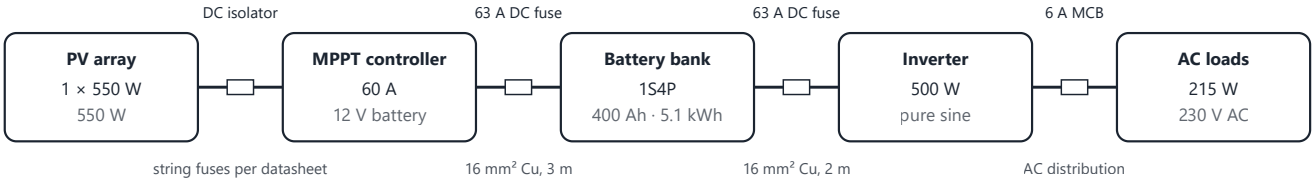
SOLAR ARRAY
1 × 550 W
550 W total

BATTERY BANK
4 × 12.8 V 100 Ah
1S4P · 5.1 kWh

INVERTER
500 W
pure sine, sized by surge

MPPT CONTROLLER
60 A
at 12.8 V battery

Single-line diagram



Loads

Appliance	W	Qty	h/day	Type	Wh/day
LED light	10	5	6	AC	300
Vaccine fridge	100	1	10	AC	1,000
Laptop	65	1	4	AC	260

Calculation steps

Daily energy needed	**1,696 Wh**	DC 0 Wh + AC 1,560 Wh ÷ 0.92 inverter efficiency
PV power needed	**440 W**	1,696 Wh ÷ (5 sun hours × 0.77 derate)
Panels	**1 × 550 W**	round up 440 ÷ 550; yields about 2,118 Wh/day in the design month
Battery energy needed	**4,462 Wh**	1,696 Wh × 2 days ÷ (0.8 DoD × 0.95 efficiency)
Battery bank	**1S × 4P = 400 Ah at 12.8 V**	1 in series for 12 V; parallel strings = round up 4,462 ÷ (12.8 V × 100 Ah). Usable 4,096 Wh

Inverter	**500 W**	max of continuous 215 W × 1.25 = 269 W and surge 615 W ÷ 2 = 308 W, next standard size
Charge controller	**60 A**	550 W ÷ 12.8 V = 43 A × 1.25 = 53.7 A
Battery to inverter cable	**16 mm² copper**	42.5 A over 2 m: needs ≥ 7.74 mm² for 3% drop; fuse 63 A (1.25 × current); 16 mm² gives 1.45% drop, rated ~66 A ≥ fuse
Controller to battery cable	**16 mm² copper**	43 A over 3 m: needs ≥ 11.75 mm² for 3% drop; fuse 63 A (1.25 × current); 16 mm² gives 2.2% drop, rated ~66 A ≥ fuse

Not covered by this sizing

- PV string design: check panel Voc at the coldest temperature against the controller's maximum input voltage.
- Fuse and breaker sizes are first estimates: confirm DC voltage ratings, breaking capacity, earthing and surge protection.
- Cable ampacity is indicative (PVC, ~30 °C, free air). Derate for conduit, heat and bundling.
- Peak sun hours should come from the site's worst-month data (e.g. PVGIS or NASA POWER).

Preliminary sizing aid. It is not a stamped engineering design. Check the results against local electrical codes, manufacturer datasheets (panel Voc/Isc, controller input limits, battery BMS limits), protection devices and site conditions before buying or installing anything.